April 2008

Local Air Quality Management

Progress Report 2008

THE ROYAL BOROUGH OF
KENSINGTON
AND CHELSEA

Front cover illustration: Art competition entrant, Olivia Godwin Garden House School

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EXECUTIVE SUMMARY

Under the Government's Air Quality Strategy, the Council is required to assess air quality within the Borough annually. In 2000, as a result of our review, the whole Borough was declared an Air Quality Management Area on the basis that certain Government air quality objectives, for nitrogen dioxide and particulate matter, would not be met. In 2003, the Council published its first Air Quality Action Plan, which set out the steps the Council is taking to work towards meeting these quality objectives. In 2007 the Council began its consultation with residents on a revised action plan to develop new ideas.

This latest Local Air Quality Management progress report provides information on the review and assessment of air quality in the borough. This review includes monitoring data collected during 2007 on the key pollutants identified in the national Air Quality Strategy. These are carbon monoxide; benzene; 1,3-butadiene; lead, nitrogen dioxide (NO_2), sulphur dioxide and particulate matter (PM_{10}). We have also included information on benzo(α)pyrene which is used as a marker for a complex group of hydrocarbons (PAH), ozone and $PM_{2.5}$ though there is no requirement to do so.

Most pollutants remain well within their respective objective levels. However, NO_2 and PM_{10} continue to exceed certain objectives but many of the monitoring locations have, for the first time, shown a slight downward trend compared to the previous year.

A separate report provides an update on progress with implementing the Council's current Air Quality Action Plan.

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INTRODUCTION

Background

The Environment Act 1995 introduced the system of Local Air Quality Management. Local authorities are required, under Section 82 of this act to work towards achieving air quality objectives and to report annually on progress. Details about previous review and assessment work can be found in Annex 1.

Local Air Quality Management

The first national air quality strategy was produced in 1997. Since then there have been two reviews of the air quality strategy with the latest being published in 2007. The strategy sets out health based standards and objectives, most of which have been incorporated within Air Quality Regulations, though some have retained a provisional status. The objectives for key pollutants are shown in Table 1 below. Each objective consists of a level measured over a specific averaging period and a date by which it should be achieved and retained thereafter.

Table 1 Air Quality Objectives within London

Pollutant	Concentration	Measured as	Date to be achieved by and maintained
Benzene	16.25μg/m^3 5.00μg/m^3	running annual mean annual mean	31.12.2003 31.12.2010
1,3-butadiene	2.25μg//m^3	running annual mean	31.12.2003
Carbon monoxide	10 mg/m^3	max daily running 8hour mean	31.12.2003
Lead	0.5 μg/m^3 0.25 μg/m^3	annual mean annual mean	31.12.2004 31.12.2008
Nitrogen dioxide	200 μg/m^3 (not to be exceeded more than 18 times per year) 40 μg/m^3	1hr mean annual mean	31.12.2005 31.12.2005
Particles – PM_{10}	50μg/m^3 (not to be exceeded more than 35 times per year) 40μg/m^3	24 hr mean annual mean	31.12.2004 31.12.2004
Sulphur dioxide	350 μg/m^3 (not to be exceeded more than 24 times per year) 125μg/m^3 (not to be exceeded more than 3 times per year) 266 μg/m^3 (not to be exceeded more than 35 times per year)	1 hr mean 24 hr mean 15 minute mean	31.12.2004 31.12.2004 31.12.2005
Ozone	100μg/m^3(not to be exceeded more than 10 times per year)	8 hour mean	31.12.2005
PAH (Polycyclic aromatic Hydrocarbons	0.25ng/m^3	annual mean	31.12.2010 provisional

The provisional objective for ozone whilst not dealt within the LAQM process (because it requires action at the European level) has been included for information purposes on page 24 due to concern over its health effects and regular exceedence of objectives. Polycyclic aromatic hydrocarbons (PAHs) have yet to be incorporated within the Air Quality Regulations and there is no requirement to include an assessment of PAHs at this time, however information also has been included in page 23.

The latest Air Quality Strategy published in 2007 resulted in the replacement of the provisional 2010 and 2015 objectives for PM_{10} with a new objective for $PM_{2.5}$ (see table 2). A new approach termed the 'exposure reduction framework' is also introduced which is designed to achieve a more widespread reduction of particles rather than targeting hotspots. This approach consists of an objective or concentration cap coupled with a percentage (or exposure) reduction objective which aims to reduce the average exposure to below the cap level. The exposure reduction objective for $PM_{2.5}$ is shown in Table 2.

Table 2 $PM_{2.5}$ Exposure reduction objectives

Pollutant	Concentration	Measured as	Date to be achieved by and maintained
Particles – PM_{10}	***Provisional objectives to be replaced:***		
	23µg/m³	*annual mean*	*31.12.2010*
	*20*µg/m³	*annual mean*	*31.12.2015*
	50 µg/m³ not to be exceeded more than 10 times per year	*24 hr mean*	*31.12.2010*
Particles – $PM_{2.5}$	25µg/m³	annual mean	2020
	15 % reduction in concentrations at urban background		Between 2010 and 2020

This will bring the approach to managing particles in line with the European Union as the new ambient air quality directive is also proposing a similar framework for the control of fine particles ($PM_{2.5}$). This sets a limit value of 25µgm³ to be met everywhere by 2015 (with a target date of 2010), with a second stage 'indicative' limit value of 20µg to be met by 2020. These are intended as 'backstops' to provide minimum protection. The driver for reductions is intended to be the exposure reduction target for urban background areas to be achieved by 2020. The percentage reduction required will depend on the initial average concentration in urban background areas across the member states but it is expected to be 15% for the UK.

The new directive also introduces compliance flexibilities for PM_{10} (3 yrs from coming into force – i.e. to 2011) and NO2 (5 yrs, to 2015) subject to member states putting forward detailed plans setting out how the limit values will be achieved in the extended timeframes. Subject to public consultation, the UK expects to submit such plans for PM_{10} and NO_2. The UK will need to demonstrate action beyond that agreed in the Air Quality Strategy if we are to achieve full compliance with EU limit values.

It is not clear at this stage how $PM_{2.5}$ will be incorporated into the LAQM process in the longer term but, currently, local authorities have no requirement to report on it. However a brief summary of data has been included in the particles section. A review of the LAQM system is due to be undertaken by 2010.

Further information

For further copies of this report, or any other report in the Review and Assessment series (for full list see Annex 1), please contact Kyri Eleftheriou-Vaus on 020 7341 5686 or visit our website **http://www.rbkc.gov.uk/EnvironmentalServices/AirQuality/**. If you have any comments or ideas on how the Council could work towards improving air quality then please email them to **air.quality@rbkc.gov.uk** or post them to the Environmental Quality Unit, Royal Borough of Kensington and Chelsea, Council Offices, 37 Pembroke Road, London W8 6PW.

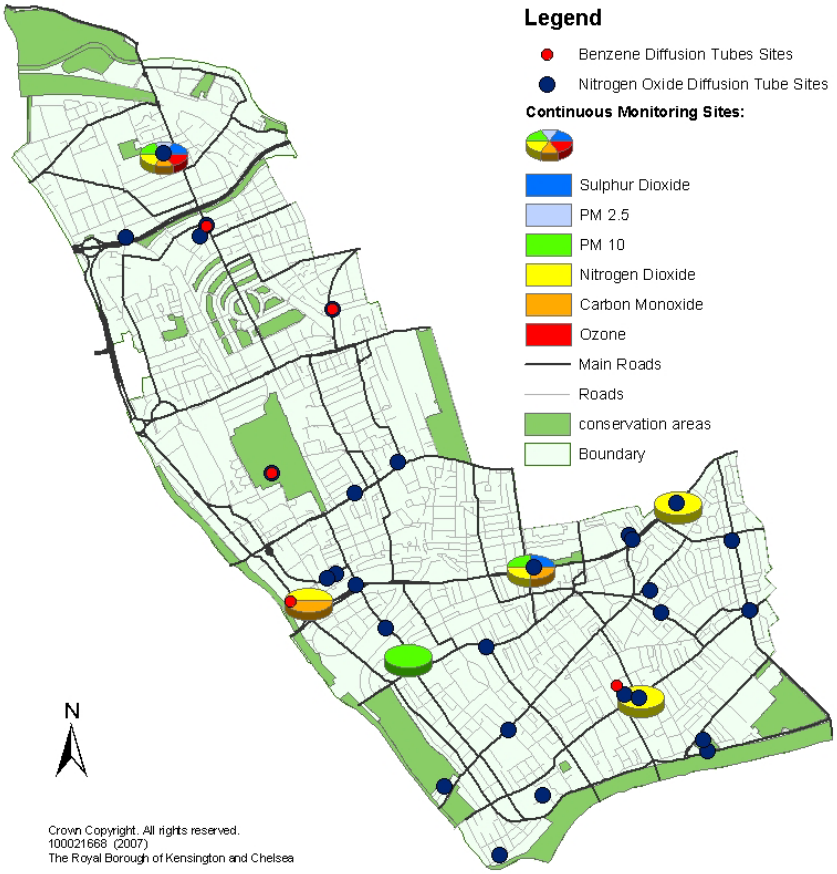
AIR QUALITY MONITORING

There are two main types of monitoring undertaken in the borough. We have fully automated continuous sites and monitoring which is undertaken using sampling devices, such as diffusion tubes. Gravimetric monitoring samples continuously but does not provide real time data (see glossary). Air quality data for 2007 has been included in the report where it is available but is largely provisional.

Automated monitoring data

This is collected at five monitoring sites in the borough; table 3 (page 4) provides details about each. The West London site operated by Defra was recently closed following a review of their monitoring networks.

Air Quality Monitoring Site Locations in the Royal Borough of Kensington & Chelsea



Non automatic networks

Monitoring data for benzene and nitrogen dioxide (in addition to continuous monitoring) is collected using passive diffusion techniques. The borough subscribes to the London Wide Environmental Programme offered by Bureau Veritas for the analysis of this data.

Quality control and assurance

Automated data that we collect is subject to quality control and audit procedures by Kings Environmental Research Group (Kings ERG) that operate the London Air Quality Network (LAQN). In addition independent consultants carry out audits annually. The North Kensington site is further scrutinised by Defra's contractors as it is affiliated to the Automatic Urban and Rural Network (AURN). Further information on data collection and quality control is included in appendix 2. Overleaf (table 3) is an outline of the monitoring network in the Borough. It is followed by an assessment of each pollutant individually.

Table 3 Monitoring locations in the Royal Borough of Kensington and Chelsea

Site name	North Kensington	Cromwell Rd/ Cromwell Rd 2	Cromwell Rd 2	West London	Knightsbridge	Chelsea	Earls Court
Site type*	LAQN & AURN affiliate	AURN	LAQN	AURN	LAQN	LAQN	-
Ownership	RBKC	DEFRA	RBKC	DEFRA	RBKC	RBKC	RBKC
Pollutants measured	nitrogen oxides PM_{10} carbon monoxide sulphur dioxide	nitrogen oxides carbon monoxide sulphur dioxide	PM_{10}	nitrogen oxides carbon monoxide	nitrogen oxides	nitrogen oxides	PM_{10} gravimetric
Other monitoring undertaken	Gravimetric monitoring PM_{10} & $PM_{2.5}$	Lead and heavy metals					
Grid reference	TQ401821	TQ264789 TQ265790 >1998	TQ265790	TQ251788	TQ527179	TQ527178	TQ525178
Site location and description	Sited in the grounds of Sion Manning school in St Charles Square, North Kensington. Surrounded by a mainly residential area. Height inlet is approx. 3m.	Originally sited at the kerbside of the Cromwell Rd. Traffic density approx. 60,000 vehicles per day. Now located at the rear of the pavement at the Natural History Museum, 3.5m from the Cromwell Road. The height of the inlet is approx. 2m.	Located within the DEFRA monitoring cabin in the grounds of the Natural History Museum. Approx. within 8m of the Cromwell Rd and 5m of Queens Gate. Height inlet is approx. 1.4m.	Located within the Council depot, Pembroke Road. The nearest road is Warwick Rd (50m). The surrounding area is built-up. Height inlet is approx. 30m.	Located on the Kerb of Hans Road and 4m from the Brompton Rd. Height inlet approx 3m.	Located at the building façade of the Chelsea Old Town Hall at the rear of the pavement approx. 8m from the Kings Road. Height inlet approx. 3m.	Sited on the kerb of the Earls Court Road.
Site definition	Urban background	Kerbside < Roadside	Roadside	Urban background	Kerbside/ Roadside	Roadside	Kerbside
Start date	1/4/1995 Affiliated from 1/4/1996	22/2/1973	22/5/1998	1/1/1987 **Closed October 2007**	28/03/2000	27/9/2000	29/05/2002
Website for data	www.londonair.org.uk www.airquality.co.uk	www.airquality.co.uk	www.londonair.org.uk	www.airquality.co.uk	www.londonair.org.uk	www.londonair.org.uk	www.londonair.org.uk

*LAQN- London Air Quality Network, AURN- Automatic Urban and Rural Network

Kerbside: within 1m of a busy road, Roadside: located 1-5m, Urban background at least 50m from any major pollutant source.

CARBON MONOXIDE

The objective for carbon monoxide (CO) is 10 mg/m^3 as a maximum daily 8 hour running mean. We have looked at data from 2007 to check this objective continues to be met.

Monitoring data

All available carbon monoxide monitoring data (since 1999) recorded in the Borough has been collated below, along with data from one other busy kerbside location from central London.

Table 4 Concentrations of CO measured in the Borough and at one central London site.

Year	Site	Annual mean (mg/m^3)	Max daily 8-hour* (mg/m^3)	No. of hours above 10mg/m^3	% Data capture
1999	North Kensington	0.4	3.9	0	96
	West London	0.4	4.3	0	97
	Cromwell Rd 2	1.5	5.1	0	98
	Marylebone Rd	2.1	8.5	0	92
2000	North Kensington	0.4	5.8	0	95
	West London	0.3	5.3	0	97
	Cromwell Rd 2	1.3	6.0	0	98
	Marylebone Rd	2.4	9.9	0	96
2001	North Kensington	0.5	3.4	0	92
	West London	0.4	3.8	0	98
	Cromwell Rd 2	1.2	4.1	0	98
	Marylebone Rd	1.7	6.5	0	96
2002	North Kensington	0.4	5	0	96
	West London	0.4	3	0	97
	Cromwell Rd 2	1.0	4	0	93
	Marylebone Rd	1.4	5	0	98
2003	North Kensington	0.4	2.5	0	92
	West London	0.4	2.1	0	95
	Cromwell Rd 2	0.9	2.9	0	89
	Marylebone Rd	1.3	3.7	0	98
2004	North Kensington	0.5	2.3	0	99
	West London	0.4	1.6	0	99
	Cromwell Rd 2	0.8	2.3	0	98
	Marylebone Rd	1.1	3.0	0	96
2005	North Kensington	0.4	3.1	0	96
	West London	0.4	2.1	0	94
	Cromwell Rd 2	0.7	3.5	0	94
	Marylebone Rd	0.9	3.6	0	98
2006	North Kensington	0.3	*2.0*	0	97
	West London	0.4	*1.8*	0	84
	Cromwell Rd 2	0.7	*2.0*	0	95
	Marylebone Rd	1.0	*2.8*	-	66#
2007	North Kensington	*0.3*	*2.6*	*0*	*98*
	West London	*0.4*	*2.0*	*0*	*82*
	Cromwell Rd 2	*0.6*	*2.3*	*0*	*96*
	Marylebone Rd	*0.8*	*2.7*	*0*	*94*

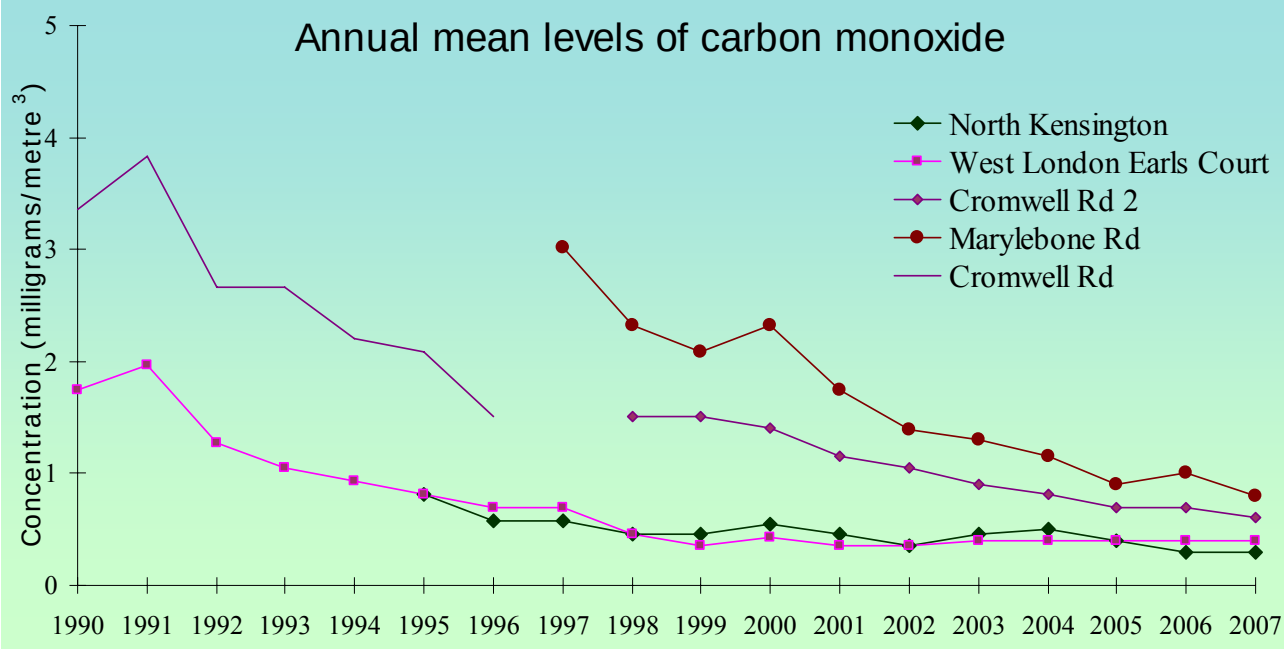
*** Maximum daily 8-hour running mean**

2007 data is provisional and must be treated with caution

 # Low data capture at Marylebone road

Generally, annual mean levels at roadside locations are twice as high as concentrations at background locations. There were no exceedences of the objective in 2007 at any of the monitoring locations in the Royal Borough. The highest maximum daily 8 hour running mean value measured at any of the sites in the borough during 2007 was 2.6 mg/m^3; this is well below the 10 mg/m^3 objective level. The Marylebone Road site, though not located within the borough, is included because it is indicative of levels at busy kerbside locations.

The chart below indicates that the overall trend shows a reduction in annual mean levels. At background sites levels have largely stabilised in recent years while at roadside locations there continues to be some slight reduction in levels.



Conclusion

Levels of carbon monoxide measured remain well within the 10 mg/m^3 (as a maximum 8 hour running mean) objective. It is also unlikely that any exceedences will occur in the Borough in 2008.

BENZENE

Two objectives have been set for the assessment of benzene – a running annual mean of 16.25µg/m^3 to be met by 31.12.2003, and a more stringent annual mean of 5µg/m^3 to be achieved by 31.12.2010.

Monitoring data

We undertake sampling at five locations using diffusion samplers, two roadside, two background and one in close proximity to a petrol station forecourt. This site has been operating since mid 2006 and has replaced the previous petrol station site which was closed as a result of the site being completely re-developed.

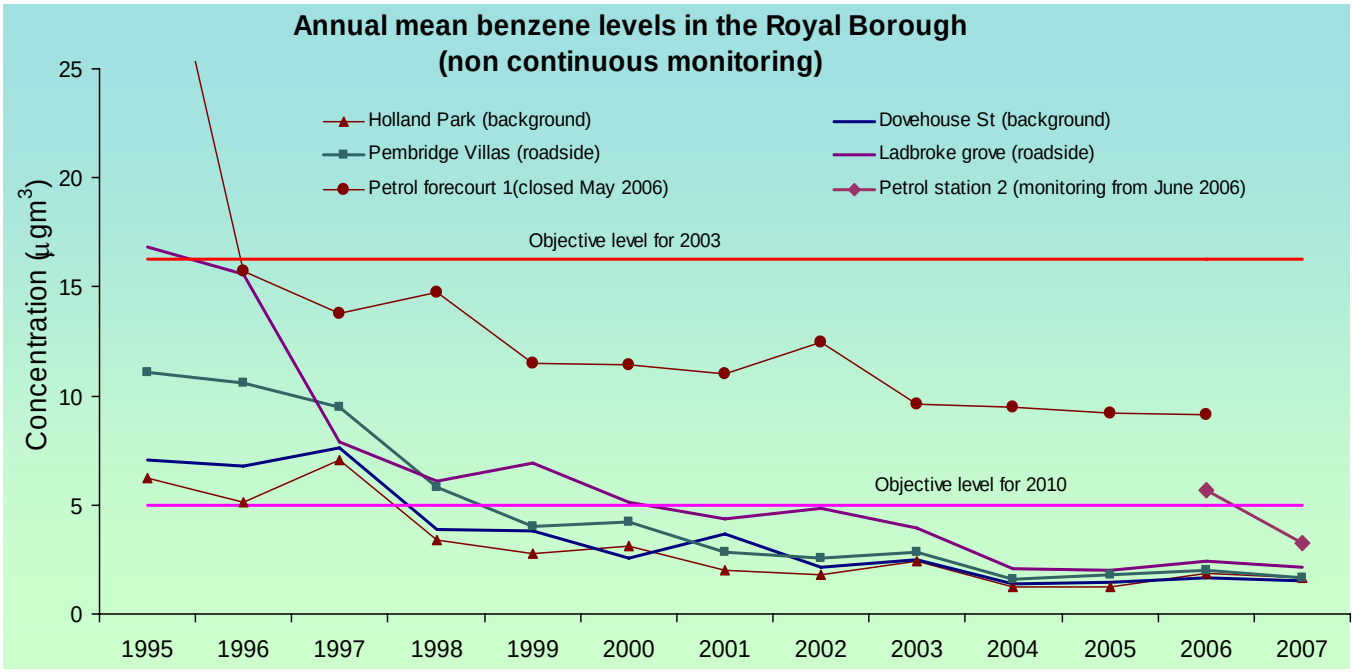
The highest levels of benzene have generally been recorded at the petrol station site. The table below demonstrates that the 2003 (16.25µg/m^3) objective has been met at all sites since 1997 (the measured annual mean is assumed to be the equivalent of the running annual mean). Seven months of monitoring in 2006 at the new petrol station site indicated a level close to the stricter 2010 objective (5µg/m^3), however monitoring in 2007 shows the site is below the 2010 objective level.

Table 5 Annual average benzene levels using diffusion samplers (µg/m^3)

Location	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	200(	200
Holland Park (B)	10.5	9.0	6.2	5.1	7.1	3.4	2.8	3.1	2.0	1.8	2.43	1.24	1.28	1.88	1.63
Dovehouse St (B)	22.8	13.1	7.1	6.8	7.6	3.9	3.8	2.6	3.7	2.1	2.47	1.38	1.43	1.66	1.50
Pembridge Villas (R)	-	10.2	11.1	10.6	9.5	5.8	4.0	4.2	2.9	2.6	2.85	1.59	1.83	1.99	1.67
Ladbroke grove (R)	20.6	14.8	16.8	15.6	7.9	6.1	6.9	5.1	4.3	4.9	3.92	2.07	2.03	2.26	2.16
Petrol forecourt (1)#	44.0	27.3	34.9	15.7	13.8	14.7	11.5	11.4	11.0	12.5	9.63	9.46	9.24	9.17	Closed
Petrol station (2)#	-	-	-	-	-	-	-	-	-	-	-	-	-	5.70	3.24

B= background, R= roadside
 # 2006 data Petrol forecourt (1) = 4 months, Petrol station (2) = 7 months

The graph below demonstrates the long term trend; generally there has been a significant overall decline though this has slowed down in recent years with levels stabilising at most sites around 1-2µg/m^3 with only the petrol station site around 3µg/m^3.



Whilst continuous monitoring is more accurate than diffusive samplers the equipment is very costly and complicated to operate; consequently there are few continuous monitors within London. The London-Wide Benzene survey is subject to quality control procedures including exposing additional diffusion tubes for duplicate or triplicate exposure at a monitoring site within each borough. In addition, diffusion tubes are also exposed at the Hydrocarbon Network site on Marylebone Road. Tubes exposed at this site are compared against benzene data from the automatic Hydrocarbon Network data. Generally, but particularly in more recent years, this has shown a good correlation.

Table 6 Comparison of benzene monitoring methods at Marylebone Road

Year	Diffusive Sampler	Continuous analyser
2000	3.2	2.1
2001	6.8	4.5
2002	4.5	3.92
2003	3.3	3.33
2004	2.2	2.75
2005	2.1	2.2

Source: Air Quality Archive/NETCEN

The maximum running annual means, which allow for direct comparison with the objective from the two automated Defra sites in London, are shown in the table below. The data shows that benzene levels have declined significantly at the Marylebone Road site since monitoring started, with the 2003 objective having been achieved in 2002 and the 2010 objective in 2003. The Eltham site has been within both objective levels when it has been operating. This data confirms the trend demonstrated by our own monitoring.

Table 7 Maximum running annual mean benzene levels for automated sites (μg/m^3)

Location	1999	2000	2001	2002	2003	2004	2005	2006	2007
Marylebone Rd	12.8	10.8	6.29	4.97	3.92	3.37	2.75	2.29	*1.93*
Eltham	2.81	2.52	-	-	-	-	0.86	1.04	*0.96*

*** low data capture**
2007 data (in italics) is provisional

Conclusion

Examination of monitoring data in the borough indicates that the 2003 objective has been met at all locations. Based on the available data the new site located closely to a petrol forecourt shows levels are below the 2010 objective. The petrol station underwent a refurbishment early in 2007 and reopened in May 2007 and is now operating stage two (in addition to stage one) vapour recovery equipment.

1, 3-BUTADIENE

For this pollutant, measurements should meet the 2003 objective as a running annual mean of 2.25µg/m^3.

Monitoring data

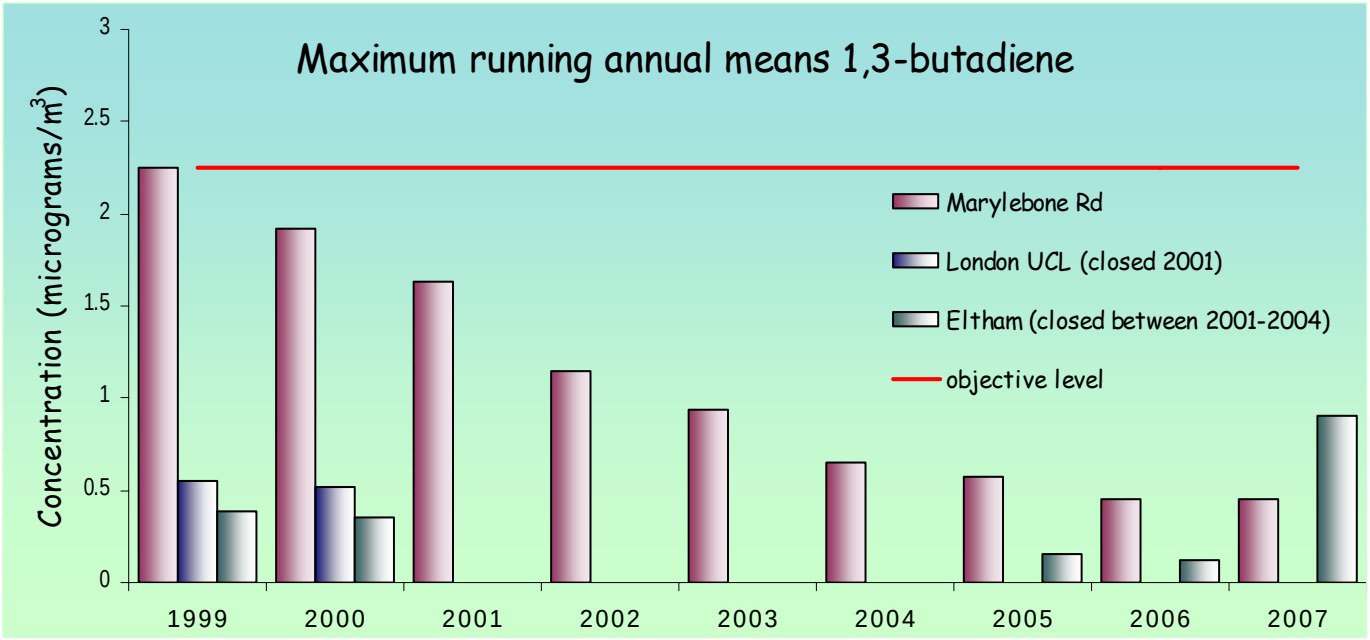
1,3-butadiene is not monitored in Kensington and Chelsea. However data is collected by Defra unfortunately this is limited to a few sites within London. Continuous data is shown in the table below; data from Marylebone Road and Eltham can be used to indicate likely conditions in the borough.

Table 8 Levels of 1,3-butadiene (maximum annual running means, µg/m^3) in London

Location	1999	2000	2001	2002	2003	2004	2005	2006	2007
Marylebone Rd	2.25	1.92	1.63	1.15	0.95	0.65	0.57	0.45*	*0.45**
Eltham	0.39	0.35	-	-	-	-	0.15*	0.12	*0.9*

***Incomplete data**
Data (in italics) is provisional

The running annual mean concentration has been declining steadily at the Marylebone Road (roadside) site since 1999, dropping from 2.25µg/m^3 to 0.45 µg/m^3 in 2006. The London UCL site met the objective when it was operating. The Eltham site which has operated intermittently is also well within the objective level during 1999 and 2000. These results indicate that there are unlikely to be any exceedences of the 2003 objective in the borough.



Conclusion

There is sufficient evidence to suggest that no exceedences are likely in the Borough.

LEAD

There are two annual mean objectives for lead: 0.5µg/m^3 to be achieved by 2004 and an objective of 0.25µg/m^3 to be achieved by 2008.

Monitoring data

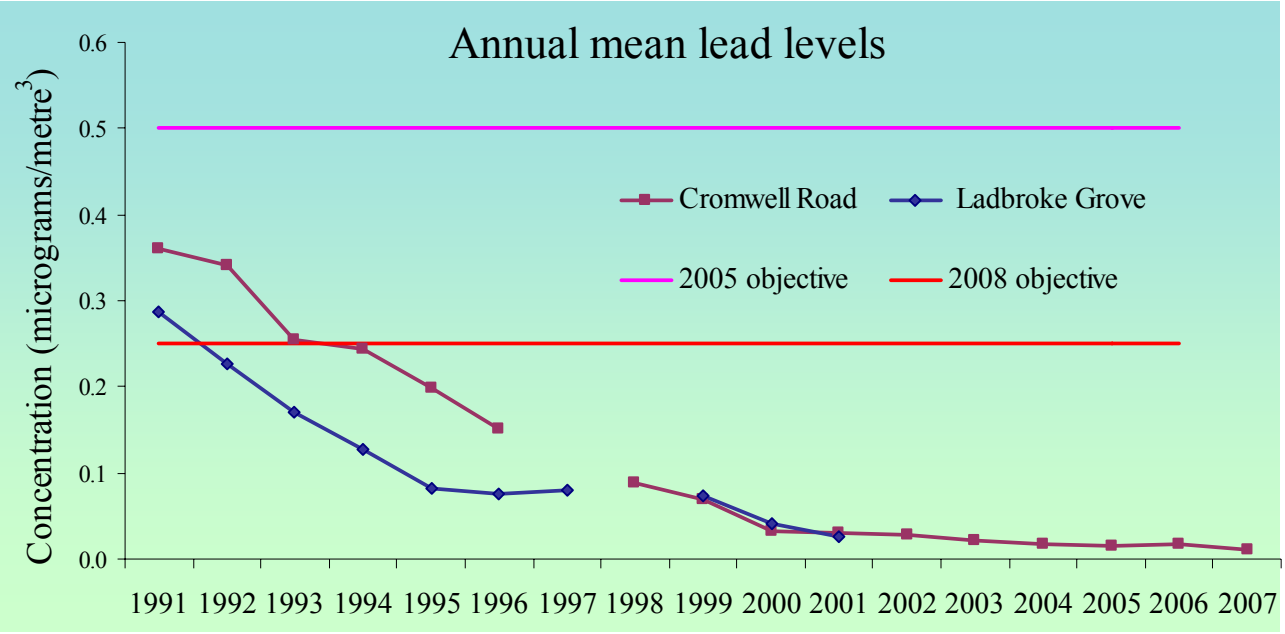
Lead monitoring in the Borough is undertaken by Defra at the Cromwell Road monitoring site. Previously monitoring was also undertaken by the Council in Ladbroke Grove. However this site closed at the end of 2001; levels dropped significantly due to the phasing out of leaded petrol, so it was not necessary to retain it. Monitoring data is shown in the table below.

Table 9 Lead levels within the Borough

Year	Ladbroke Grove (µg/$m^{3)}$	Cromwell Rd (µg/m^3)	Objective level (µg/m^3)
1999	0.073	0.068	0.5
2000	0.041	0.032	0.5
2001	0.026	0.031	0.5
2002	-	0.027	0.5
2004	-	0.017	0.5
2005	-	0.015	0.5
2006	-	0.017	0.5
2007	-	0.011	0.5

Data source: National air quality archive

As demonstrated in the chart below, monitoring data shows a downward trend at both Cromwell Road and Ladbroke Grove. This trend continues today at the Cromwell Road site. The 2004 and 2008 objectives were met by 1992 at the Ladbroke Grove site and by 1994 at the Cromwell Road site.



Conclusion

There is sufficient evidence from monitoring to suggest that lead levels within the Borough remain significantly below the 2004 and 2008 objectives and have done so since the mid 1990's.

NITROGEN DIOXIDE

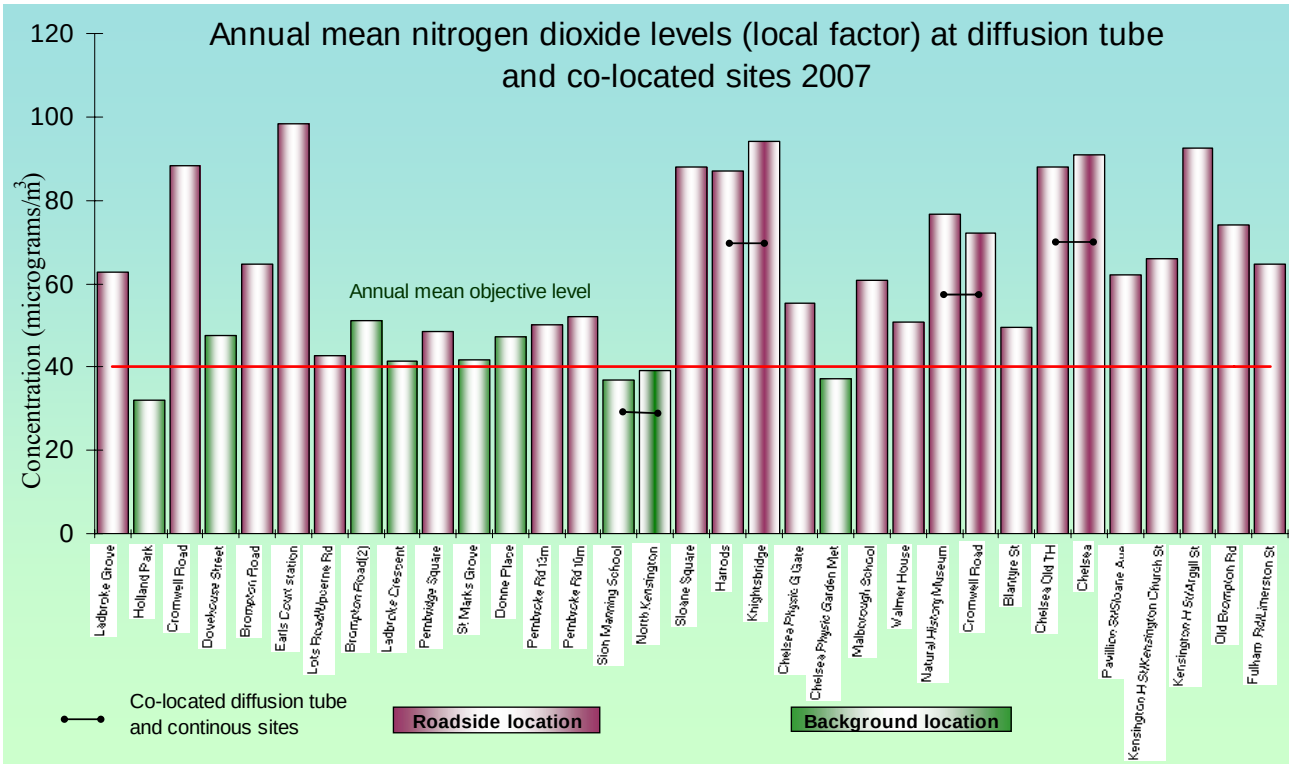
There are two objectives for nitrogen dioxide (NO_2); a short term objective of 200µg/m^3 not to be exceeded more than 18 times as a one hour mean, and a longer term objective of 40µg/m^3 as an annual mean. The deadline for achieving these objectives was the end of 2005. The whole of the Royal Borough was declared an Air Quality Management Area in 2000. It was declared on the basis that NO_2 (and PM_{10} to a lesser extent) would fail to meet its objectives.

Monitoring data

Automatic chemiluminescent analysers and passive diffusion tubes are used to monitor NO_2 in the borough. The latter method provides more limited data but does allow levels to be compared to the annual mean objective at a greater number of locations than would be practicable by continuous methods alone.

Diffusion tube monitoring

Diffusion tube data is collected at 29 locations in the Borough (factored data from 2001-2007 is shown overleaf in table 12). The data is adjusted to take into account the difference between the two monitoring techniques. The adjustment factor is calculated by Bureau Veritas using data collected through the London Wide Environmental Programme (LWEP) co-location study. How this is calculated is described in appendix 2. This year two factors have been provided, a locally derived factor of 1.00 and a network derived factor (based on all co-located data included in the LWEP) of 1.04. Previous reports have used the LWEP network factor. However this year advice from NO2 guidance from the archive suggests that a 'local' factor based on measurements from two co-located AURN sites within the borough should be considered. If the locally derived factor (1.0) is used then no adjustment is necessary. There is a slight difference in the results depending on the factor used; overall it makes no difference to the total number of sites exceeding the annual mean objective. The graph below shows the diffusion tube data for 2007 and includes the measurements from continuous sites where these are co-located. The results at these sites show a reasonable correlation.



An examination of the NO_2 data (in table 12) shows that, between 2001 and 2007, there were between two and five sites that measured levels below the objective. The results for 2007 indicate that three of the 29 sites were below the objective level. These were located in Holland Park, the grounds of a school in North Kensington and in the Chelsea Physic Garden.

Table 12 Factored NO_2 Diffusion tube data

Location	2001	2002	2003	2004	2005	2006	2007*
Ladbroke Grove	**50.1**	**47.0**	**59.5**	**61.0**	**64.74**	**65.8**	**62.8**
Holland Park	31.8	29.2	37.1	36.5	35.03	32.9	32.1
Cromwell Road	**75.2**	**69.9**	**82.6**	**84.9**	**82.49**	**84.2**	**88.4**
Dovehouse Street	**49.2**	**43.8**	**53.3**	**51.1**	**50.35**	**48.2**	47.7
Brompton Road	**49.5**	**50.7**	**62.3**	**60.7**	**64.57**	**72.1**	**64.8**
Earls Court Station	**87.6**	**89.4**	**94.5**	**95.1**	**94.16**	**102.7**	**98.2**
Lots Road/Upcerne Rd	**43.3**	**46.1**	**42.5**	**40.9**	**41.82**	**41.2**	**42.6**
Brompton Road (2)	**55.5**	**45.9**	**59.8**	**48.8**	**49.52**	**46.6**	**51.1**
Ladbroke Crescent	**42.6**	**43.1**	**43.4**	**44.6**	**43.98**	**42.5**	**41.4**
Pembridge Square	**50.2**	**40.6**	**52.3**	**50.6**	**50.11**	**51.9**	**48.4**
St Marks Grove	**44.4**	35.3	**42.3**	**41.7**	38.94	37.8	**41.7**
Donne Place	**47.4**	39.1	**49.7**	**48.7**	**46.18**	**43.7**	**47.2**
Pembroke Rd 8m	**45.8**	**41.1**	**53.4**	**45.3**	**51.94**	**52.5**	**50.3**
Pembroke Rd 10m	**57.7**	**41.0**	**51.9**	**50.7**	**52.84**	**53.4**	**52.1**
Sion Manning School	**43.1**	38.1	**41.0**	38.6	38.23	36.7	36.8
Sloane Square	**68.9**	**64.3**	**72.8**	**77.9**	**80.15**	**83.0**	**88.0**
Harrods	**69.3**	**66.7**	**72.8**	**73.3**	**77.74**	**81.3**	**86.9**
Chelsea Physic Garden (Gate)	**59.3**	**50.4**	**61.8**	**58.9**	**56.61**	**57.0**	**55.4**
Chelsea Physic Garden (Met station)	37.4	34.8	38.7	**40.7**	37.48	35.6	37.1
Malborough School	**59.1**	**50.8**	**79.3**	**63.1**	**56.82**	**58.4**	**60.7**
Walmer House	**50.9**	**44.4**	**54.4**	**48.4**	**48.77**	**50.1**	**50.8**
Natural History Museum	**59.6**	**55.5**	**72.5**	**72.7**	**68.34**	**76.8**	**76.8**
Blantyre St	**55.1**	**43.4**	**49.7**	**46.9**	**49.77**	**47.8**	**49.4**
Chelsea Old Town Hall	**64.4**	**51.2**	**71.9**	**74.6**	**81.58**	**86.9**	**87.9**
Pavillion St/Sloane Ave	**62.7**	**46.6**	**55.6**	**50.3**	**56.88**	**56.6**	**62.2**
Kensington H St/Kensington Church St	**55.0**	**46.9**	**65.4**	**65.4**	**66.92**	**64.9**	**66.0**
Kensington H St/Argyll St	**53.4**	**68.6**	**78.2**	**85.0**	**87.86**	**92.7**	**92.4**
Old Brompton Rd	**52.3**	**51.7**	**67.6**	**69.7**	**66.33**	**68.9**	**74.2**
Fulham Rd/Limerston St	**59.3**	**48.2**	**61.0**	**62.2**	**57.18**	**62.0**	**64.8**

Bold indicates an exceedence of the annual mean objective
2007* locally derived adjustment factor

Continuous monitoring data

Continuous monitoring is undertaken at five sites in this Borough; details of these sites are included in Table 3, page 4. The results are shown in table 13 and in the chart overleaf. The levels have been compared to the annual mean and the hourly mean objectives. Caution must be applied to the 2007 data as it is provisional. However any subsequent adjustments are unlikely to affect the overall conclusions.

Preliminary monitoring results for 2007 indicates that exceedences of the annual average NO_2 annual mean objective level have occurred at all continuous sites in the Borough apart from the North Kensington background site. All monitoring sites (except North Kensington background site) showed a decrease to varying degrees in the annual mean level compared to 2006. Most sites also saw small reductions in the number of hours above the hourly mean objective except for the Knightsbridge location.

Table 13 Concentrations of NO_2 in and near the Borough using continuous monitors

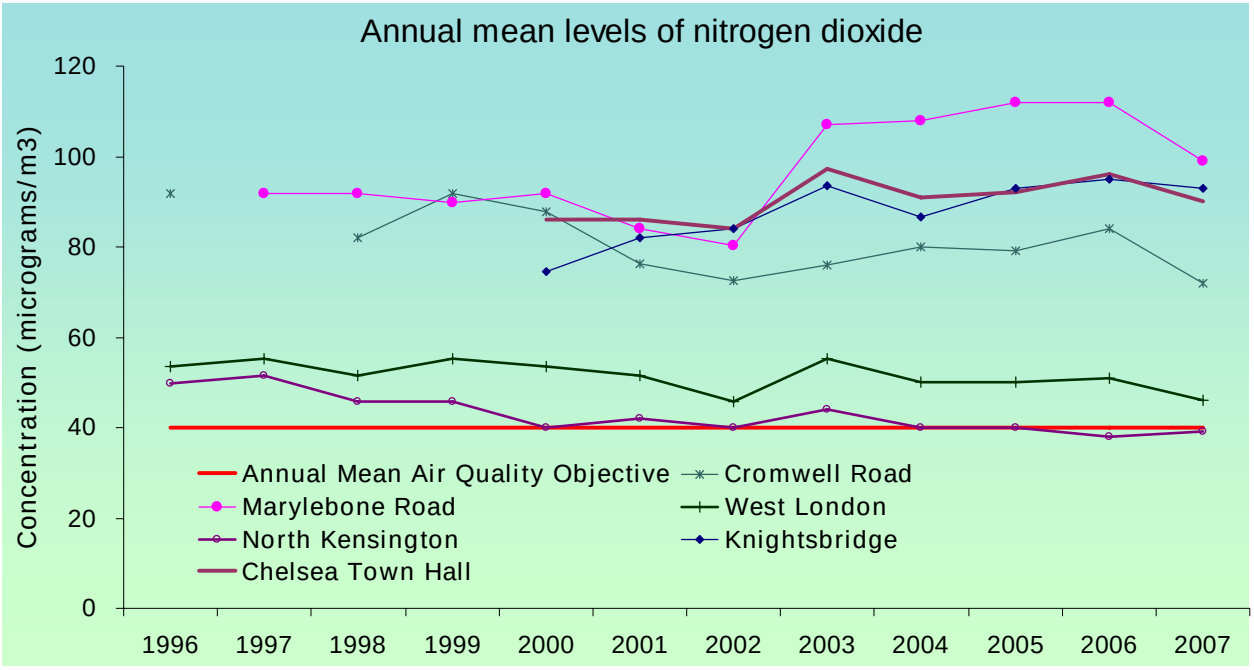
Year	Site	Annual mean µg/m^3 (ppb)	Max hour µg/m^3 (ppb)	No of hours >200 µg/m$^{3\#}$	% Data Capture
1997	North Kensington	**52 (27)**	346 (181)	20	98
	West London	**56 (29)**	415 (217)	**38**	97
	Marylebone Rd*	92 (48)	300 (1570)	69	39
1998	North Kensington	**46 (24)**	226 (118)	2	99
	West London	**52 (27)**	193 (101)	0	98
	Cromwell Rd 2*	**82 (43)**	222 (116)	4	60
	Marylebone Rd	92 (48)	176 (92)	71	98
1999	North Kensington	**46 (24)**	178 (93)	0	97
	West London	**55 (29)**	205 (107)	1	98
	Cromwell Rd 2	**92 (48)**	253 (132)	12	98
	Marylebone Rd	90 (47)	325 (170)	51	85
2000	North Kensington	**40 (21)**	425 (222)	3	96
	West London	**53 (28)**	304 (159)	0	98
	Cromwell Rd 2	**88 (46)**	746 (390)	12	94
	Knightsbridge*	**74 (39)**	2818 (1473)	**52**	72
	Chelsea Town Hall*	**86 (45)**	270 (141)	2	25
	Marylebone Rd	92 (48)	570 (298)	100	96
2001	North Kensington	**42 (22)**	220 (115)	4	96
	West London	**52 (27)**	187 (98)	0	95
	Cromwell Rd 2	**76 (40)**	204 (107)	1	97
	Knightsbridge	**84 (44)**	325 (170)	**97**	97
	Chelsea Town Hall	**86 (45)**	228 (120)	16	95
	Marylebone Rd	82 (43)	273 (173)	74	94
2002	North Kensington	**40 (21)**	160 (84)	0	99
	West London	**46 (24)**	151 (79)	0	95
	Cromwell Rd 2	**73 (38)**	183 (96)	0	95
	Knightsbridge	**86 (45)**	366 (192)	**154**	98
	Chelsea Town Hall	**84 (44)**	193 (101)	0	99
	Marylebone Rd	80 (42)	237 (124)	2	99
2003	North Kensington	**44**	195	0	94
	West London	**55**	186	0	96
	Cromwell Rd 2	**76**	224	6	93
	Knightsbridge	**93**	371	**235**	99
	Chelsea Town Hall	**98**	282	**50**	99
	Marylebone Rd	107	394	471	94
2004	North Kensington	**40**	170	0	99
	West London	**50**	206	1	99
	Cromwell Rd 2	**80**	229	3	99
	Knightsbridge	**87**	472	**254**	98
	Chelsea Town Hall	**92**	268	**56**	99
	Marylebone Rd	110	361	529	99
2005	North Kensington	**40**	238	14	96
	West London	**50**	204	1	95
	Cromwell Rd 2	**79**	248	9	94
	Knightsbridge	**93**	475	**379**	99
	Chelsea Town Hall	**92**	267	**98**	99
	Marylebone Rd	112	364	853	98
2006	North Kensington	38	*176*	0	*96*
	West London	**51**	*197*	0	*95*
	Cromwell Rd 2	**84**	*229*	6	94
	Knightsbridge	**95**	*381*	**389**	*98*
	Chelsea Town Hall	**96**	*284*	**136**	*100*
	Marylebone Rd	112	*399*	676	*96*
2007	North Kensington	*39*	*401*	*14*	*98*
	West London*	***46***	*189*	*0*	*82*
	Cromwell Rd 2	***72***	*235*	*2*	*96*
	Knightsbridge	***94***	*453*	***446***	*98*
	Chelsea Town Hall	***91***	*311*	***75***	*99*
	Marylebone Rd	*99*	*344*	*426*	*96*

more than 18 hours above 200 µg/m^3

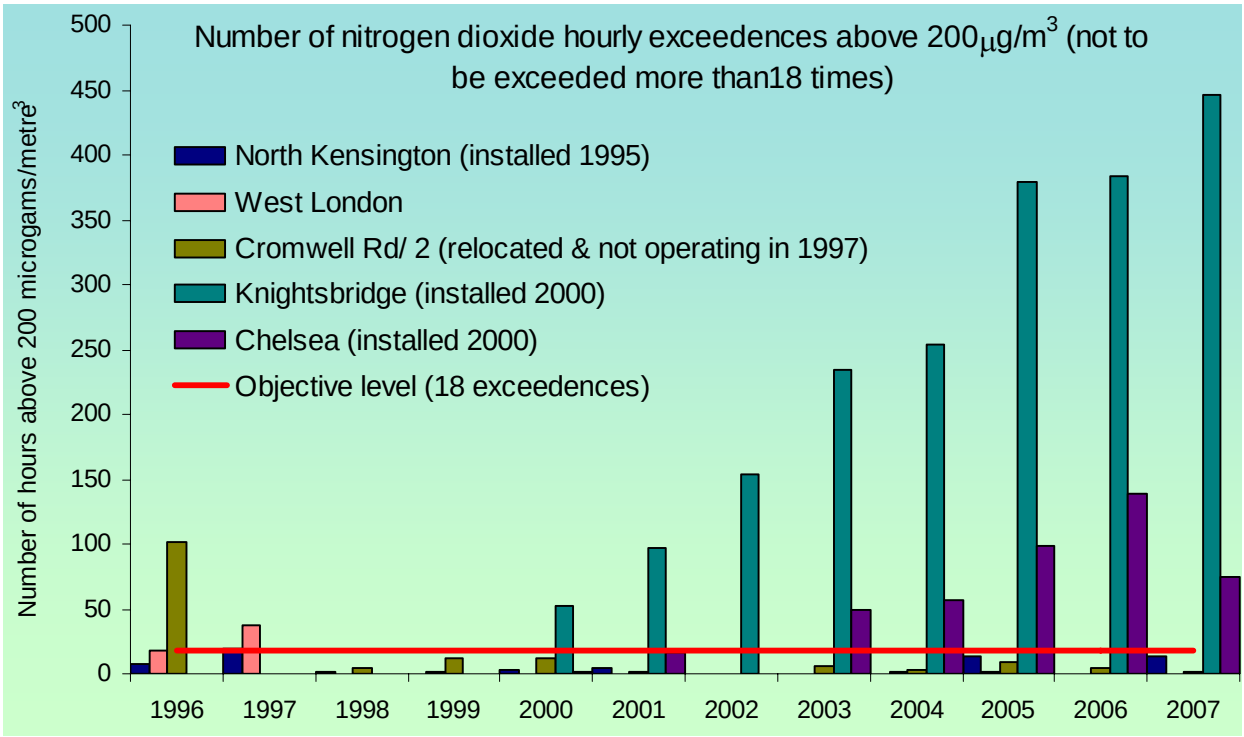
* some sites have operated for part of a year, 2007 data (in italics) is provisional and should be treated with caution.

Figures in bold indicate an exceedence of an objective, recorded within Kensington and Chelsea.

The chart below shows that levels at all sites have been above the annual mean objective for all years shown, apart from North Kensington which fell below the objective level for the first time in 2006 and has remained just below in 2007. Also, for the first time, in five years there has been an overall decline in annual mean levels at roadside locations. The concentration at the West London background site has also shown a decline but must be treated with caution because it is based on low data capture due to the sites closure as a result of Defra's review of its monitoring network.



The chart below shows the number of hourly exceedences at sites in the borough. This has steadily risen at one site which is 4m from a very busy road (but on the kerb of a side road). The number of exceedences had been rising steadily at the Chelsea roadside site (approximately 8m from the kerb close to a busy junction) but has declined for the first time in 2007. The hourly objective has been breached at both these sites. Two other sites have been below the limit of 18 hourly means above 200µg/m^3.

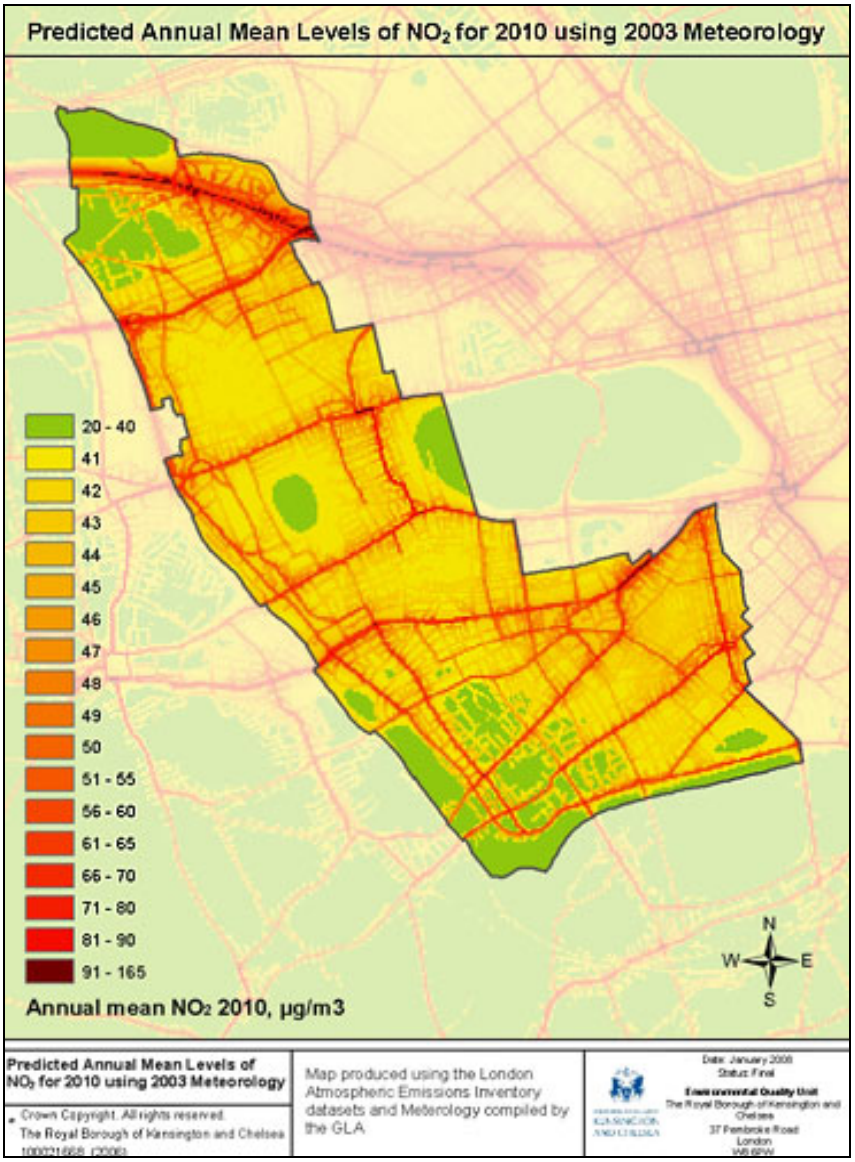


Despite some overall improvement in annual mean levels during 2007, concentrations remain above the objective levels. The high number of hourly breaches also remains a significant problem. Other busy roadside locations in central London areas e.g. Marylebone Road also experience this problem. A recent Air Quality Expert Group (AQEG) report has concluded that the most likely explanation, considering the available information, is that this is mainly due to increased penetration of Euro-III diesel vehicles fitted with oxidation catalysts and the fitting of catalytically regenerative particle traps to vehicles such as buses which has resulted in an increase in the proportion of NO_X being emitted as direct NO_2.

Modelling

Dispersion modelling work is regularly undertaken by the GLA for the London area. The most recent work that is currently available is based on the 2003 inventory. A map showing predicted concentrations for 2010 for the borough is shown here.

The map indicates that approximately 80% of the borough is likely to remain above the annual mean objective. Areas below the objective level are mainly green spaces or areas with quiet residential roads. This is comparable to the measurements currently measured in the borough.



Conclusion

There has been some improvement in annual nitrogen dioxide concentrations at most monitoring sites in the borough during 2007 however these sites continue to exceed the annual mean objective. The hourly mean objective also continues to be exceeded at two roadside sites.

SULPHUR DIOXIDE

Three objectives have been set for this pollutant; a one hour mean of 350 μg/m^3 (not to be exceeded more than 24 times per year), a 24 hour mean of 125μg/m^3 (not to be exceeded more than 3 times per year) and a 15 minute mean of 266 μg/m^3 (not to be exceeded more than 35 times per year), as shown in table 1, page 1.

Monitoring data

Monitoring data is currently collected at two sites in the borough and is shown in the table below. Historical data based on non continuous '8 port bubbler' method is also available from the Dovehouse Street and Town Hall sites. Some of this data is included in the chart overleaf.

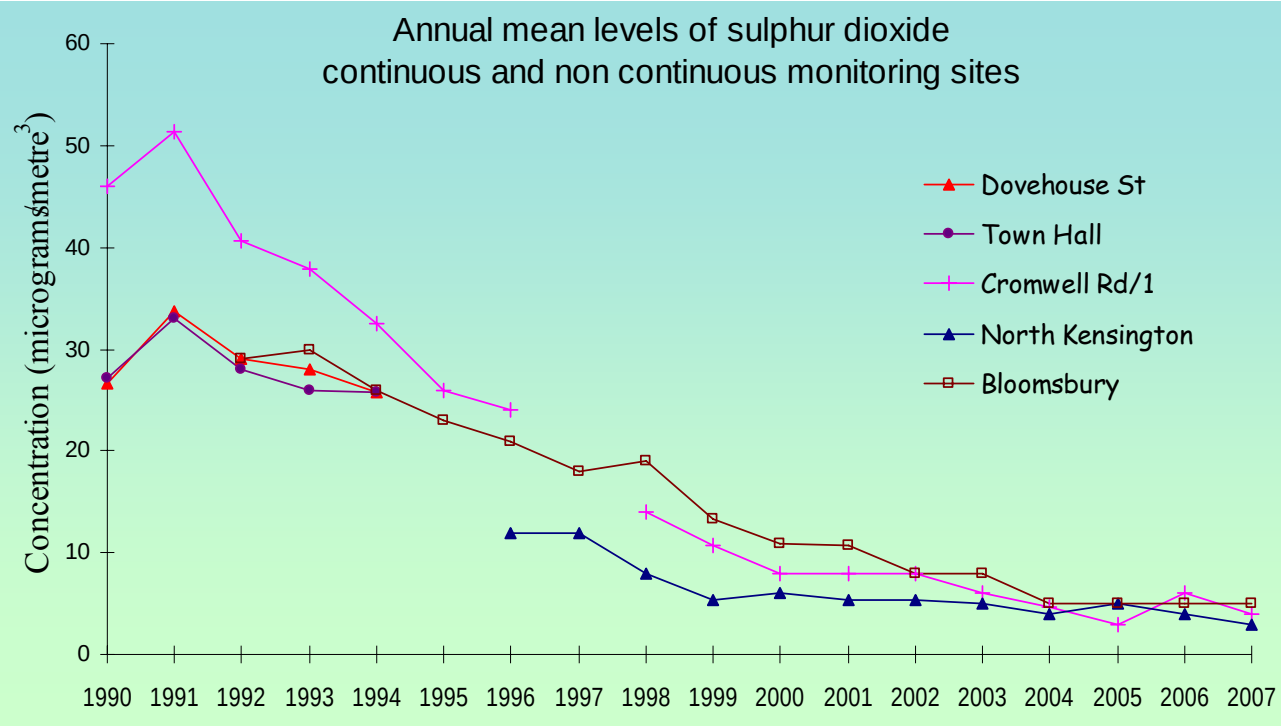
Table 14 Sulphur dioxide concentrations in the Borough

Year	Location	Annual average μg/m^3	No. of 1 hour means > 350μg/m^3	No. of 24 hour means > 125μg/m^3	No. of 15min means > 266μg/m^3	Data capture
1999	North Kensington	5	0	0	0	99
	Cromwell Rd	11	0	0	0	98
2000	North Kensington	6	0	0	0	96
	Cromwell Rd	8	0	0	0	97
2001	North Kensington	5	0	0	0	97
	Cromwell Rd	8	0	0	0	95
2002	North Kensington	5	0	0	0	99
	Cromwell Rd	8	0	0	0	85
2003	North Kensington	5	0	0	0	99
	Cromwell Rd	6	0	0	0	88
2004	North Kensington	4	0	0	0	97
	Cromwell Rd	5	0	0	0	99
2005	North Kensington	3	0	0	0	99
	Cromwell Rd	5	0	0	0	95
2006	North Kensington	4	0	0	0	99
	Cromwell Rd	6	0	0	0	87
2007	North Kensington	*3*	*0*	*0*	*0*	*95*
	Cromwell Rd	*4*	*0*	*0*	*0*	*94*

2007 data (in italics) is provisional and should be treated with caution.

No exceedences of any of the objectives have been observed in the past eight years at monitoring locations in the Borough. Elevated sulphur dioxide is most likely to be the result of a plume grounding episode arising from industrial sources in the East Thames area but none have resulted in any exceedences.

The 15 minute, one-hour, and 24 hour mean objectives continue to be met.



The graph above illustrates the long term decline in annual mean sulphur dioxide levels over the past 16 years. However, annual mean levels in the past three years have now largely stabilised at between 3 and 5µg/m^3. Other data from another central London monitoring location is included to show comparability.

Conclusion

Monitoring data shows that there have been no exceedences of any of the three objectives for sulphur dioxide.

PARTICULATE MATTER (PM_{10})

Two objectives for particles (PM_{10}), to be achieved by the end of 2004, have been incorporated within the Air Quality Regulations (see table 1, p1) – a short term 24 hour mean objective and a long term annual average objective. The three more stringent objectives for 2010 and 2015 (which were not incorporated into the Air Quality Regulations) will now be replaced by objectives for $PM_{2.5}$ following the review of the Air Quality Strategy. The whole of the Royal Borough was declared an Air Quality Management Area in 2000 partially based on exceedences of the 2004 PM_{10} objectives at some locations.

Monitoring Data

Automatic monitoring of PM_{10} (using TEOM instruments) first began in 1995 in North Kensington (urban background site) and later from 1998 at the Cromwell Road site (roadside). Whilst these instruments are considered not to be equivalent to gravimetric methods, the data from these sites is still relevant for local air quality management purposes. Gravimetric data is also available at the North Kensington site. This data is collected by Defra for research purposes comparing different particle monitoring techniques. This enables us to compare the results from our TEOM instrument; this has shown that the adjusting the TEOM data by a factor of 1.3 gives a reasonable approximation of the annual average. It is less reliable when applied to exceedences of the daily objective. A gravimetric sampler, installed by the Council, has been operating on the Earls Court Road since May 2002.

Data for monitoring sites within the borough and other central locations are shown in table 15 (overleaf). This data indicates that the 2004 annual mean objective is likely to be met in most locations within the borough. However, concentrations at the Earls Court kerbside location have either been on or just above the annual mean objective level of 40µg/m^3 between 2003 and 2007. This site has also exceeded the daily mean objective every year apart from its year of installation when it operated for six months only.

Table 15 Concentrations of particulate matter PM_{10} (TEOM) measured in the Borough and other nearby locations (μg/m^3)

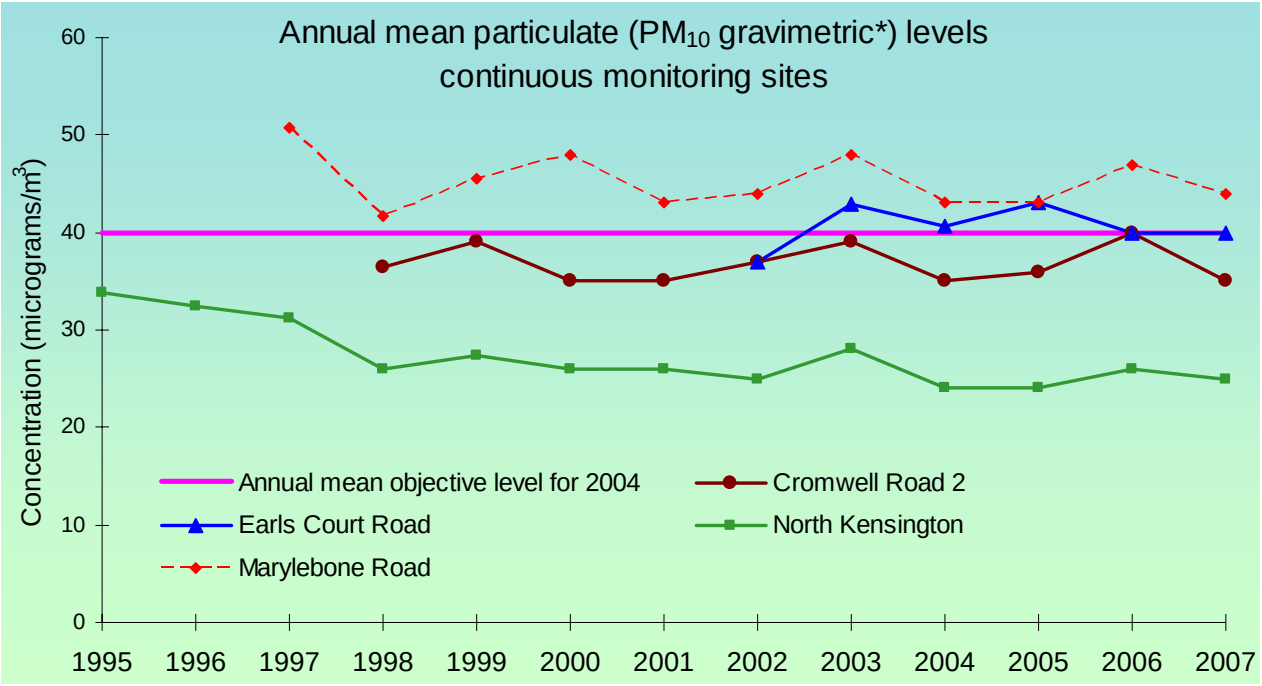
Year	Site	Annual mean μg/m^3 (TEOM)	Annual mean 40μg/m^3 2004 (GRAV)	No of days above 50μg/m^3 (GRAV) fixed 24 hr mean	% Data Capture
1998	North Kensington	20	26	16	98
	Bloomsbury	23	30	21	94
	Cromwell Rd2*	28	37	28	60
	Marylebone Rd	32	42	85	98
1999	North Kensington	21	27	16	99
	Bloomsbury	22	29	21	96
	Cromwell Rd2	30	39	**51**	95
	Marylebone Rd	35	46	114	95
2000	North Kensington	20	26	11	96
	Bloomsbury	21	28	11	97
	Cromwell Rd2	27	35	30	97
	Marylebone Rd	37	48	159	99
2001	North Kensington	20	26	4	96
	Bloomsbury	22	29	16	98
	Cromwell Rd2	27	35	34	99
	Marylebone Rd	34	43	105	98
2002	North Kensington	19	25	8	99
	N Kensington Partisol	Not applicable	25	**39**	88
	Bloomsbury	29	38	43	85
	Cromwell Rd 2	28	37	**36**	95
	Marylebone Rd	34	44	111	98
	Marylebone Rd Partisol	Not applicable	44	44	Not available
	Earls Court Partisol*	Not applicable	37	30	62
2003	North Kensington	22	28	29	98
	N Kensington Partisol	Not applicable	28	**32**	88
	Bloomsbury	23	30	14	58
	Cromwell Rd 2	30	39	**56**	88
	Marylebone Rd	37	48	161	99
	Marylebone Rd Partisol	Not applicable	45	96	98
	Earls Court Partisol	Not applicable	**43**	**91**	97
2004	North Kensington	19	24	6	97
	N Kensington Partisol	Not applicable	25	12	79
	Bloomsbury	20	26	7	98
	Cromwell Rd 2	27	35	29	99
	Marylebone Rd	33	43	97	98
	Marylebone Rd Partisol	Not applicable	41	66	84
	Earls Court Partisol	Not applicable	**41**	**67**	*89*
2005	North Kensington	19	24	6	99
	N Kensington Partisol	Not applicable	29	26	74
	Bloomsbury	21	27	5	95
	Cromwell Rd 2	28	36	**39**	98
	Marylebone Rd	33	43	118	96
	Marylebone Rd Partisol	Not applicable	44	85	87
	Earls Court Partisol	Not applicable	**43**	**81**	94
2006	North Kensington	20	26	16	99
	N Kensington Partisol*	Not applicable	*32*	*22*	*66*
	Bloomsbury	*23*	*30*	*21*	*98*
	Cromwell Rd 2	31	40	**60**	98
	Marylebone Rd	36	47	151	97
	Marylebone Rd Partisol*	Not applicable	*46*	*69*	*55*
	Earls Court Partisol	Not applicable	**40**	**62**	87
2007	North Kensington	*19*	*25*	*13*	*99*
	N Kensington Partisol*	Not applicable	*28*	*19*	*72*
	Bloomsbury*	*23*	*30*	*13*	*70*
	Cromwell Rd 2	*27*	*35*	*26*	*94*
	Marylebone Rd	*34*	*44*	*121*	*98*
	Marylebone Rd Partisol*	Not applicable	*47*	*62*	*66*
	Earls Court Partisol	Not applicable	***40***	***69***	*90*

* Indicates that these sites were not operating for a full year or low data capture. Partisol indicates gravimetric collection method.

- Figures in bold indicate an exceedence of an objective recorded within Kensington and Chelsea.

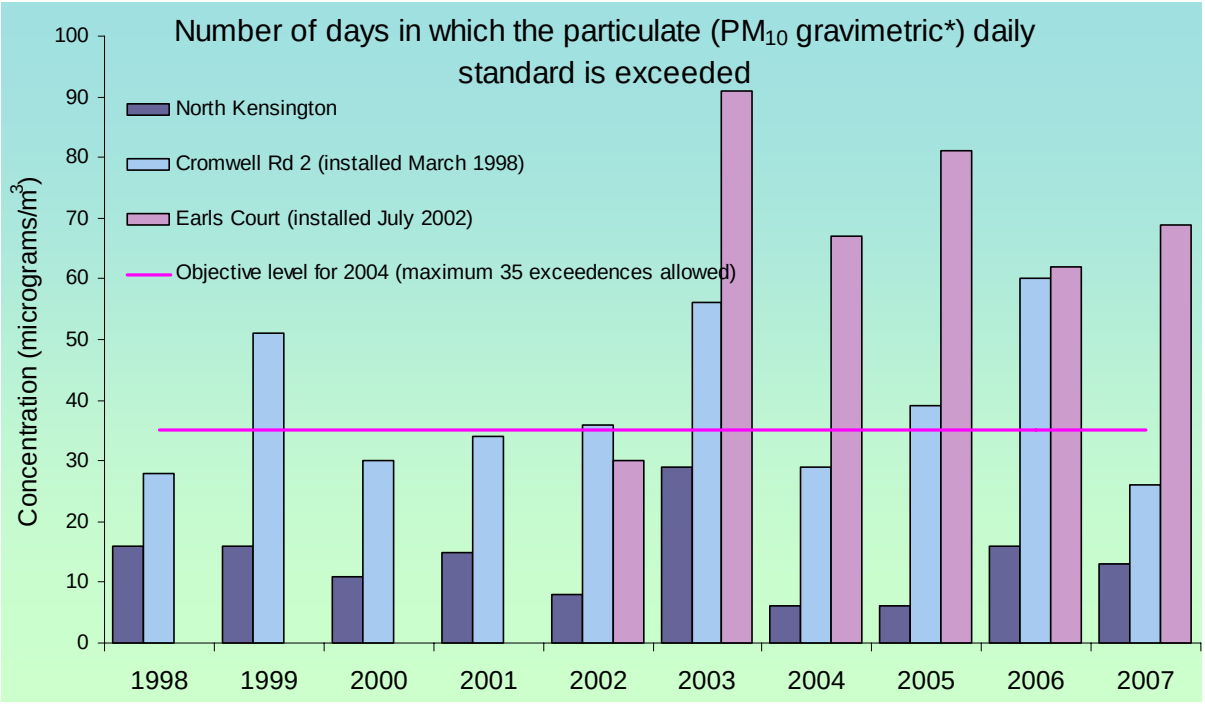
\# Data shown in italics is provisional

Whilst no clear trend in annual mean PM_{10} levels can be seen, most sites showed slight reductions between 2006 and 2007. Only North Kensington shows a longer term overall reduction since 1995(shown in the chart below). No change was seen in the annual mean level at the Earls Court site which stayed at a level (40µg/m^3) for the past two years.



*levels measured by TEOM are factored by 1.3

The 24 hour (or daily mean) objective has been regularly exceeded at the roadside locations (shown in the chart below), but again there is no clear overall trend. The extent of the exceedences is likely to be dependent on factors such as weather conditions. In 2007 two of the three sites were within the objective. It is important to note that measurements from TEOM instruments can underestimate the number of exceedences above 50µg/m^3 because of a feature of the technique. Where instruments are co-located with gravimetric monitors (such as North Kensington) a greater number of days above 50µg/m^3 are measured. The number of exceedences at the North Kensington site, measured as 19 using the gravimetric method, are still within the objective of 35 days.

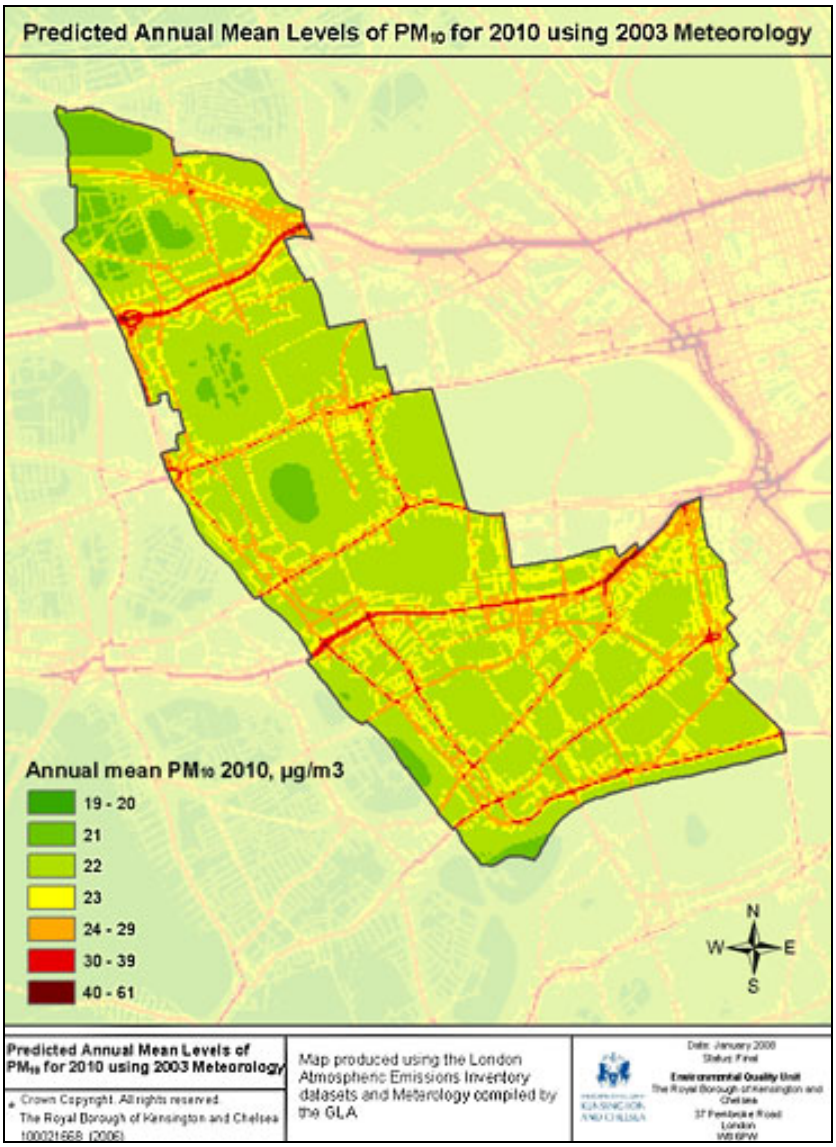


*levels measured by TEOM are factored by 1.3

Modelling

Dispersion modelling has been undertaken by the GLA to predict future levels of PM_{10} for the London area. The maps shown here have been extracted from this work to show the levels in the borough.

The results predicted for 2010 indicate that exceedences of the 2004 annual mean objective level are likely to continue along small sections along heavily trafficked roads along the Westway, West Cromwell Road and the Brompton Road. Along busy roads they rise to between 24 and 29µg/m³ and on major roads are more than 30µg/m³.



Conclusion

There have been more than 35 exceedences of the 24-hour objective and an exceedence of the annual mean level at a roadside location in 2004 and 2005. This demonstrates that busy roadside locations continue to be at risk of breaching the objectives.

PARTICULATE MATTER ($PM_{2.5}$)

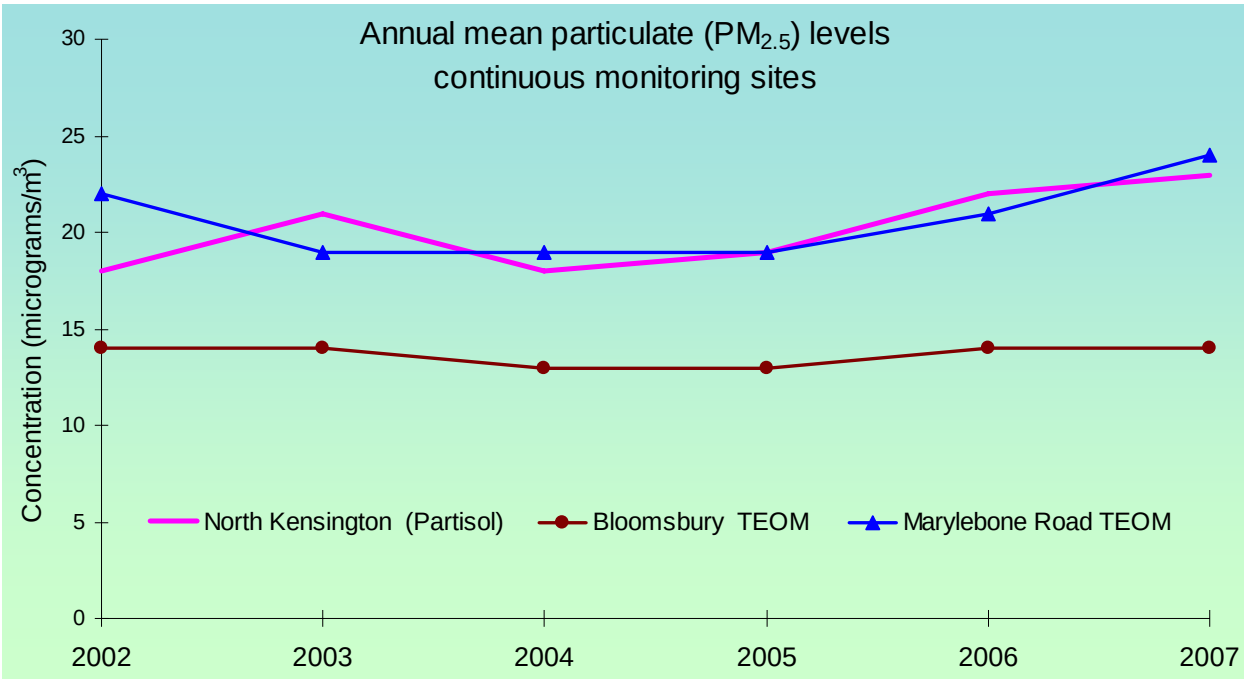
The latest strategy set a cap of 25µg/m^3 for $PM_{2.5}$ and a 15 % reduction in annual mean concentrations at urban background locations by 2020. There is no requirement for local authorities currently to report against these exposure reduction targets. However some information on current levels has been included below. Monitoring of $PM_{2.5}$ is only undertaken at a relatively small number of locations in the London area. $PM_{2.5}$ is monitored in the borough at the North Kensington by Defra using a gravimetric instrument. This came to an end in October 2007 but is likely to be replaced with continuous monitoring using a TEOM FDMS instrument.

Table 16 Concentrations of $PM_{2.5}$ monitoring sites in central London

Year	Site	Annual mean µg/m^3 (TEOM)	Annual mean µg/m^3 (GRAV)	% Data Capture
2002	North Kensington (Partisol)	-	*18*	91
	Bloomsbury TEOM	14	-	na
	Marylebone Road TEOM	22	-	na
2003	North Kensington	-	*21*	87
	Bloomsbury	*14*	-	na
	Marylebone Rd	*19*	-	na
2004	North Kensington (Partisol)	-	*18*	89
	Bloomsbury TEOM	13	-	na
	Marylebone Road TEOM	19	-	na
2005	North Kensington	-	*19*	93
	Bloomsbury TEOM	13	-	94
	Marylebone Rd TEOM	19	-	97
2006	North Kensington (Partisol)	-	*22*	94
	Bloomsbury TEOM	14	-	98
	Marylebone Road	21	-	98
2007	North Kensington	-	*23*	*74*
	Bloomsbury TEOM	*14*	-	*86*
	Marylebone Rd TEOM	*24*	-	*99*

Data in italics is unratified

Currently levels of $PM_{2.5}$ measured by TEOM are not factored as no adjustment factor has been recommended yet. However it is apparent from the data from Bloomsbury and Marylebone Road that TEOM instruments are likely to underestimate concentrations due to the loss of volatile components. At the North Kensington site a gravimetric method is used. As these results currently stand they are below the cap level proposed, but appear to be increasing.

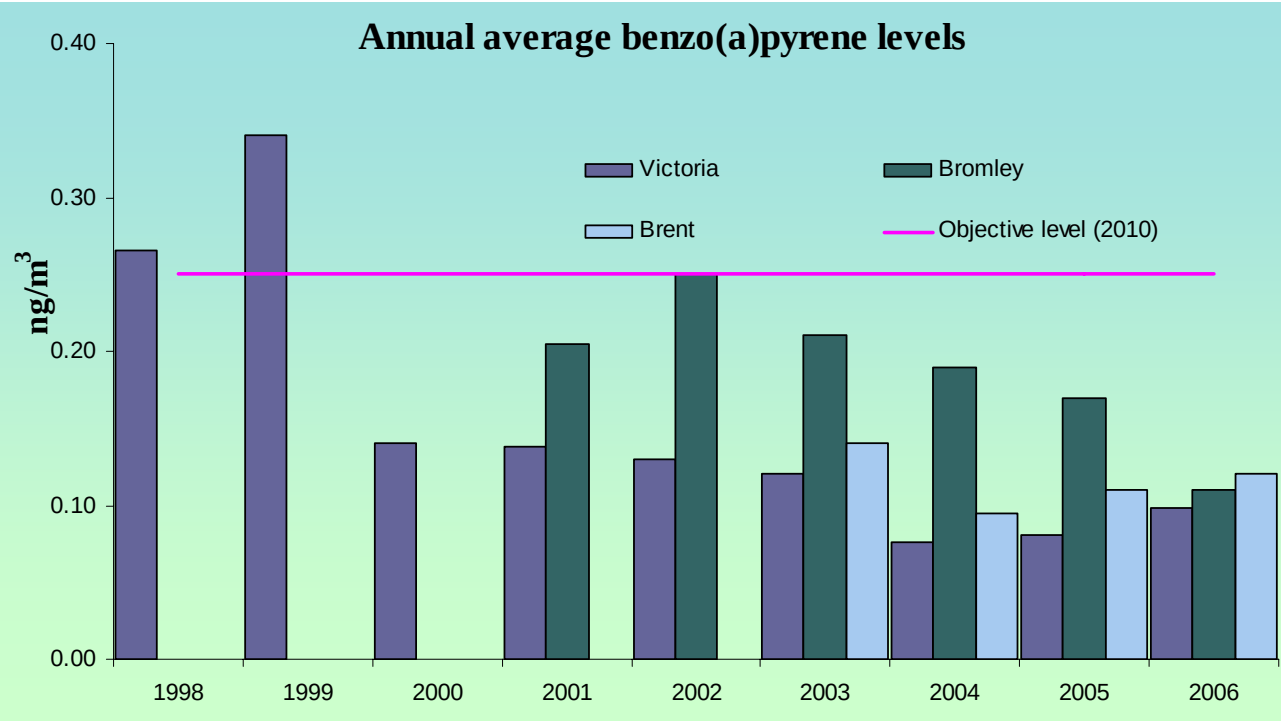


POLYCYCLIC AROMATIC HYDROCARBONS

Polycyclic Aromatic Hydrocarbons (PAHs) are a complex mixture of organic compounds some of which are carcinogens. The Government has set an objective for these pollutants. It would be very difficult and expensive to monitor a selection of these pollutants, consequently, the Government has selected benzo(α)pyrene (b(a)p) as a marker for PAH and set an objective based on this pollutant: 0.25ng/m^3 as an annual average to be achieved by the end of 2010.

Whilst this objective has been set it has not been included in regulations for local air quality management purposes. However monitoring data from the London area has been included in this report for information. The main sources of b(a)p are industrial emissions, domestic coal and wood burning. Vehicles no longer appear to be a major source. Urban areas, without significant industrial activity, such as London have shown reductions in concentrations. This may be of increasing concern in the future however if the use of biomass becomes more widespread.

The most recent data available from monitoring at sites in Victoria, Bromley and Brent indicates that at these locations concentrations have generally been declining. Data for 2007 was not available at the time of this writing this report. The chart below shows that since 2003, the annual average concentrations of benzo(α)pyrene measured at these sites have met the objective for 2010.



Conclusion

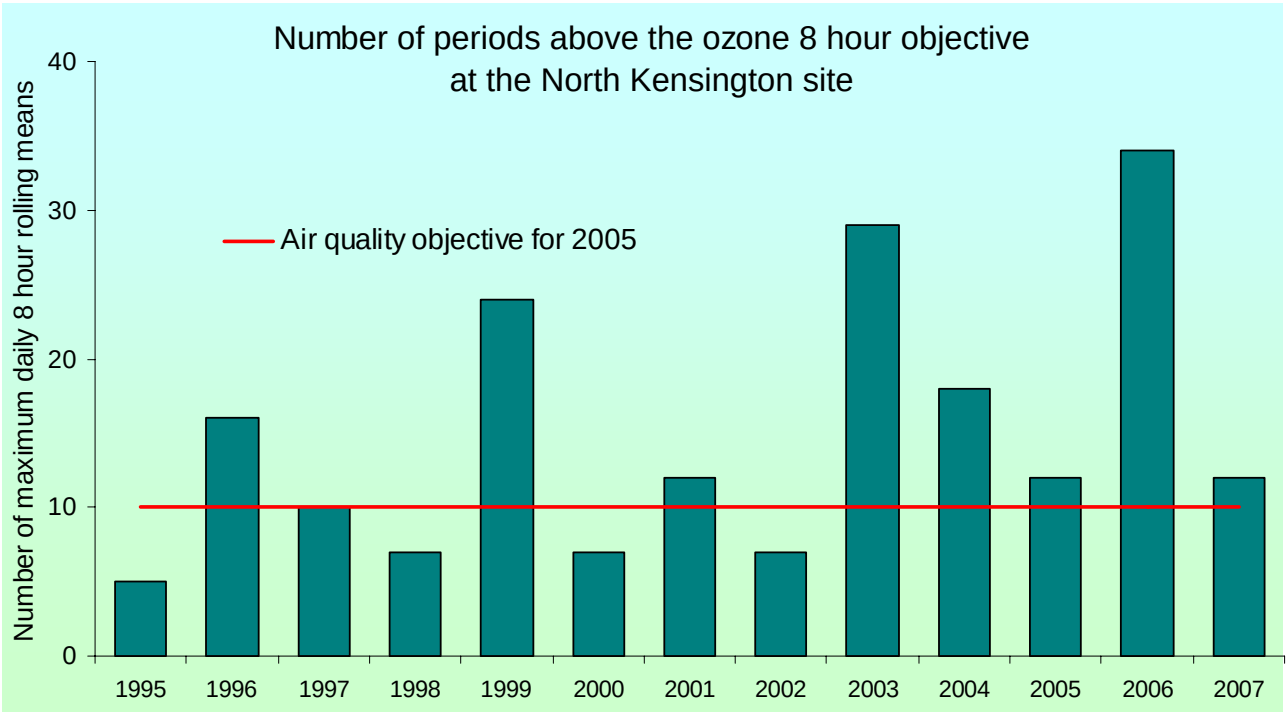
As the borough has no industrial processes and very little coal and wood burning, concentrations of b(a)p would be expected to be similar to the levels indicated by the above monitoring results and are therefore likely to be well within the 2010 objective.

OZONE

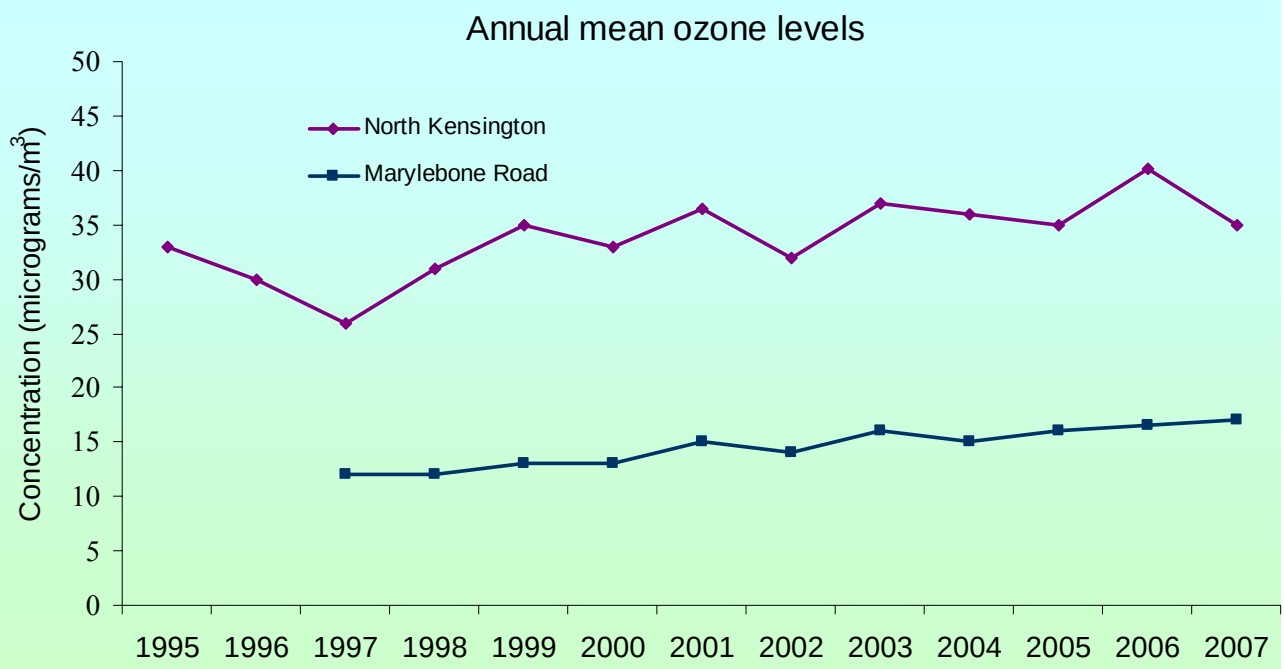
The objective for ozone is 100µg/m^3 not to be exceeded more than 10 times a year (calculated as the daily maximum 8 hour mean) by 2005. The Borough is not required to work towards the achievement of this as it is not included in the LAQM process. This is because ozone reduction requires action at a regional and European level. However, due to its health effects, monitoring is undertaken at the North Kensington background site in the borough.

Ozone formation is dependant on high temperatures and sunny weather as well as the necessary precursor pollutants such as oxides of nitrogen NO_x and volatile organic compounds. Some of these pollutants may not be locally produced and consequently attempts to control ozone are being undertaken at a European level. Unlike most pollutants ozone tends to be higher at background locations away from busy roads, often the highest levels being reached in rural locations. This is because oxides of nitrogen (NO_x) emitted from exhaust will react with ozone, reducing its level in heavily trafficked areas.

The chart below shows exceedences of the objective at a background location in the borough. Overall there has been an increase in the number of periods exceeding the objective; however this varies considerably from year to year. There has been an exceedence of the objective in eight out of thirteen years that monitoring has been undertaken. These have been in 1996, 1999, 2001, and for the past five years. These are likely to be years which experience high temperatures and of levels sunshine. In 2007 the number of exceedences were down considerably compared to 2006 but still remain above the objective.



The chart below shows the annual mean levels at the North Kensington site and at a roadside location site (Marylebone Road) located outside the borough. The latter site is included to demonstrate the lower levels measured near to busy roads. This chart also shows that, overall, annual mean levels have increased since monitoring began.



Conclusion

Ozone currently exceeds the objective level in the Borough at background locations.

New local developments

There are no landfill or mineral developments planned in the borough. An access road is planned for the Warwick Road developments. All new developments of a significant size must undertake an air quality assessment, which should include a cumulative assessment where other developments are planned nearby. The assessment must be based on a transport assessment that has been approved by the Council's Transport section. We request that air quality assessments follow the London Councils Air Quality and Planning Guidance.

This has included a number of mixed use developments applications:

100 West Cromwell Road
213-215 Warwick Road
245 Warwick Road
Chelsea Academy

Where air quality assessments have been submitted to the Council none are predicted to have a significant impact on air quality.

A risk assessment and a report for dust control (including an inventory and timetable of dust generating activities and emission control methods) are also requested and whether baseline monitoring is also required. We ask developers to follow The London Best Practice Guidance for The Control of Dust and Emissions from Construction and Demolition'.

Recently a new condition has been included for the provision of detailed information on biomass boilers and note that the borough is a smoke control area as well as an Air Quality Management area.

Since the previous updating and screening assessment, 28 dry cleaners have been identified as requiring a permit. All of these were inspected by early 2008 and have now been issued with permits. The Council is not aware of any plans for any new processes as listed in Appendix 2 of TG (03).

Overall Conclusions

Monitoring results have shown some significant improvement in pollutant concentrations of nitrogen dioxide and particulate matter (PM_{10}). However, despite this, many locations remain above the objective levels. In particular, short term (hourly/daily) objectives for nitrogen dioxide and particulate matter increased compared to 2006 levels at a few road side locations. The remainder of the strategy pollutants already meet objective levels and continue to show very small reductions or have largely stabilised.

The exceptions to this are Ozone and $PM_{2.5}$. Ozone is not managed through the LAQM process but continues to be a cause for concern in that levels continue to rise. A preliminary consideration of $PM_{2.5}$ data indicates that annual mean levels are changing very little or show a slight increase. It is not clear how the exposure reduction approach will work in practice and how it will impact on local authorities efforts to reduce particles (whether as PM_{10} or $PM_{2.5}$). The Council will continue to work towards delivering cleaner air and looks forward to further guidance to assist it in improving air quality.

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GLOSSARY

AQMA - Air Quality Management Area, an area designated by a local authority where it is likely that the air quality objectives in the National Air Quality Strategy will not be achieved by the appropriate future year specified by each pollutants' objective.
Air Quality Action Plan – a plan of initiatives that is being implemented to improve air quality.
Automatic monitoring sites - sites producing high-resolution measurements typically hourly or shorter period averages.
AURN - Automated Urban Rural Network - A DEFRA (previously DETR) air quality monitoring network.
AURN affiliate - a monitoring site owned and operated by a local authority but included in the DEFRA network of sites.
Urban background site - a sampling site in an urban location distanced from sources and broadly representative of city-wide background concentrations e.g. elevated locations, parks and urban residential areas.
Benzene - an aromatic hydrocarbon.
1,3-Butadiene - colourless gaseous hydrocarbon.
Carbon monoxide - gas formed by the incomplete combustion of carbon containing fuels.
DEFRA – Department for Environment, Food & Rural Affairs.
Diffusion tube - a small air pollution monitor that passively absorbs a pollutant over a monthly time period, and is then collected and analysed.
Emissions inventory – a comprehensive data set of pollution emitted from a variety of sources.
Fine particles – see Particles.
Gravimetric method – a method of sampling particulate matter by collecting it on a filter which is then weighed later e.g. Partisol
HGV – heavy goods vehicle, a goods carrying vehicle of 3.5 tons, or more, gross laden weight.
8 hr running mean - an average taken over an 8-hour period, which progresses hour by hour.
Intermediate site - a sampling site within 20-40 metres of the source/road.
Kerbside site – a site sampling within 1 metre of a busy road.
Lead – one of the heavy metals that are a toxic and acts as a cumulative poison.
LAQN - London Air Quality Network, a network run by a consortium including local authorities, the Environmental Research Group - King's College, to co-ordinate air pollution monitoring.
$\mu g/m^3$ - a microgram of pollutant in a cubic metre of air.
Nitric oxide (NO) - a colourless toxic gas arising from the combination of atmospheric nitrogen with oxygen in high temperature combustion.
Nitrogen dioxide (NO_2) - a stable brown gas largely produced by the oxidation of NO. NO_2 is more toxic than NO.
Particles – or fine particles, these are microscopic particles of varying composition, and for the purposes of this report the term 'particles' refers to a range of particle sizes from 10μ to 0.1μ.
Pollutant specific guidance – issued by DEFRA, provides advice on review and assessment for each pollutant identified in the air quality regulations 1997.
Objective –we have used the word objective throughout this report. This is the term used by the Government to describe standards which have a set timescale (i.e. a target date) for their achievement.
PM_{10} - particulate matter less than 10 μ (micrometres) in diameter.
$PM_{2.5}$ - particulate matter less than 2.5μ (micrometres) in diameter.
Roadside site - a sampling site between 1 metre of the kerbside of a busy road and the back of the pavement. Typically within 5 metres of the road.
Screening models - give a preliminary level of assessment and only require simple input data.
Source apportionment – the degree to which various sources of pollution contribute to air quality problems.
Sulphur dioxide (SO_2) - a colourless toxic and acid forming gas, it is the main product of the combustion of sulphur contained in fuels.
Technofix – the use of improved engine and fuel technology to reduce pollution.
TEOM - Tapered Element Oscillating Microbalance - a device for continuously measuring fine particles.

APPENDICES

REVIEW AND ASSESSMENT WORK TO DATE — Appendix 1

This section describes briefly the work undertaken previously.

First Round of Review and Assessment:

Stages One - Three

The Royal Borough of Kensington and Chelsea completed the first round of Review and Assessment in 2003: it consisted of three stages of examining the sources, identifying the contribution of each and a reviewing of monitoring data and finally a prediction of concentrations for the key deadlines using sophisticated modelling. By the end of stage three after a process of elimination the following conclusions were reached.

Table 15 Summary of results

Pollutant	Assessment
NO_2	High likelihood the Borough would exceed the annual mean and hourly mean objective along many of the major roads in the borough.
PM_{10}	High likelihood that the Borough would exceed the 24 hour mean objective at a few locations.
SO_2	Virtually no likelihood that the Borough would exceed the objectives for sulphur dioxide.
CO	No likelihood that the Borough would exceed the objectives for carbon monoxide.

Consequently an Air Quality Management Area was declared in December 2000 based on exceedences of nitrogen dioxide (NO_2), particulate matter (PM_{10}). This covers the whole of the Royal Borough of Kensington and Chelsea.

Stage Four

Stage four was carried out to check the results of the previous reports in the light of the latest air monitoring results at the time and further modelling work. It also took into account the revised information gathered on road traffic emissions, which essentially acknowledged that the exhaust emissions of newer vehicles were not as clean as previously claimed. There were some differences between the modelling undertaken previously, but exceedences were still being predicted for both nitrogen dioxide and PM_{10}. In addition the further work eliminated any concerns regarding carbon monoxide and sulphur dioxide. Alongside this, an Air Quality Management Plan was produced, setting out 25 actions that the Council should take to work towards improving air quality.

Second Round of Review and Assessment

An Updating and Screening Assessment (USA) was conducted as part of the second round. This was published in April 2004. The purpose of a USA is to identify whether any changes have taken place with the seven pollutants, highlighted in table 1, since the previous assessment. A Detailed Assessment (DA) must then be undertaken if this is the case. We concluded that a DA was unnecessary. The following year we submitted a combined Air Quality and Action Plan Progress report.

Third Round of Review and Assessment

A further updating and screening assessment was undertaken of as part of the third round of assessment in 2004/05. Each pollutant was dealt with individually and considered against the updated guidance checklist.

A Progress report is undertaken in years when updating and screening assessments are not required this is the third of such reports.

Appendix 2
DATA COLLECTION AND QUALITY ASSURANCE/QUALITY CONTROL

Continuous Data
Data collection, screening and validation
Monitoring data is stored as 15-minute averages within the analysers. Air quality data, including full instrument status information, is collected hourly via modem by the King's ERG on the Borough's behalf from the monitoring sites via the data loggers within the analysers. This data is stored within the London Air Quality Network database. Data is validated by a combination of automatic and manual checks. The procedures used comply with the validation requirements of the UK Automatic Urban and Rural Network Management and Co-ordination Units. Manual validation is carried out daily. Data is ratified in three to six month blocks using service records, calibration records, and the results of inter-calibration and audit. Data is passed on to the DEFRA's Quality Assurance and Quality Control Unit for final ratification.

Quality Control and Audit
Routine calibration and independent checks
Local site visits are undertaken fortnightly at the urban background site and weekly for the roadside Tapered Element Oscillating Microbalance (TEOM) for the purposes of calibration, filter changes and instrument cleaning. Equipment is additionally serviced at regular intervals.

Independent calibration and audit is carried out by AEA Technology as part of their Automatic Urban and Rural Network (AURN) responsibilities for the North Kensington site and for the Cromwell Rd through a separate contract. Calibration certificates are provided by AEAT. National Physical Laboratory (NPL) undertake the London affiliate inter-calibration exercise. The following checks are performed for the oxides of nitrogen, sulphur dioxide and carbon monoxide analysers:

Analyser response factors: The analyser samples a stable 'inter-calibration standard' which has been validated against a network primary standard. The analyser also samples from a certified zero air source.

Analyser linearity: The analyser response to a series of known concentrations covering the analyser range is noted. A linear regression is then performed on the results.

Analyser 'noise' levels: This is the standard error of ten successive spot readings of analyser readings when fully stabilised on zero.

Nitrogen Oxides analyser converter efficiency: NO_x analyser converter efficiency is determined using Gas Phase Titration at a range of concentrations, this uses a high concentration of NO and a known amount of O_3 which is subsequently converted to NO_2.

Estimation of site cylinder concentrations: The concentrations are evaluated by sampling from the site cylinder and comparison to analyser response factors determined from the 'inter-calibration standard'.

For particle analysers the following checks are performed: Mass transducer calibration: The mass transducer is calibrated by placing pre-weighed filters on it and noting the change in the frequency that is induced.

Analyser flow rates**:** Flow rates are measured by calibrated flow audit measurement systems. Leak checks are also carried out.

Bias adjustment of NO_2 diffusion tubes

Triplicate diffusion tube NO2 results associated with each monitoring site were averaged, and the annual mean NO2 concentration compared to the equivalent concentration measured by the co-located continuous NOx analyser over the twelve-month period. Monthly continuous NO2 data for each monitoring site has been retrieved from the Air Quality Archive or the LAQN website. Continuous analyser monthly mean results containing less than 75% data capture have been omitted to ensure a comparative and robust data set.

The monthly concentration for diffusion tubes and continuous analyser's data followed the exposure period using midnight as the starting point. The annual mean is derived from these monthly averages and the correction factor is based on:

$$\frac{\text{continuous average}}{\text{diffusion tube average}}$$

The sites selected this year for Kensington and Chelsea used the data from London N. Kensington and London Cromwell Road 2.