



# 2012 Updating and Screening Assessment for The Royal Borough of Kensington and Chelsea

In fulfillment of Part IV of the Environment Act 1995  
Local Air Quality Management

APRIL 2012



THE ROYAL BOROUGH OF  
KENSINGTON  
AND CHELSEA

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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. The Council has been monitoring air quality since before 1995 and continues to be seriously concerned about the impact of air pollution on health. In 2000, the whole borough was declared an Air Quality Management Area (AQMA) 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 (AQAP), which set out the steps the Council was taking to work towards meeting these objectives. In September 2009, the Council published a revised Action Plan to develop new ideas, following an extensive consultation with residents and other stakeholders.

This latest Updating and Screening Assessment (USA) provides information on the review and assessment of air quality in the borough. The USA has reviewed the sources of pollutants identified in the national Air Quality Strategy using guidance checklists to identify any significant changes since previous assessments. No new significant sources have been identified. An examination of monitoring data collected during 2011 has also been undertaken for the key strategy pollutants; these are nitrogen dioxide (NO<sub>2</sub>), particulate matter (PM<sub>10</sub>) carbon monoxide, sulphur dioxide and benzene. Information on PM<sub>2.5</sub>, 1, 3-butadiene, lead, benzo( $\alpha$ )pyrene (which is used as a marker for a complex group of hydrocarbons - PAH), and ozone is also included, though there is no requirement to do so. However these pollutants are also regarded as significant threats to health.

This report also provides a summary of the implementation of the actions contained in the Air Quality Action Plan 2009 -2014 in Section 9. In particular this highlights successes such as emission reductions from the Council's buildings and vehicle fleet and elsewhere further progress with provisions for cyclists. The section also notes improvements in tackling the air quality impacts of major redevelopments both during construction and when occupied. On raising awareness about the health impact of air quality, there are encouraging signs that despite resource constraints some initiatives have been possible and there is the prospect of working more closely with the business community.

It is of some comfort to note that the review of the monitoring data shows that most pollutants (excluding NO<sub>2</sub>, PM<sub>10</sub> and ozone) remain well within their respective objective levels.

The situation for NO<sub>2</sub> remains problematic. Monitoring at the borough's five continuous monitoring sites show that exceedences of the annual mean NO<sub>2</sub> objective level have occurred at all sites apart from the North Kensington background site. Decreases were observed at all sites, however to meet the objectives, reductions of almost 60µg/m<sup>3</sup> are still required at the worst affected road side locations, and reductions of nearly 35-40µg/m<sup>3</sup> are required at some building façades on busy and congested roads. Exceedences of the hourly mean objective vary from site to site, from none at the North Kensington to 380 at the Earls Court site (compared to the 18 exceedences permitted).

Monitoring of PM<sub>10</sub> at our three sites shows that these have all met the annual mean objective since 2008, though there was an increase in levels at the North Kensington site. Whilst in 2010, the council's three monitoring stations met the daily mean objective level for the first time, in 2011 the Earls Court site exceeded the daily mean objective level. Therefore it is likely that other sites may be at continued risk of exceedences.

Defra has completed a review of the monitoring stations it runs, which includes the Cromwell Road site. It has now been decided that because of siting requirements it no longer meets their objectives and Defra will discontinue the monitoring of NO<sub>x</sub>, SO<sub>2</sub>, and CO by September 2012. This will impact on our knowledge of air pollution in this area and therefore public exposure.

The lack of progress in significantly reducing NO<sub>2</sub> levels and the upturn in PM<sub>10</sub> levels are seriously worrying, particularly given the substantial reduction needed to meet the objective levels for NO<sub>2</sub> and the EU time limit of 2015. We assume the government and the Mayor of London share this concern and will be bringing forward more effective measures to address the problem.

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# 1 Introduction

## 1.1 Description of Local Authority area

The Royal Borough of Kensington and Chelsea is a densely populated urban environment located to the west of central London. The borough extends from Chelsea Embankment in the south, through Kensington, Notting Hill and Ladbroke Grove up to Kensal Green to the north. It is bounded by Bayswater, Kensington Gardens and Belgravia to the east and by the West London Railway Line to the west. Kensington and Chelsea has less open space compared to other boroughs, however it has 26 public parks and open spaces, eight of which are categorised as major parks due to a combination of size and range of facilities. It is home to several major museums and part of the Imperial College campus.

The Royal Borough has an estimated population of 180,000, which is expected to rise to 200,000 by 2030, and the highest population density (131 people per hectare) of all local authorities in England and Wales. However, with the exception of the City of London it is the smallest London borough. The 2011 census results should reveal more recent population changes, but this information is not available yet. In addition to the resident population thousands of people come into the borough each day to work and visit. About 30,000 visitors stay each night.

The borough is primarily a residential area with a large volume of commuter traffic; people both travelling across and into the area, and local residents travelling within and outside the borough. The area is relatively well served by the London Underground network with the Circle, District, Central, Piccadilly and Hammersmith and City Lines running through the borough. Although currently there is no over-ground rail service actually within the borough, the West London Line stations at Shepherds Bush, Kensington Olympia, West Brompton, and Imperial Wharf are easily accessible to residents and visitors in those localities. There is an extensive bus network.

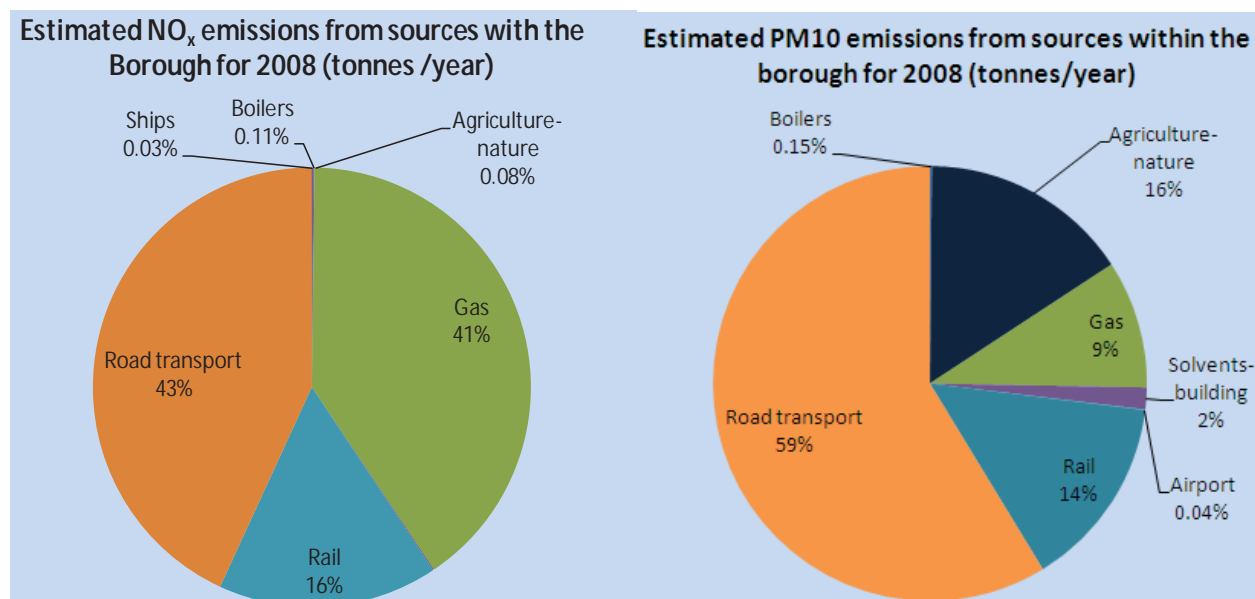
There are 207 km (127.6 miles) of roads in the borough; 28 km (17 miles, 13.5 per cent) are A roads, ten km (six miles, 4.8 per cent) are B roads and the remaining 169 km (105 miles, 81.6 per cent) are C roads or unclassified. Six per cent (12.5 km or 7.8 miles) of the roads in the borough are designated as part of the Transport for London Road Network (TLRN) managed by TfL. These routes are: Westway (A40), Cromwell Road (A4), Earl's Court one-way system (A3220) and Chelsea Embankment (A3212).

The available north/south or east/west routes are also constrained by bridges which mean that these are heavily trafficked. They are also often major retail areas with heavy pedestrian flows. The transport infrastructure has changed relatively little since its major development in the nineteenth century. In the past fifty years, the two most notable changes have been the construction of the Westway flyover and the decline in the use of the River Thames. However the demands placed upon the infrastructure have continued to change; the movement of people, goods and services has increased, bringing more congestion to the road network.



## Emission sources

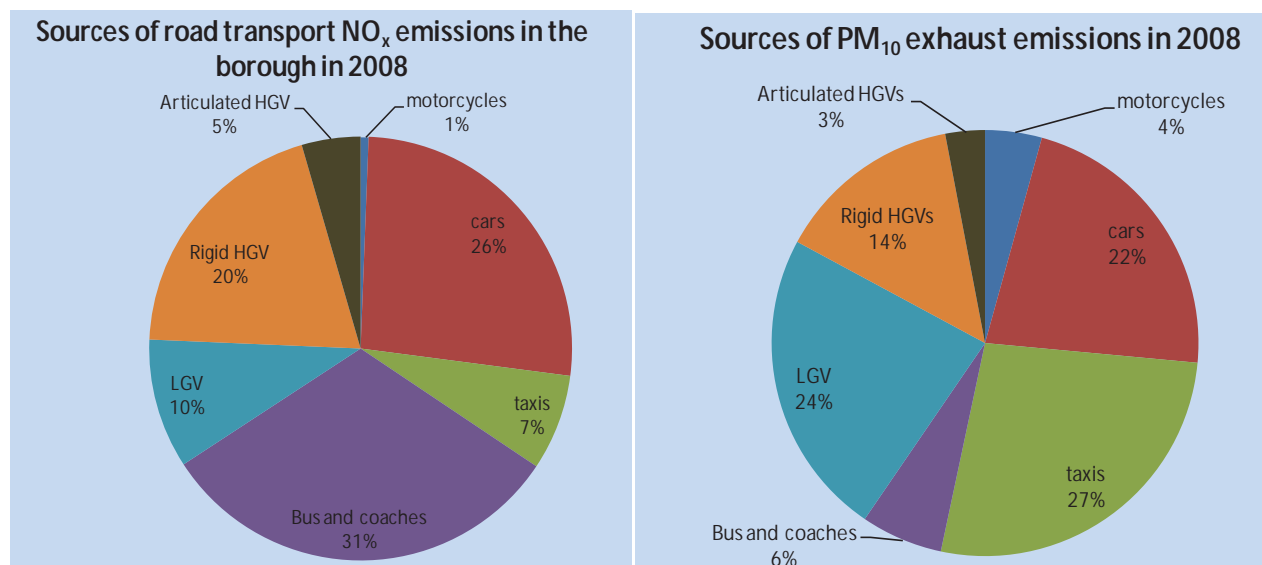
The emission sources of pollutants from within the borough are mainly from transport, residential and commercial activities. A large proportion of the pollution however arises from beyond the borough's immediate area including neighbouring boroughs, the metropolis as a whole and further afield from national and European sources. The contribution of NO<sub>x</sub> and PM<sub>10</sub> from the various sources within the borough in 2008 (based on the 2010 LAEI) is shown below. The predictions for 2008 are shown because we consider them to be more representative of current conditions.



Data source LAEI 2008 (published 2010) showing predicted emissions for 2008.

The most significant source of NO<sub>x</sub> is road transport followed closely by gas emissions based on the predictions for 2008. The most significant source of PM<sub>10</sub> from within the borough is road transport; however the next most important source is agricultural and natural sources (this includes soils, domestic gardens, bonfire night, fireworks and accidental fires). Predictions for 2011 and 2015 indicate that transport emissions of NO<sub>x</sub> are expected to decline significantly to almost half by 2015 compared to 2008. However there is increasing evidence and recognition that actual emissions from vehicles are not declining as predicted.

The charts overleaf look at road transport emissions in more detail, focussing on the contribution of different vehicle types to NO<sub>x</sub> and PM<sub>10</sub> emissions. For NO<sub>x</sub>, buses and coaches, followed by cars and heavy goods vehicles are the three biggest sources while taxis, LGVs and cars are the three main sources of exhaust emissions of PM<sub>10</sub>.



## 1.2 Purpose of the report

This Updating and Screening Assessment (USA) fulfils the requirements of the Local Air Quality Management (LAQM) process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. These reports are produced every third year; in the intervening years progress reports are produced.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas and determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area and prepare an Air Quality Action Plan setting out the measures it intends to put in place in pursuit of the objectives.

## 1.3 Air quality objectives

The air quality objectives applicable to LAQM in England are set out in the Air Quality (England) Regulations 2000 (SI 928), and the Air Quality (England) (Amendment) Regulations 2002 (SI 3043). They are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre ( $\mu\text{g}/\text{m}^3$ ), except for carbon monoxide, where the units used are milligrammes per cubic metre ( $\text{mg}/\text{m}^3$ ). Table 1.1 includes the number of permitted exceedences in any given year (where applicable).

**Table 1.1 Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in England**

Pollutant	Concentration	Measured as	Date to be achieved by
<b>Benzene</b>	16.25 µg/m <sup>3</sup>	Running annual mean	31.12.2003
	5.00 µg/m <sup>3</sup>	Running annual mean	31.12.2010
<b>1,3-Butadiene</b>	2.25 µg/m <sup>3</sup>	Running annual mean	31.12.2003
<b>Carbon monoxide</b>	10.0 mg/m <sup>3</sup>	Running 8-hour mean	31.12.2003
<b>Lead</b>	0.5 µg/m <sup>3</sup>	Annual mean	31.12.2004
	0.25 µg/m <sup>3</sup>	Annual mean	31.12.2008
<b>Nitrogen dioxide</b>	200 µg/m <sup>3</sup> not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 µg/m <sup>3</sup>	Annual mean	31.12.2005
<b>Particles (PM<sub>10</sub>) (gravimetric)</b>	50 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 µg/m <sup>3</sup>	Annual mean	31.12.2004
<b>Sulphur dioxide</b>	350 µg/m <sup>3</sup> , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m <sup>3</sup> , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

## 1.4 Summary of previous Review and Assessments

### 1.4.1 First round of Review and Assessment

#### Stages one to three

The Council completed the first round of Review and Assessment in 2000. It consisted of three stages which involved examining the sources of pollution, identifying the contribution of each source followed by a review of monitoring data, and finally a prediction of concentrations for the key deadlines using modelling. By

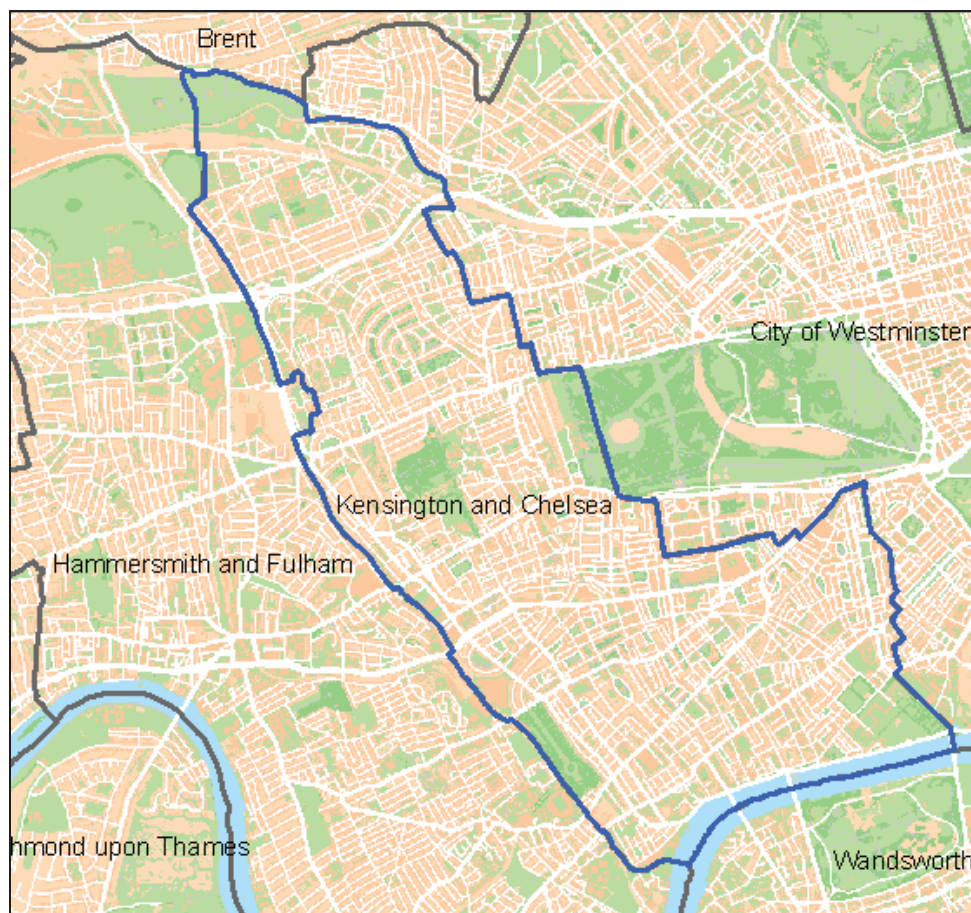
the end of stage three, after a process of elimination, the following conclusions were reached.

**Table 1.2 Summary of results of first round of Review and Assessment**

Pollutant	Assessment
<b>NO<sub>2</sub></b>	High likelihood the borough would exceed the annual mean and hourly mean objective along many of the major roads in the borough.
<b>PM<sub>10</sub></b>	High likelihood that the borough would exceed the 24 hour mean objective at a few locations.
<b>SO<sub>2</sub></b>	Virtually no likelihood that the borough would exceed the objectives for sulphur dioxide.
<b>CO</b>	No likelihood that the borough would exceed the objectives for carbon monoxide.

Following a major public consultation in the summer of 2000 a decision was reached by the full Council to declare the whole of the borough an Air Quality Management Area (AQMA). The Order making the declaration came into force on the 6th December 2000 and was based on exceedences of nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM<sub>10</sub>).

**Figure 1:1 Map of AQMA Boundary**



**Stage Four**

Stage four was carried out to check the results of the previous reports in light of the latest air monitoring results at the time and further modelling work. This was completed in August 2003. 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 NO<sub>2</sub> and PM<sub>10</sub>. In addition the further work eliminated any concerns regarding carbon monoxide and sulphur dioxide. Alongside this, the Council's first Air Quality Management Plan was produced, setting out 25 actions that the Council should take to work towards improving air quality.

**1.4.2 Second round of Review and Assessment**

An Updating and Screening Assessment (USA) was conducted as part of the second round. This was published in December 2003. The purpose of a USA is to identify whether any changes have taken place with the seven pollutants, highlighted in Table 1.1, 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.

**1.4.3 Third round of Review and Assessment**

A further USA was undertaken as part of the third round of assessment in April 2006. Each pollutant was dealt with individually and considered against the updated guidance checklist at the time. Progress reports are undertaken in years when USAs are not required.

**1.4.4 Fourth round of Review and Assessment**

The last USA was conducted in 2009. The latest monitoring data was reported for each pollutant and we re-examined all sources using the checklists provided in the Department of Environment, Food and Rural Affairs' (Defra) Local Air Quality Management Technical Guidance LAQM TG (09) to see if any significant changes had occurred. Following changes to guidance issued in 2009 we concluded that a further assessment was required in relation to emissions from the Paddington to Swansea railway line. In 2010 a joint review and assessment report and action plan update report was produced. In 2011, the final part (a progress report) of the fourth round was published.

All reports since 2003 are available for download from the Council's air quality WebPages:

<http://www.rbkc.gov.uk/environmentandtransport/airquality/reportsanddocuments.aspx>

## 2 New Monitoring Data

### 2.1 Summary of monitoring undertaken

#### 2.1.1 Automatic monitoring sites

We have automated continuous monitoring at five sites in the borough. Figure 2.1 shows the locations of the continuous sites in the borough and detailed information about each is contained in Table 2.1. In addition, information is included for the West London and Cromwell Road sites operated by Defra, because data from these are included in the report. Although the West London site was closed by Defra in 2007, it is retained in the table as long term trends incorporate data from here. We also have one gravimetric instrument, a partisol located at the Earl's Court site. This type of instrument samples air continuously, but does not provide real time data (see glossary in Appendix C) as the filters must be weighed manually.

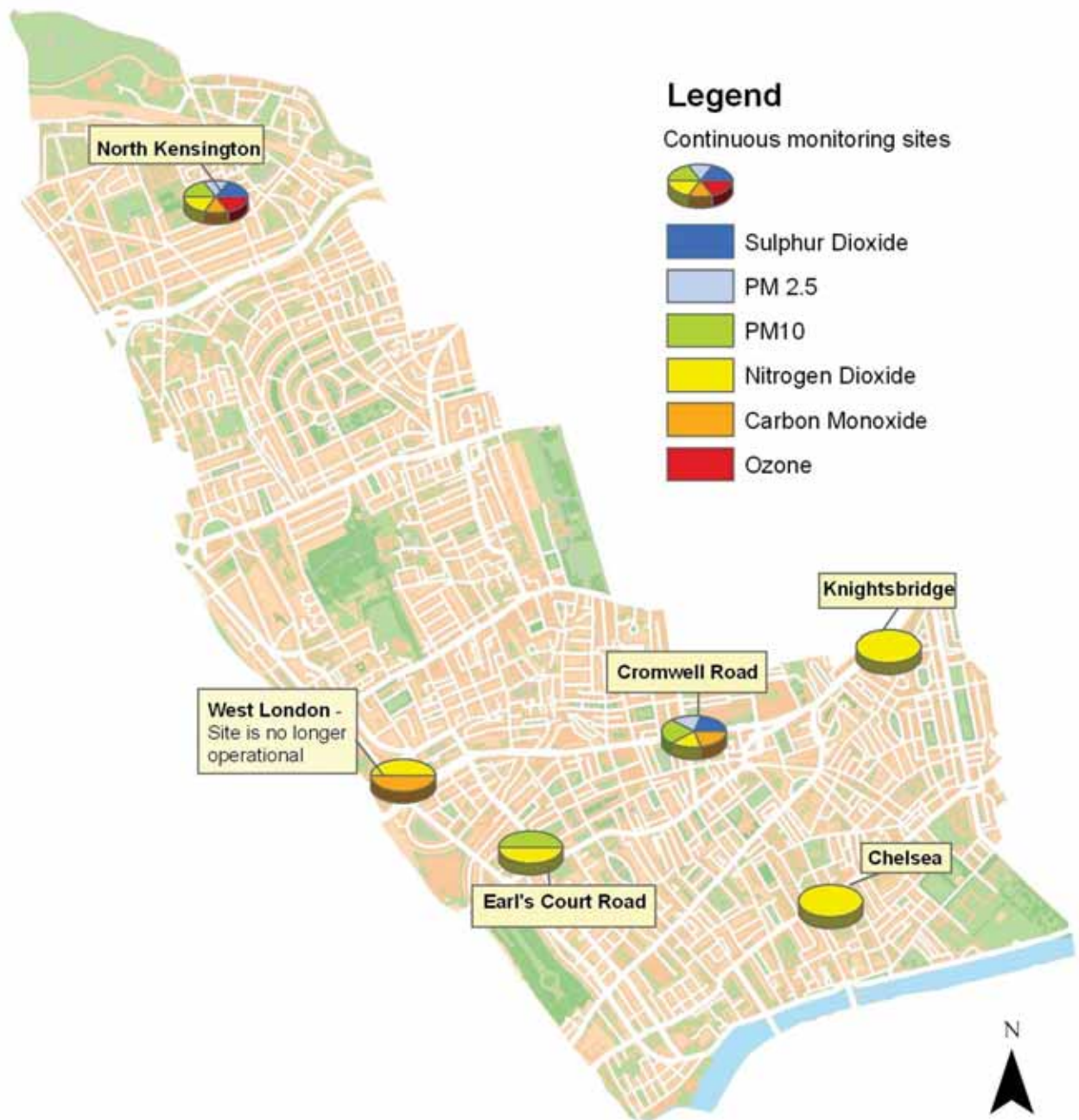
Air quality data for 2011 has been included in the report where it is available but is largely provisional. The map overleaf shows continuous sites operating between 2006 and 2011.

Defra has completed a review of the air quality monitoring stations it operates. We have now received confirmation that the monitoring of gaseous pollutants at the long running Cromwell road site will stop being supported from the end of September. Whilst the site may not conform to EU guidelines, due to its proximity to the road junction, the site does represent exposure experienced by a significant number of residents and visitors. This long established monitoring site is also invaluable for trend monitoring. The Royal Borough is naturally very concerned about this and we are currently considering our response.

#### **Quality control and assurance**

Calibrations of the monitoring instruments are carried out at fortnightly intervals by contractors. Automated data that we collect is subject to quality control and audit procedures by Kings Environmental Research Group (Kings ERG) and is disseminated via the London Air Quality Network (LAQN). In addition independent consultants carry out audits annually. An equipment servicing unit is also contracted to service equipment twice annually and to investigate and repair faults in order to maintain high quality data and good data capture. 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 A.

Figure 2:1 Map of automatic monitoring sites



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Ordnance Survey 100021668

Status: Final  
Date: April 2011  
Author: Environmental Quality



**Table 2.1 Details of automatic monitoring sites**

Site Code	Site Name	Site Type	OS Grid Ref	Pollutants Monitored	Monitoring Technique	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
KC1	North Kensington	Urban background LAQN & AURN affiliate	X524045 Y 181752	Nitrogen oxides PM <sub>10</sub> Carbon monoxide Sulphur dioxide Ozone Other Defra/ERG monitoring undertaken: PM <sub>10</sub> & PM <sub>2.5</sub>	Chemiluminescent FDMS and TEOM GFC Fluorescence UV Photometric FDMS and Partisols	Y	Y	N/A	N
AURN	Cromwell Rd/ Cromwell Rd 2	Roadside, AURN	X 26524 Y 178965	Nitrogen oxides Carbon monoxide Sulphur dioxide Other monitoring undertaken: Lead and heavy metals	Chemiluminescent GFC Fluorescence UV partisol	Y	Y	3.5m from Cromwell Road	N
KC2	Cromwell Rd 2	Roadside, LAQN	X 26524 Y 178965	PM <sub>10</sub> PM <sub>2.5</sub>	FDMS FDMS	Y	Y	Approx within 8m of Cromwell Rd and 5m of Queens Gate. 50m from Warwick Rd	N
AURN	West London	Urban background AURN	X 25026 Y 178741	Nitrogen oxides Carbon monoxide	Chemiluminescent	Y	Y		N
KC3	Knightsbridge	Kerbside, LAQN	X 27518 Y 179395	Nitrogen oxides	Chemiluminescent	Y	Y	Located on the kerb of Hans Road and 4m from Brompton Rd	Y
KC4	Kings Rd Chelsea	Roadside, LAQN	X 27268 Y 178089	Nitrogen oxides	Chemiluminescent	Y	Y	Approx 8m from Kings Rd	N
KC5	Earls Court	Kerbside, LAQN	X 25695 Y 178363	PM <sub>10</sub> gravimetric Nitrogen oxides	Partisol plus Chemiluminescent	Y	Y	Sited on the kerb of Earls Court Rd	Y



### 2.1.2 Non-Automatic Monitoring

Monitoring data for benzene and nitrogen dioxide, also known as NO<sub>2</sub>, is collected using passive diffusion techniques (in addition to continuous monitoring). The borough participates in the London Wide Environmental Programme (LWEP) offered by Bureau Veritas for the provision and analysis of diffusion tubes. Further details on the laboratory, method, bias adjustment and quality control are in Appendix A.

**Figure 2:2 Map of non-automatic nitrogen dioxide monitoring sites**



The diffusion tube site at Marlborough Court (KC46) shown above is no longer in use, but is still included in the map, as data from this site is referred to in the report.

The figure below shows all locations where benzene has been monitored, however only five sites are now in operation as the KC03 site was re-located in 2006 following the closure of the petrol station.

Two months of benzene data from June to July 2011 had to be eliminated from the final results due to a possible contamination/sample degradation issue that remains unidentified. This has resulted in data loss for the year.

**Figure 2:3 Map of non-automatic benzene monitoring sites**

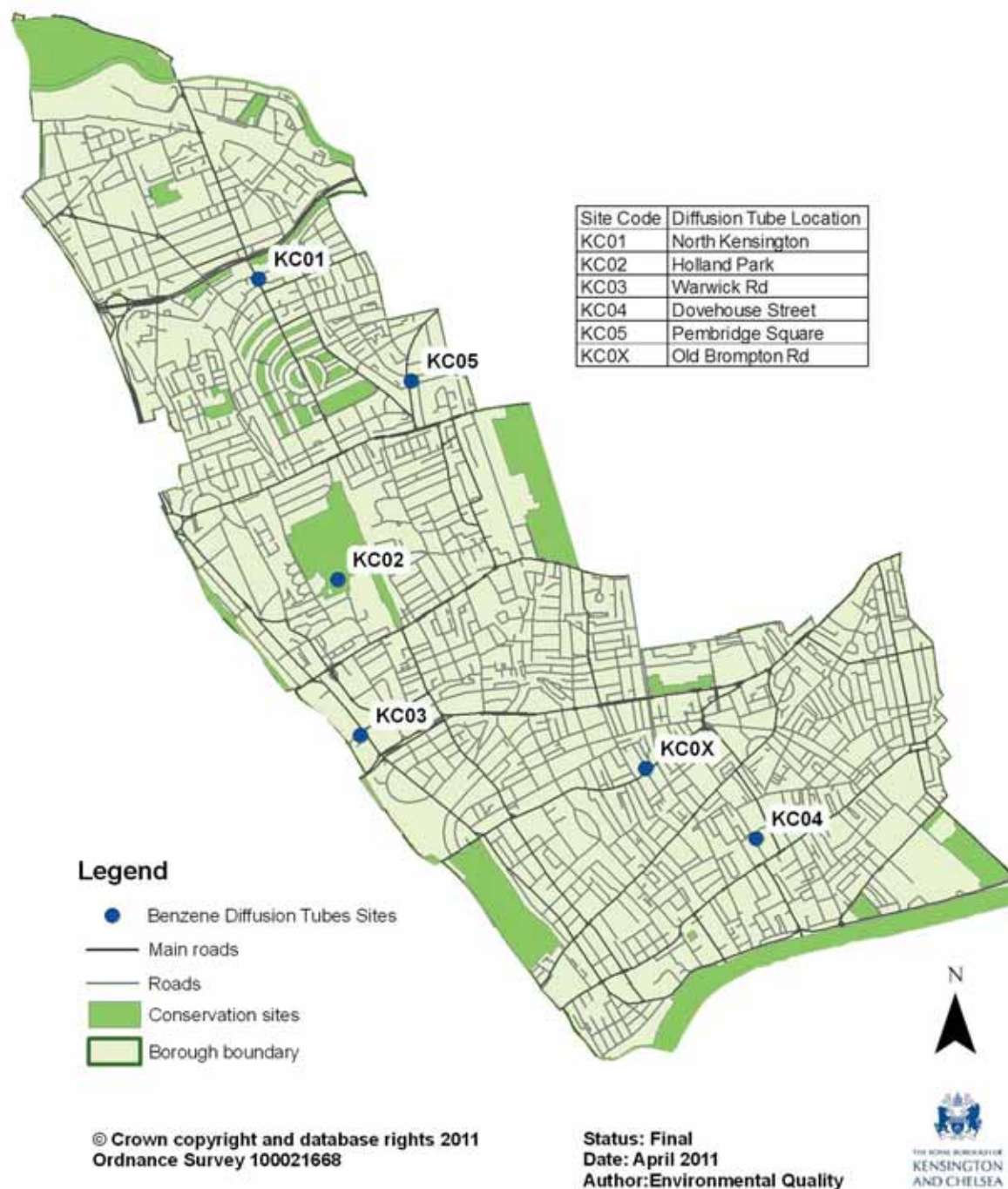


Table 2.2 overleaf provides further details of the 33 NO<sub>2</sub> and five benzene diffusion tube sites operating in the borough in 2010/11.

**Table 2.2 Details of non-automatic monitoring sites**

Site ID	Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
KC31	Ladbroke Grove/Nth Ken Library	Roadside	X 524342	Y 181271	NO <sub>2</sub>	Y	Y	3.5m	No
KC32	Holland Park	Urban Background	X 524784	Y 179599	NO <sub>2</sub>	Y	Y	380m	No
KC33	Cromwell Rd/ Earls Court Rd	Roadside	X 525355	Y 178841	NO <sub>2</sub>	Y	Y	1.1m	Yes
KC34	Dovehouse Street	Urban Centre	X 527164	Y 178103	NO <sub>2</sub>	Y	Y	26m	No
KC35	Brompton Road/ Cottage Place	Roadside	X 527192	Y 179185	NO <sub>2</sub>	Y	Y	8m	No
KC38	Earls Court Station	Roadside	X 525548	Y 178556	NO <sub>2</sub>	Y	Y	1.7m	Yes
KC39	Lots Road/ Uperne Road	Roadside	X 526317	Y 177022	NO <sub>2</sub>	Y	Y	8.1m	No
KC40	Brompton Road	Urban Centre	X 527214	Y 179153	NO <sub>2</sub>	Y	Y	65m	No
KC41	Ladbroke Crescent	Urban Background	X 524294	Y 181200	NO <sub>2</sub>	Y	Y	70m	No
KC42	Pembroke Square Library	Roadside	X 525191	Y 180705	NO <sub>2</sub>	Y	Y	6m	No
KC43	St Marks Grove	Urban Background	X 525950	Y 177487	NO <sub>2</sub>	Y	Y	38m	No
KC44	Donne Place	Urban Background	X 527335	Y 178810	NO <sub>2</sub>	Y	Y	55m	No
KC45	Chatsworth Court	Roadside	X 525263	Y 178936	NO <sub>2</sub>	Y	Y	13m	No
KC46	Marlborough Court- now closed	Roadside	X 525157	Y 178892	NO <sub>2</sub>	Y	Y	8m	No
KC47	Sion Manning School	Urban Background	X 524046	Y 181758	NO <sub>2</sub>	Y	Y	8.5m	No
KC48	Sloane Square	Roadside	X 528011	Y 178675	NO <sub>2</sub>	Y	Y	7m	No
KC49	Harrods	Urban Centre	X 527516	Y 179395	NO <sub>2</sub>	Y	Y	4m	Yes
KC50	Chelsea Physic Garden (Gate)	Roadside	X 527726	Y 177727	NO <sub>2</sub>	Y	Y	4m	No
KC51	Chelsea Physic Garden (Met Station)	Urban Background	X 527690	Y 177800	NO <sub>2</sub>	Y	Y	92m	No

Site ID	Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
KC52	Sloane Avenue	Roadside	X 527411	Y 178659	NO <sub>2</sub>	Y	Y	2.6m	No
KC53	Walmer House	Urban Background	X 523792	Y 181189	NO <sub>2</sub>	Y	Y	12.5m	No
KC54	Cromwell Rd/ Natural History Museum	Roadside	X 526550	Y 178968	NO <sub>2</sub>	Y	Y	3.1m	No
KC55	Blantyre St	Urban Background	X 526608	Y 177429	NO <sub>2</sub>	Y	Y	100m	No
KC56	Chelsea Old Town Hall	Roadside	X 527268	Y 178089	NO <sub>2</sub>	Y	Y	9m	No
KC57	Pavillion St/ Sloane Ave	Roadside	X 527889	Y 179145	NO <sub>2</sub>	Y	Y	3m	No
KC58	Kensington H St/Kensington Church St	Roadside	X 525630	Y 179674	NO <sub>2</sub>	Y	Y	13m	No
KC59	Kensington High St/Argyll St	Kerbside	X 525342	Y 179464	NO <sub>2</sub>	Y	Y	0.7m	No
KC60	Old Brompton Rd/ Draycott Ave	Kerbside	X 526231	Y 178425	NO <sub>2</sub>	Y	Y	0.7m	No
KC61	Fulham Rd/ Limerston St	Roadside	X 526377	Y 177867	NO <sub>2</sub>	Y	Y	10m	No
KC64	Warwick Road	Roadside	X 524825	Y 178902	NO <sub>2</sub>	Y	Y	3.5m	No
KC65	Barlby Road	Roadside	X 523899	Y 182113	NO <sub>2</sub>	Y	Y	0.5m	No
KC66	Acklam Road	Railway	X 524541	Y 181893	NO <sub>2</sub>	Y	Y	16m	No
KC67	Southern Row	Railway	X 524056	Y 182148	NO <sub>2</sub>	Y	Y	38m	Yes
KC68	Exhibition Road	Kerbside	X 526863	Y 179060	NO <sub>2</sub>	Y	Y	0.5m	Yes
KC01	Ladbroke Grove/Nth Ken Library	Roadside	X 524342	Y 181271	Benzene	Y	Y	3.5m	No
KC02	Holland Park	Urban Background	X 524784	Y 179599	Benzene	Y	Y	380m	No
KC03	Warwick Rd - Petrol Station (forecourt) now closed	Petrol station	X 524911	Y 178736	Benzene	Y	Y	N/A	No
KC04	Dovehouse Street	Urban Background	X 527111	Y 178165	Benzene	Y	Y	45m	No
KC05	Pembridge Square Library	Roadside	X 525191	Y 180705	Benzene	Y	Y	6m	No
KC0X	Old Brompton Rd/Clareville Grove Petrol Station	Petrol station	X 526496	Y 178553	Benzene	Y	Y	N/A	No

## 2.2 Comparison of Monitoring Results with Air Quality Objectives

### 2.2.1 Nitrogen dioxide

There are two objectives for nitrogen dioxide (NO<sub>2</sub>). A short term objective of 200µg/m<sup>3</sup> not to be exceeded more than 18 times as a one hour mean, and a longer term objective of 40µg/m<sup>3</sup> as an annual mean. The deadline for achieving these objectives was the end of 2005. The whole of the borough was declared an Air Quality Management Area in 2000 on the basis that NO<sub>2</sub> and PM<sub>10</sub> (to a lesser extent) would not meet their objectives.

#### Monitoring data

Automatic chemiluminescent analysers and passive diffusion tubes are used to monitor NO<sub>2</sub> 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.

#### Automatic monitoring data

Continuous monitoring is undertaken at five sites in the borough. Details of these sites are included in Table 2.31. As mentioned previously, the West London monitoring site was closed in 2007 following a previous review by Defra of its monitoring network. The automatic monitoring results are shown in Tables 2.3 and 2.4. Another site in London, Marylebone Rd, has also been included for comparison purposes. The results have been assessed against the annual mean and the hourly mean objectives. All sites are located at distances which are representative of residential building facades with the exception of Earls Court which is relevant for short term exposure.

**Table 2.3 Results of automatic monitoring for nitrogen dioxide: comparison with annual mean objective**

Site ID	Location	Within AQMA?	Data Capture for full calendar year 2011 %	Annual mean concentrations (µg/m <sup>3</sup> )				
				2007	2008	2009	2010	2011
KC1	North Kensington	Y	94	39	33	33	37	35
AURN	West London*	Y	closed	<b>46</b>	-	-	-	-
KC5	Earls Court*	Y	96	-	<b>107</b>	<b>107</b>	<b>113</b>	<b>100</b>
AURN	Cromwell Rd 2	Y	95	<b>72</b>	<b>67</b>	<b>72</b>	<b>74</b>	<b>66</b>
KC3	Knightsbridge	Y	92	<b>94</b>	<b>94</b>	<b>89</b>	<b>91</b>	<b>79</b>
KC4	Kings Road Chelsea	Y	99	<b>91</b>	<b>93</b>	<b>93</b>	<b>91</b>	<b>89</b>
AURN	Marylebone Rd	Y	97	<b>102</b>	<b>115</b>	<b>107</b>	<b>98</b>	<b>97</b>

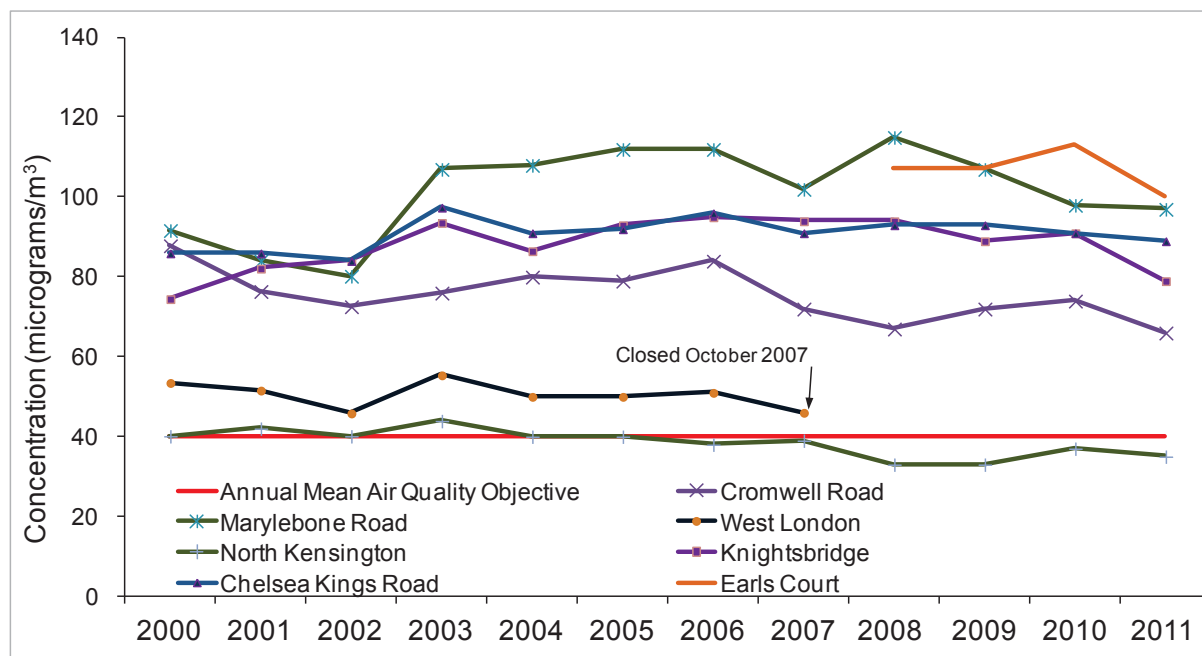
\* These sites have operated for part of a year. Data capture for West London site in 2007 was 82%; Data capture for Earls Court site in 2008 is 72%. Means should normally be “annualised” if monitoring is less than 9 months however this has not been undertaken. Source: Londonair.org.uk. Data in *italics* is provisional and should be treated with caution. **Bold** indicates an exceedence of the annual objective (Table 1.1).

Preliminary results (Table 2.3) for 2011 show that exceedences of the average NO<sub>2</sub> annual mean objective level of 40 µg/m<sup>3</sup> have occurred at all continuous sites in the borough apart from the North Kensington background site. The data also indicates

that mean concentrations during 2011 decreased (significantly at some sites) compared to 2010. However this is based on unratified data and final levels may change; it should also be noted that some of the 2010 data has increased as a result of final ratification since the last review and assessment report was published. The exceedences at the most polluted sites still remain more than twice above the objective.

Figure 2.4 shows the longer term trend since 2001 in the borough (plus one other site in central London). North Kensington, Cromwell Road and West London (until it was closed) have shown an overall downward trend. However, over the same period the sites at Chelsea and Knightsbridge have statistically shown a very slight increase in the annual mean level. Whilst there is no single trend applicable to all the sites, there was a significant drop in levels between 2010 and 2011.

**Figure 2:4 Trends in annual mean nitrogen dioxide concentration measured at automatic monitoring sites**



**Table 2.4 Results of automatic monitoring for nitrogen dioxide: comparison with 1-hour mean objective**

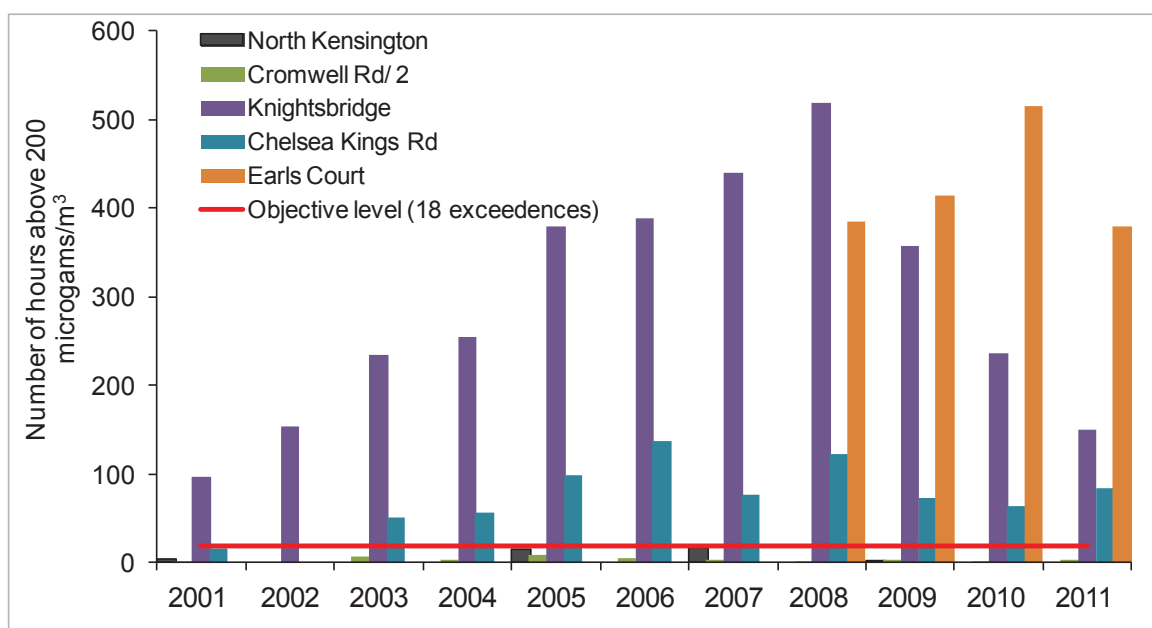
Site ID	Location	Within AQMA ?	Data Capture for full calendar year 2010 %	Number of Exceedences of hourly mean (200 µg/m³) Where valid data is less than 90% the 99.8 <sup>th</sup> percentile of hourly means is shown in brackets				
				2007	2008	2009	2010	2011
KC1	North Kensington	Y	94	17 (201)	0 (122)	1	0	0
AURN	West London*	Y	closed	0	-	-	-	-
KC5	Earls Court*	Y	96	-	<b>384 (242)</b>	<b>414</b>	<b>515</b>	<b>380</b>
AURN	Cromwell Rd 2	Y	95	2	1 (147)	3	1	3
KC3	Knightsbridge	Y	92	<b>440</b>	<b>519</b>	<b>358</b>	<b>307</b>	<b>150</b>
KC4	Kings Road Chelsea	Y	99	<b>77</b>	<b>122</b>	<b>72</b>	<b>63</b>	<b>83</b>
AURN	Marylebone Rd	-	97	<b>452</b>	<b>812</b>	<b>477</b>	<b>534</b>	<b>205</b>

2011 data (in italics) is provisional and should be treated with caution. Source Londonair.org.uk. **Bold** indicates an exceedence of the hourly mean objective (Table 1.1).

Table 2.4 shows exceedences of the hourly mean (above  $200\mu\text{g}/\text{m}^3$ ) for  $\text{NO}_2$ . The preliminary data shows considerable variation from site to site, from no exceedences at the background site to 380 hours at the Earls Court Site (only 18 exceedences are permitted). Two of the sites have shown significant reductions in the number of exceedences compared to 2010 (however some of results for the number of exceedences in 2010 have been revised upward following the publication of the final data). Three sites have shown increases. Three of the five sites (Knightsbridge, Chelsea Kings Road and Earls Court) continue to exceed the objective by a very wide margin in 2011; this illustrates that meeting the objective is highly problematic.

The chart below shows the number of hourly exceedences measured at sites in the borough since 2001. As mentioned, the hourly objective should not be exceeded more than 18 times in a year. The highest number of exceedences were measured in 2008 at the Knightsbridge site but since then this number has declined but remains significantly above the objective level. Monitoring at Earls Court began in 2008; the number of exceedences at this site show no clear overall trend with the highest number of exceedences measured in 2010. The chart shows that in the past decade the overall trend has been an increase in the number of exceedences.

**Figure 2:5 Trends in the hourly mean nitrogen dioxide concentration measured at automatic monitoring sites**



All the sites are representative of public exposure for either one or more of the objective values.

**Diffusion tube monitoring data**

Diffusion tube data for  $\text{NO}_2$  was collected at 33 locations in the borough in 2011. The details of all the diffusion tube sites can be found in Table 2.2.

Table 2.5 presents factored annual mean concentrations for 34 sites, 33 of which operated in 2011 (full dataset of monthly mean values is included in Appendix B). The data is adjusted to take into account any potential difference between the continuous monitoring and the diffusion tube methods. The bias adjustment factor is calculated by Bureau Veritas using data collected through the London Wide Environmental Programme co-location study at a number of sites. The mean bias

adjustment factor for 2011 has been calculated as 1.02. Details of the analytical laboratory and bias adjustment methodology are described in Appendix A.

**Table 2.5 Results of nitrogen dioxide diffusion tubes**

Site ID	Location	Within AQMA?	Data Capture %for full calendar year 2011	Annual mean concentrations ( $\mu\text{g}/\text{m}^3$ ) Adjusted for bias				
				2007	2008	2009	2010	2011 <sup>#</sup>
KC31	Ladbroke Grove/Nth Ken Library	Y	100.0	<b>63.4</b>	<b>58.2</b>	<b>57.7</b>	<b>60.0</b>	<b>52.9</b>
KC32	Holland Park	Y	100.0	32.5	32.3	31.7	32.8	29.0
KC33	Cromwell Road/Earls Court Rd	Y	92.0	<b>89.3</b>	<b>85.3</b>	<b>90.9</b>	<b>91.2</b>	<b>83.6</b>
KC34	Dovehouse Street	Y	100.0	<b>48.1</b>	<b>45.6</b>	<b>47.2</b>	<b>44.9</b>	<b>42.6</b>
KC35	Brompton Road/Cottage Place	Y	83.0	<b>65.4</b>	<b>64.0</b>	<b>67.9</b>	<b>66.8</b>	<b>71.8</b>
KC38	Earls Court Station	Y	100.0	<b>99.2</b>	<b>98.2</b>	<b>101.2</b>	<b>96.1</b>	<b>95.3</b>
KC39	Lots Road/Upcerne Road	Y	100.0	<b>43.0</b>	<b>43.5</b>	<b>41.4</b>	<b>40.7</b>	33.4
KC40	Brompton Road	Y	100.0	<b>51.6</b>	<b>49.5</b>	<b>51.6</b>	<b>49.5</b>	<b>49.9</b>
KC41	Ladbroke Crescent	Y	100.0	<b>41.8</b>	38.8	39.6	<b>40.9</b>	35.5
KC42	Pembridge Square Library	Y	100.0	<b>48.9</b>	<b>47.2</b>	<b>46.3</b>	<b>46.4</b>	<b>43.5</b>
KC43	St Marks Grove	Y	100.0	<b>42.1</b>	<b>40.2</b>	39.1	<b>40.8</b>	34.8
KC44	Donne Place	Y	92.0	<b>47.7</b>	<b>42.8</b>	<b>42.1</b>	<b>45.3</b>	39.9
KC45	Chatsworth Court	Y	100.0	<b>50.8</b>	<b>50.7</b>	<b>50.5</b>	<b>52.0</b>	<b>51.7</b>
KC46	Marlborough Court	Y	-	<b>52.6</b>	closed	closed	closed	closed
KC47	Sion Manning School	Y	100.0	37.2	36.0	35.6	37.1	32.3
KC48	Sloane Square	Y	100.0	<b>88.9</b>	<b>80.1</b>	<b>81.8</b>	<b>86.3</b>	<b>82.4</b>
KC49	Harrods	Y	100.0	<b>87.8</b>	<b>76.1</b>	<b>79.8</b>	<b>79.0</b>	<b>70.6</b>
KC50	Chelsea Physic Garden (Gate)	Y	100.0	<b>55.9</b>	<b>52.7</b>	<b>58.9</b>	<b>57.5</b>	<b>56.4</b>
KC51	Chelsea Physic Garden (Met Station)	Y	92.0	37.5	36.1	37.1	36.8	33.2
KC52	Sloane Ave. nr Marlborough school	Y	100.0	<b>61.3</b>	<b>60.2</b>	<b>59.4</b>	<b>59.4</b>	<b>51.5</b>
KC53	Walmer House	Y	100.0	<b>51.3</b>	<b>47.0</b>	49.6	<b>49.4</b>	<b>46.3</b>
KC54	Cromwell Rd/Natural History Museum	Y	100.0	<b>77.6</b>	<b>72.8</b>	<b>75.6</b>	<b>70.7</b>	<b>73.2</b>
KC55	Blantyre St	Y	92.0	<b>49.9</b>	<b>46.9</b>	43.2	<b>44.3</b>	<b>40.6</b>
KC56	Chelsea Old Town Hall	Y	100.0	<b>88.8</b>	<b>87.6</b>	<b>81.9</b>	<b>80.6</b>	<b>84.3</b>
KC57	Pavillion St/Sloane Ave	Y	100.0	<b>62.8</b>	<b>55.5</b>	<b>55.0</b>	<b>57.7</b>	<b>52.5</b>
KC58	Kensington H St/Kensington Church St	Y	100.0	<b>66.7</b>	<b>62.5</b>	<b>62.8</b>	<b>68.2</b>	<b>58.1</b>
KC59	Kensington H St/Argyll St	Y	100.0	<b>93.4</b>	<b>86.9</b>	<b>86.1</b>	<b>82.2</b>	<b>83.0</b>
KC60	Old Brompton Rd/Draycott Ave	Y	67.0	<b>75.0</b>	<b>72.2</b>	<b>76.4</b>	<b>78.9</b>	<b>69.3</b>
KC61	Fulham Rd/Limerston St	Y	100.0	<b>65.4</b>	<b>61.0</b>	<b>60.0</b>	<b>63.5</b>	<b>60.5</b>
KC64	Warwick Rd	Y	92.0	-	<b>51.2</b>	<b>51.7</b>	<b>63.0</b>	<b>49.0</b>
KC56	Barlby Road*	Y	100.0	-	-	39.6	<b>40.8</b>	38.8
KC66	Acklam Road*	Y	100.0	-	-	<b>43.4</b>	<b>45.9</b>	<b>43.5</b>
KC67	Southern Row*	Y	100.0	-	-	<b>41.6</b>	<b>43.6</b>	<b>43.8</b>
KC68	Exhibition Road	Y	58.0	-	-	-	<b>55.9</b>	<b>60.6</b>

# Bias adjustment factor 2011=1.02, 2010= 1.06; 2009 = 1.00; 2008 = 0.98; 2007 = 1.01 (see Appendix A), KC47 and KC54 are the mean results of triplicate exposure. **Bold** indicates an exceedence of the annual mean objective of  $40 \mu\text{g}/\text{m}^3$  (Table 1.1). Shaded areas indicate a risk that the 1-hour objective may also be exceeded. \* period mean reported in 2009 (May 2009- March 2010 )

The results indicate that eight out of 33 sites were on or below the objective level. These include sites located at Holland Park, Chelsea Physic Garden and Sion Manning School. The remainder are above the objective level, with the highest annual mean concentration recorded outside Earls Court station. Of these, a further eleven are at risk of exceeding the hourly mean objective (shaded cells), i.e. where the annual mean is above  $60 \mu\text{g}/\text{m}^3$ . This is consistent with the results from the continuous monitoring sites.

A comparison of levels measured in 2010 and 2011 shows a reduction at many (26) background and roadside sites however there are also a number (seven) of roadside locations where levels have increased. Whilst there is no consistent overall trend there does appear to have been a promising change at some sites.



Figure 2:6 Trends in annual mean nitrogen dioxide concentration measured at diffusion tube monitoring sites (factored)

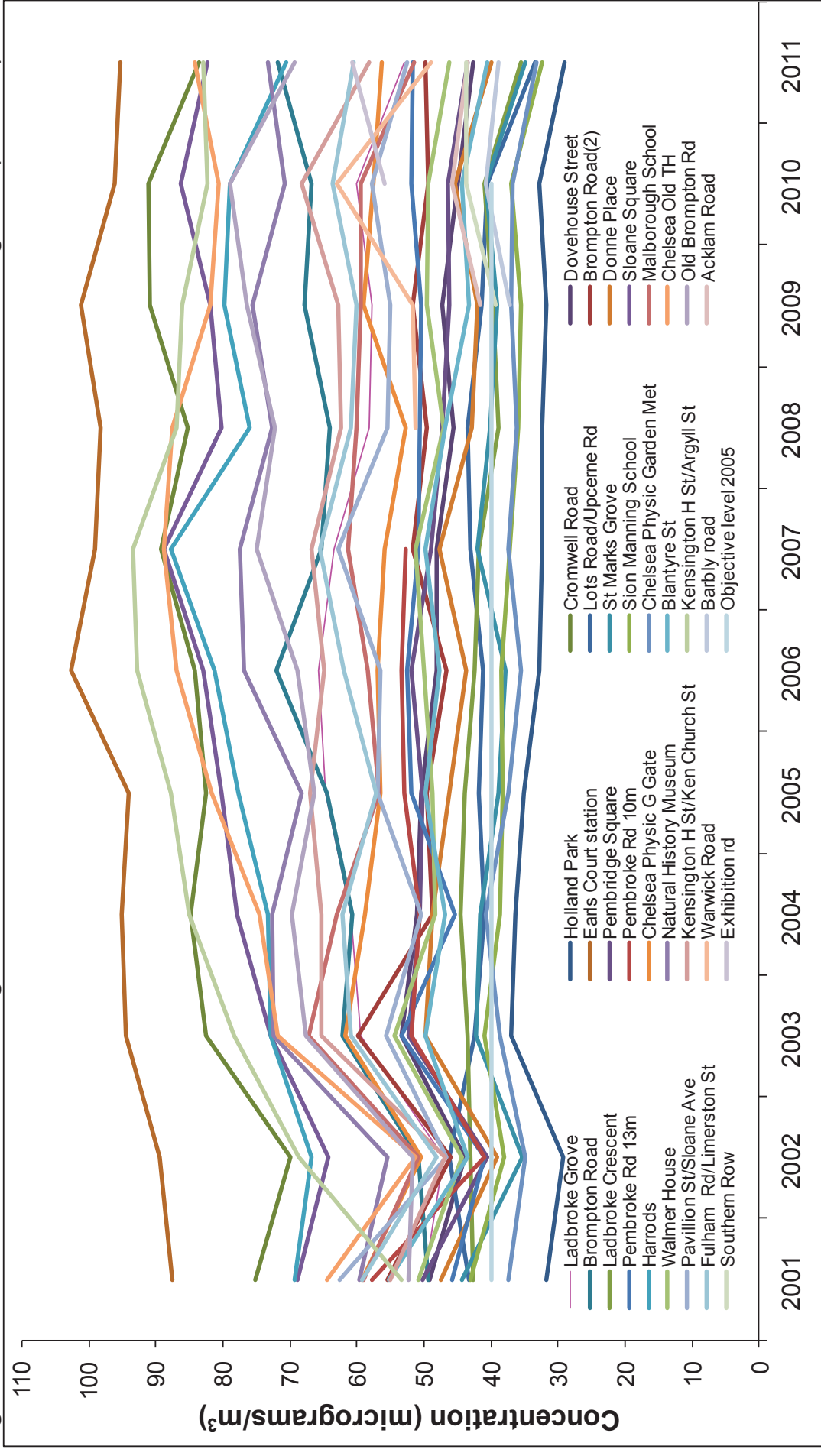


Figure 2.6 on the previous page illustrates the trend since 2001. Overall, many sites (mainly roadside locations) have recorded increased levels; there are however some recent signs of improvement but no clear indication of a consistent downward trend.

### **Overall nitrogen dioxide conclusions**

Despite some significant improvements in nitrogen dioxide levels at many sites, the borough continues to exceed the annual mean objective by an appreciable margin. Reductions of almost  $60\mu\text{g}/\text{m}^3$  are required at the worst road side positions and reductions of almost  $35\text{--}40\mu\text{g}/\text{m}^3$  are required at building facade locations on busy and congested roads, e.g. at distances of 8m as typified by the Kings Road site. In less trafficked roads or where better dispersal characteristics exist, reductions of a few micrograms to  $10\mu\text{g}/\text{m}^3$  are needed. Background locations such as parks and school grounds or roads which have access only traffic are currently meeting the objective level.

The hourly mean is also exceeded at over half of the continuous monitoring sites and likely to be exceeded at over a third of diffusion tube monitoring locations. These are predominately the busier roadside locations such as high streets. Hourly exceedences would have to be reduced by just over 360 hours to meet the objective level (of no more than 18 exceedences of  $200\mu\text{g}/\text{m}^3$ ) at the worst affected location.

The extent of these exceedences continues to have serious health implications. At some individual sites, levels are more than twice the annual objective level. We continue to fail the government objectives and time is running out rapidly, if this borough and other parts of inner London are to meet the EU objectives by 2015.

### 2.2.2 Particulate Matter (PM<sub>10</sub>)

There are two objectives for particulate matter (PM<sub>10</sub>), to be achieved by 2004, which are incorporated in the Air Quality Regulations; 40µg/m<sup>3</sup> as an annual mean and 50µg/m<sup>3</sup> as a daily mean, not to be exceeded more than 35 times a year (see Table 1.1). The whole of the borough was declared an AQMA in 2000 partially based on exceedences of the 2004 PM<sub>10</sub> objectives at certain locations.

#### Monitoring data

Monitoring of PM<sub>10</sub> is challenging because of its complex and varied composition. In addition there are a wide range of instruments and methods that are available and these in turn produce variations in the way that particulate matter is sampled, resulting in differences in the measured concentrations. In recent years there has been much work on identifying methods 'equivalent' to the EU reference. This issue has meant that a consistent long term dataset has been difficult to achieve, as exists with other pollutants.

Automatic monitoring of PM<sub>10</sub> (using TEOM instruments) first began in 1995 in North Kensington (urban background site) and later from 1998 at the Cromwell Road site (roadside). The Council has also operated a partisol (gravimetric sampler equivalent to the EU reference method) at the Earls Court Road since May 2002. As the North Kensington site is affiliated to the AURN, Defra has also operated partisol instruments at the North Kensington site.

The TEOM instruments were replaced/ upgraded to FDMS units in 2009 as they were no longer considered equivalent to gravimetric methods. The partisol monitoring (Defra) at North Kensington was interrupted between 2007 and 2008 following a review of the Defra monitoring networks and concerns over the quartz filters used<sup>1</sup>. These instruments restarted in 2009. The Earls Court partisol uses Teflon coated glass fibre (Emfab) filters these are not affected by the same issues as the quartz filters. This site offers the longest data series in the borough which is unaffected by the various changes resulting from measurement issues that have occurred elsewhere.

The monitoring data included in the report includes correction factors where applicable. Where TEOM data has been included the \*1.3 and Volatile Correction Method (VCM) correction factors have been included so that the effect of these changes can be seen in relation to the latest monitoring methods. Partisol and FMDS data does not require any correction.

The North Kensington and Cromwell Road sites are representative of public exposure for both the long and short term objective values according to the definition in Defra's LAQM TG (09) whilst the Earls Court site which is as a kerbside location is not considered representative. However it is important to note that for the following reasons this is not a reasonable conclusion as there is no known threshold level at which no health effects are detectable and current objectives are weaker than the provisional more stringent objectives which were not adopted.

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<sup>1</sup> Maggs, R., Harrison, D., Carslaw, D., Stevenson, K. (2009) Analysis of Trends in Gravimetric Particulate Mass Measurements in the United Kingdom

Table 2.6 shows particulate data collected in the borough and at other central London locations (for comparative purposes) using various methods and adjustments between 2007 and 2011. Data capture for some sites are low due to changes at sites and is included for indicative purposes only. Comparisons with air quality objectives should be treated with caution where concentrations are close to the objective level, especially for 2011 data which is unratified.

**Table 2.6 Results of PM<sub>10</sub> automatic monitoring: comparison with annual mean objective**

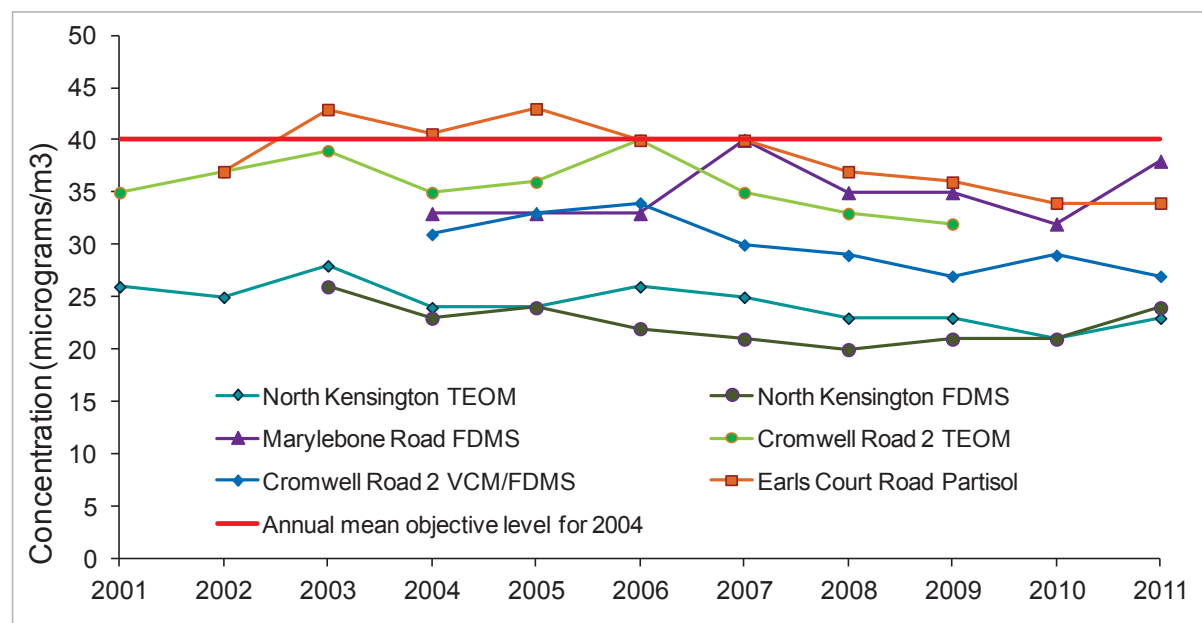
Site ID	Location	Method	Within AQMA ?	Data Capture				Annual mean concentrations (µg/m <sup>3</sup> )				
				2008 %	2009 %	2010 %	2011 <sup>#</sup> %	2007 <sup>*</sup>	2008 <sup>*</sup>	2009	2010	2011
KC1	North Kensington TEOM	1.3	Y	98	98	96	93	25	23	23	21	23
KC1	North Kensington TEOM	VCM	y	98	98	96	93	22	21	21	20	23
KC1	North Kensington FDMS	None	Y	98	86	64	84	21	20	21	21	24
AURN	N Kensington Partisol	None	Y	45	81	95	95	28	19	20	16	19.6
KC2	Cromwell Rd 2 TEOM	1.3	Y	98	95	-	-	35	33	32	-	-
KC2	Cromwell Rd 2 VCM corrected /FDMS from 2010	VCM	Y	98	95	62	74	30	29	27	29	27
KC5	Earls Court Partisol	None	Y	86	95	98	87	40	37	36	34	33
AURN	Bloomsbury TEOM	VCM	-	81	<50	89	97	26	23	19	18	22
AURN	Marylebone Rd TEOM	1.3	-	96	97	96	97	45	47	42	39	45
AURN	Marylebone Rd FDMS	none	-	93	96	91	93	40~	35	35	32	38
AURN	Marylebone Rd Partisol	none	-	58	97	82	81	<b>47</b>	39	39	30	35

\* the means should be “annualised” as in Box 3.2 of LAQN TG(09) if monitoring was not carried out for the full year. This has not been undertaken for the Marylebone Road or North Kensington partisol data. **Bold** indicates an exceedence of the annual mean objective. Data in *italics* is provisional and should be treated with caution. ~ very low data capture %

All monitoring sites within the borough met the annual mean objective level. The concentration at Earls Court declined very slightly between 2010 and 2011, Cromwell Road also showed a slight decline (however this may be in part due to the relatively low data capture in both 2010 and 2011). However the concentration measured at North Kensington increased over the same period, this increase was also seen at other central London sites.

The chart below (Figure 2.7) shows the longer term trend; overall concentrations in the borough have declined though more recently levels have become more stable or have increased.

**Figure 2:7 Trends in annual mean PM<sub>10</sub> concentrations measured at automatic monitoring sites**



The table below shows data for exceedences of the daily mean objective for three sites in the borough and other sites in central London. The data includes various monitoring methods. All sites within the borough met the daily mean objective level apart from the Earls Court site. However, the number of exceedences in 2011 at North Kensington and the Earls Court site increased significantly compared to 2010. The Cromwell Road site was the only one to demonstrate an improvement though as mentioned previously, this could be due in part due to a lower data capture in 2010 and 2011 at this site.

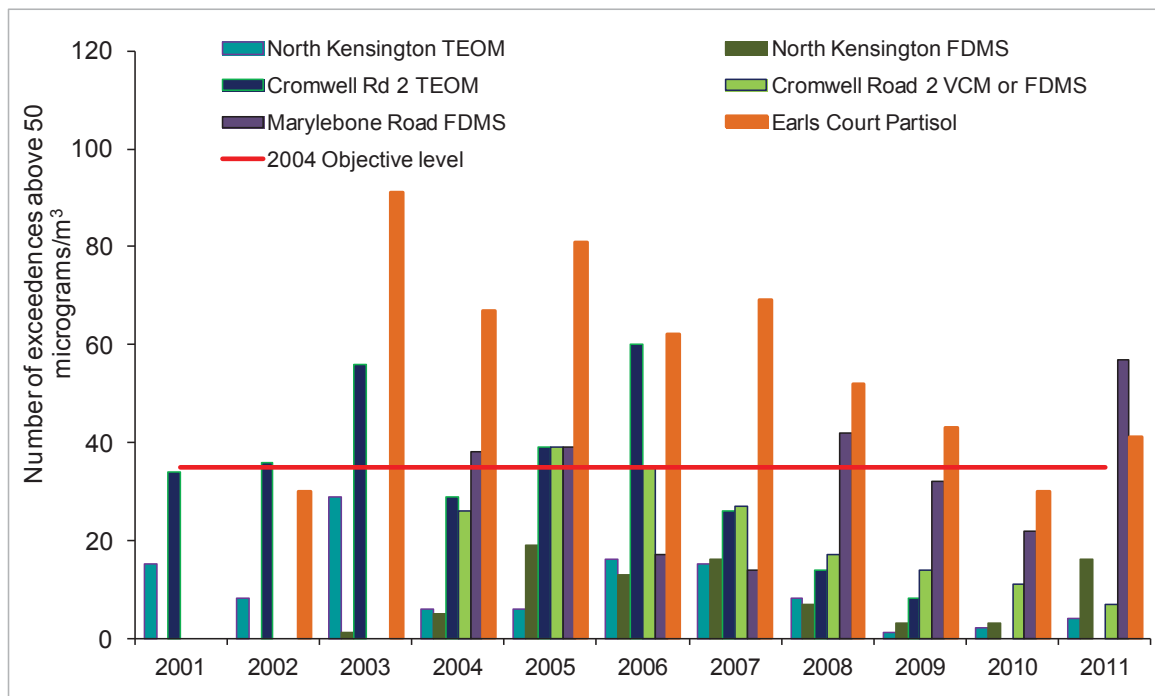
**Table 2.7 Results of PM<sub>10</sub> automatic monitoring: comparison with 24-hour mean objective**

Site ID	Location	Factor	Within AQMA ?	Data Capture				Number of exceedences of 24 hourly mean >50 µg/m <sup>3</sup> - 35 are permitted 90 <sup>th</sup> %tile shown in brackets where data capture less than 90 %				
				2008 %	2009 %	2010 %	2011 <sup>#</sup> %	2007	2008	2009	2010	2011
KC1	N. Kensington TEOM	1.3	Y	98	98	96	93	15	8	1	2	4
KC1	N. Kensington TEOM	VCM	Y	98	98	96	93	25	9	6	3	13
KC1	North Kensington FDMS		Y	98	86	65	84	16	19	3	3	16
AURN	North Kensington Partisol	None	Y	45	81	95	95	19	N/A	7	2	14
KC2	Cromwell Rd2 TEOM	1.3	Y	98	95	-	-	26	14	8	-	-
KC2	Cromwell Rd2 VCM/FDMS	VCM	Y	98	95	62	74	27	17	14	11	7(42.1)
KC5	Earls Court Partisol	None	Y	86	95	90	98	69	52 (74.4)	43	30	42
AURN	Bloomsbury TEOM	VCM	Y	81	<50	89	97	13	9 (48.5)	9	2	17
AURN	Marylebone Rd TEOM VCM method from 07	1.3/ VCM	Y	96	97	96	97	119	151	110	46	73
AURN	Marylebone Rd FDMS	none	-	93	96	91	93	14~	35	32	22	57
AURN	Marylebone Rd Partisol*	none	-	58	97	82	81	62	35	36	15	34

(Data capture for 2007 has not been included). ~ indicates very low data capture. Partisol Data 2007 < 90<sup>th</sup> percentile not calculated.

The figure below shows the longer term trend in daily exceedences. There is considerable variation from year to year but overall the number of exceedences had been declining until 2011.

**Figure 2:8 Trends in daily mean PM<sub>10</sub> concentrations measured at all monitoring sites**



**PM<sub>10</sub> conclusions**

Monitoring at the three sites in the borough reveals that all sites, including Earl’s Court, have met the annual mean objective for PM<sub>10</sub> since 2008. The daily mean objective has been met at the North Kensington and Cromwell Road sites but not at the Earls Court site. It is likely that there are other locations in the borough that are be close to or above the objective level for the daily mean objective, but we are only able to comment on those areas where monitoring is in place.

**2.2.3 Particulate Matter (PM<sub>2.5</sub>)**

The latest Air Quality Strategy<sup>2</sup> set a cap of 25µg/m<sup>3</sup> for particulate matter (PM<sub>2.5</sub>) and a likely target of a 15 per cent reduction in annual mean concentrations at urban background locations by 2020. This reduction approach is a replacement for the indicative 2010 objectives set for PM<sub>10</sub> in the 2000 strategy and 2003 addendum. However, there is no requirement for local authorities to report against these exposure reduction targets. Nevertheless as the PM<sub>10</sub> annual mean objective now appears to have been achieved across London, this PM<sub>2.5</sub> metric will become increasingly more relevant. Information on current levels has therefore been included below.

<sup>2</sup> Defra (2007) The Air Quality Strategy for England, Scotland, Wales, and Northern Ireland

### Monitoring data

Monitoring of PM<sub>2.5</sub> is only undertaken at a relatively small number of locations in the London area. PM<sub>2.5</sub> has been monitored in the borough by Defra, using a gravimetric instrument, at the North Kensington site since 2002. This monitoring was interrupted in October 2007 following concerns about the filters used in these instruments.

Monitoring restarted in 2008 and is now additionally monitored with an FDMS instrument (a continuous method).

Table 2.8 shows PM<sub>2.5</sub> data for sites in the borough along. For comparison purposes, it also includes two other central London sites. These results indicate that levels in these parts of London are currently within the cap level. Marylebone Road is 24µg/m<sup>3</sup> (just within the cap level) which suggests that other locations may be close to or just above the cap. Also it should be noted that the data is not fully ratified and should be treated with caution.

**Table 2.8 Annual mean level of PM<sub>2.5</sub> automatic monitoring**

Site ID	Location	Within AQMA ?	Data Capture %				Annual mean concentrations (Cap Level 25µg/m <sup>3</sup> ) (µg/m <sup>3</sup> )				
			2008	2009	2010	2011	2007	2008	2009	2010	2011
KC1	North Kensington FDMS	Y	4	97	93	92	-	18	14	14	16
AURN	N Kensington Partisol	Y	60	89	88	87	16	13	11	11	14
KC2	Cromwell Rd 2 FDMS	Y	No data	33	14	41	-	-	16	16	16
AURN	Bloomsbury TEOM/FDMS	-	88	91	89	98	14	13	16	16	17
AURN	Marylebone Rd TEOM	-	94	84	-	-	20	20	-	-	16
AURN	Marylebone Rd FDMS	-	-	-	58	95	-	-	21	21	24
AURN	Marylebone Rd Partisol	-	58	81	28	82	24	25.6	18	21	22

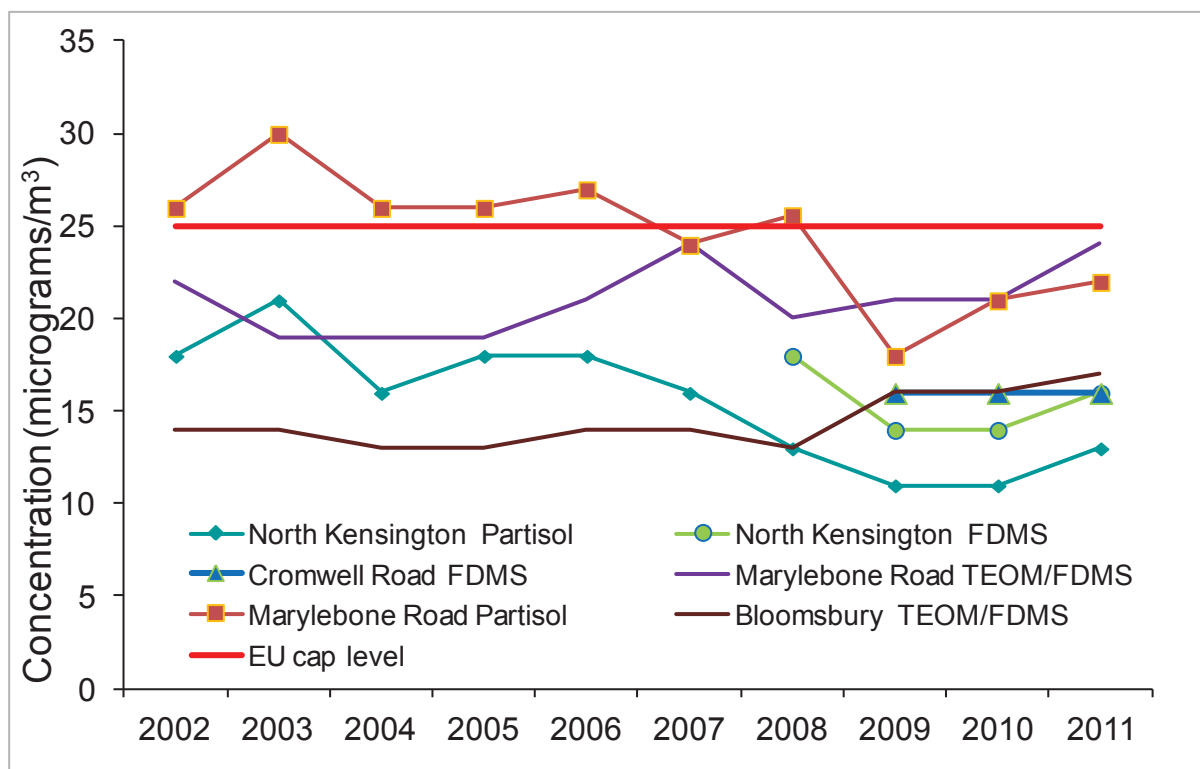
\*Monitoring of PM<sub>2.5</sub> at Cromwell Road began in 2009. Data in *italics* (2009) is provisional and should be treated with caution. **Bold** indicates an exceedence of the hourly mean objective (Table 1.1). *Italics* represent unrated data.

In addition to the cap there is also a requirement for a percentage reduction level based on the Average Exposure Index (AEI) to be calculated from the national average PM<sub>2.5</sub> concentrations for 2009-2011 (based on Defra’s PM<sub>2.5</sub> background stations). This will require further improvements at background locations by 2020.

The figure below shows concentrations with the EU cap level since 2002. Overall the longer term annual mean levels appeared to have been largely declining. However, more recently, between 2009 and 2010 levels stabilised and in 2011 concentrations increased.

In examining the longer term trends, it should be noted that the monitoring has been interrupted at some sites due to changes in equipment and monitoring methodology. Also some of the results are based on low data capture, which might partly explain the variation recorded at Marylebone Road.

**Figure 2:9 Trends in annual mean PM<sub>2.5</sub> concentrations measured at all monitoring sites**



The exposure reduction target will be calculated based on the three year average from 2009 to 2011 at urban background locations. The annual mean concentrations currently being measured at urban background sites would indicate that a national exposure reduction target of 15 per cent is likely to be applied, to be achieved by 2020.

It is therefore important that measures to reduce PM<sub>2.5</sub> are not deferred by an apparent meeting of PM<sub>10</sub> objectives.



### 2.2.4 Sulphur Dioxide (SO<sub>2</sub>)

Three objectives have been set for sulphur dioxide (SO<sub>2</sub>), a one hour mean of 350 µg/m<sup>3</sup> (not to be exceeded more than 24 times per year), a 24 hour mean of 125µg/m<sup>3</sup> (not to be exceeded more than 3 times per year) and a 15 minute mean of 266 µg/m<sup>3</sup> (not to be exceeded more than 35 times per year).

#### Monitoring data

Monitoring data is currently collected at two sites in the borough and is shown in the table below. Data from Bloomsbury (outside the borough) is also included. These monitoring sites are representative of levels at residential areas away from busy roads and at the façade of residential buildings near busy roads.

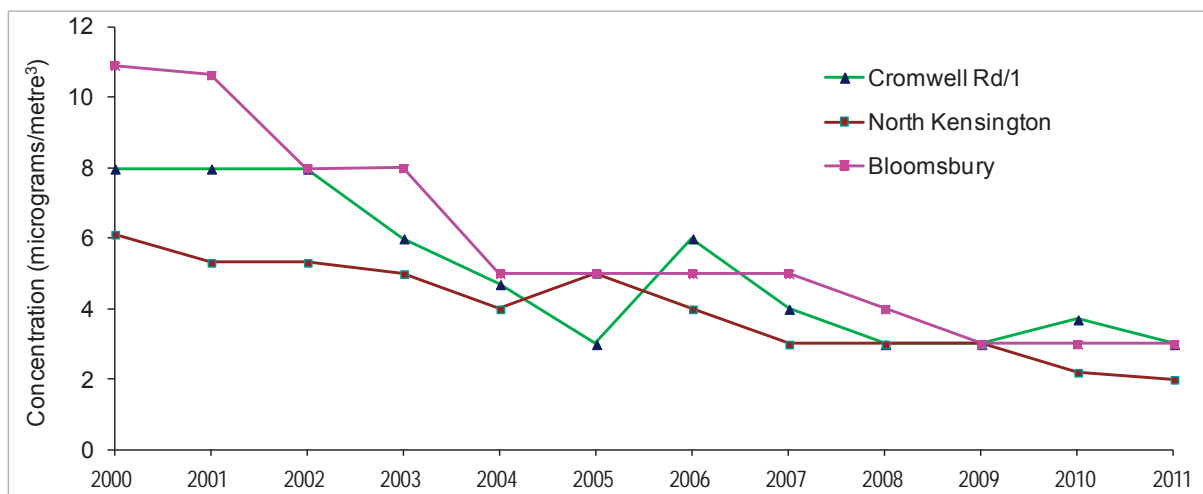
**Table 2.9 Results of sulphur dioxide automatic monitoring: comparison with objectives**

Site ID	Location	Within AQMA?	Data Capture 2010 %	Annual mean	Number of Exceedences 2011		
					15-minute Objective (266 µg/m <sup>3</sup> )	1-hour Objective (350 µg/m <sup>3</sup> )	24-hour Objective (125 µg/m <sup>3</sup> )
KC1	North Kensington	Y	98	2.2	0	0	0
AURN	Cromwell Road	Y	96	3.7	1	0	0
AURN	Bloomsbury	N	99	5.7	2	0	0

There were between one and two exceedences of the 15 minute mean at two sites in 2011 however this is well within the allowance of 35 breaches. No exceedences of any of the objectives have been observed in the past ten years at monitoring locations in the borough. Elevated SO<sub>2</sub> is most likely to occur as a result of plume grounding episodes arising from industrial sources in the East Thames area but none have resulted in any exceedences of the objectives.

Generally there has been a decline in annual mean concentrations over the longer term but more recently levels have tended to stabilise. The 15 minute, one-hour, and 24 hour mean objectives for SO<sub>2</sub> continue to be met in the borough.

**Figure 2:10 Trends in Annual Mean Sulphur Dioxide Concentration Measured at Automatic Monitoring Sites**



### 2.2.5 Benzene

Two objectives have been set for the assessment of benzene, a running annual mean of  $16.25\mu\text{g}/\text{m}^3$  to be met by 31.12.2003 and a more stringent annual mean of  $5\mu\text{g}/\text{m}^3$  to be achieved by 31.12.2010.

#### Monitoring Data

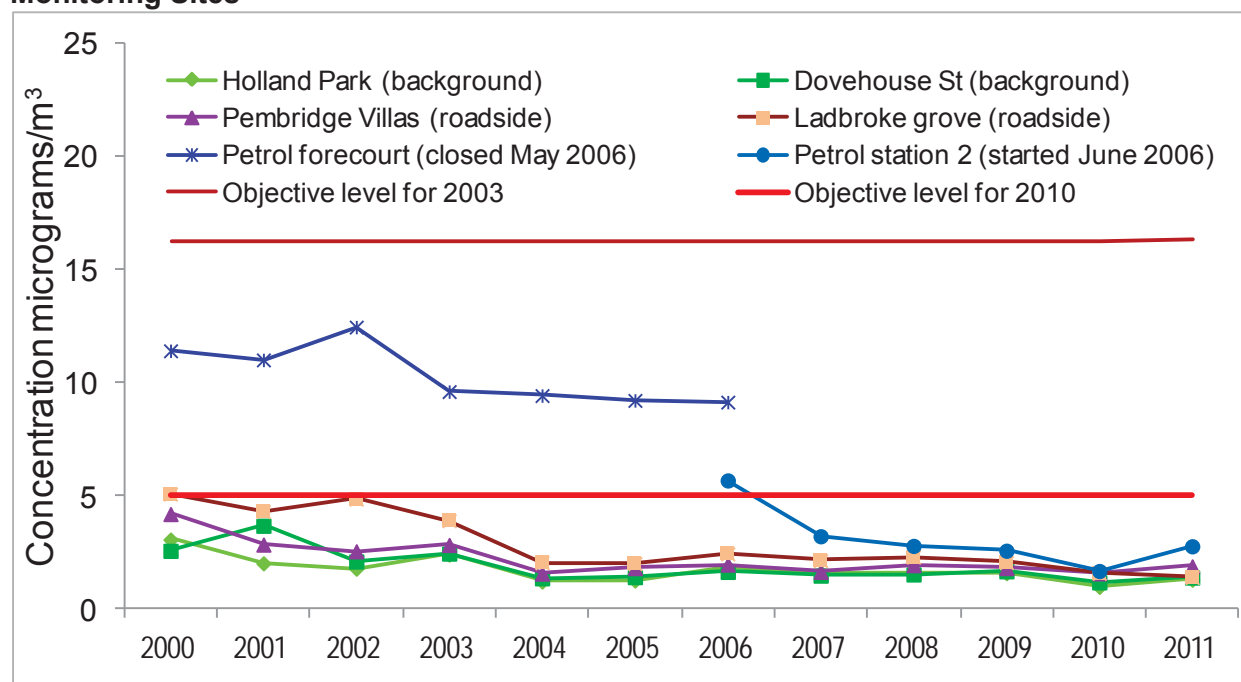
We currently undertake sampling at five locations using diffusion tubes, these include two roadside, two background, and one site in close proximity to a petrol station forecourt. The petrol station has operated stage two (in addition to stage one) vapour recovery since 2007.

The highest levels of benzene have generally been recorded at the petrol station sites. The table below shows the 2010 objective has been met at all sites since 2007; the 2003 ( $16.25\mu\text{g}/\text{m}^3$ ) objective has been met since 2000 (the measured annual mean is assumed to be the equivalent of the running annual mean). Results for 2011 show an increase compared to 2010 at four sites however this may be due in part to the lower data capture (75%) in 2010. There were two months of data loss in 2011.

**Table 2.10 Annual Average Benzene Levels Using Diffusion Samplers ( $\mu\text{g}/\text{m}^3$ )**

Year	KC01 Ladbroke Grove/Nth Ken Library	KC02 Holland Park	KC03 Warwick Rd Petrol St. (forecourt)	KC04 Dovehouse St	KC05 Pembroke Square Library	KC0X Old Brompton Rd/Claireville Grove Petrol station
2000	5.1	3.1	11.4	2.6	4.2	-
2001	4.3	2.0	11.0	3.7	2.9	-
2002	4.9	1.8	12.5	2.1	2.6	-
2003	3.9	2.4	9.6	2.5	2.9	-
2004	2.1	1.2	9.5	1.4	1.6	-
2005	2.0	1.3	9.2	1.4	1.8	-
2006	2.3	1.9	9.2	1.7	2.0	5.7
2007	2.2	1.6	Closed	1.5	1.7	3.2
2008	2.3	1.6	-	1.6	2.0	2.8
2009	2.1	1.6	-	1.7	1.8	2.6
2010	1.6	1.0	-	1.2	1.6	1.7
2011	1.4	1.3	-	1.4	1.9	2.8

Figure 2:8 (overleaf) shows the longer term trend. After an initial decline most sites showed steady levels since 2004. The petrol station site however declined more slowly with levels stabilising from around 2008 onwards.

**Figure 2:8 Trends in Annual Mean Benzene Concentration Measured at Diffusion Tube Monitoring Sites**

## 2.2.6 Other pollutants monitored

### Polycyclic Aromatic Hydrocarbons (PAHs)

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(a)pyrene (b(a)p) as a marker for PAHs and set an objective based on this pollutant:  $0.25\text{ng/m}^3$ <sup>(footnote 3)</sup> 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 (Victoria, Brent and Marylebone Road) 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. This pollutant may become of increasing concern in the future if the use of biomass or biofuels become more widespread.

The most recent data available from monitoring at sites in Marylebone Road and Brent are included in the chart below (monitoring at Victoria ceased in 2007). Only data up to the end of 2010 was available from the Defra data archive at the time of preparing the report.

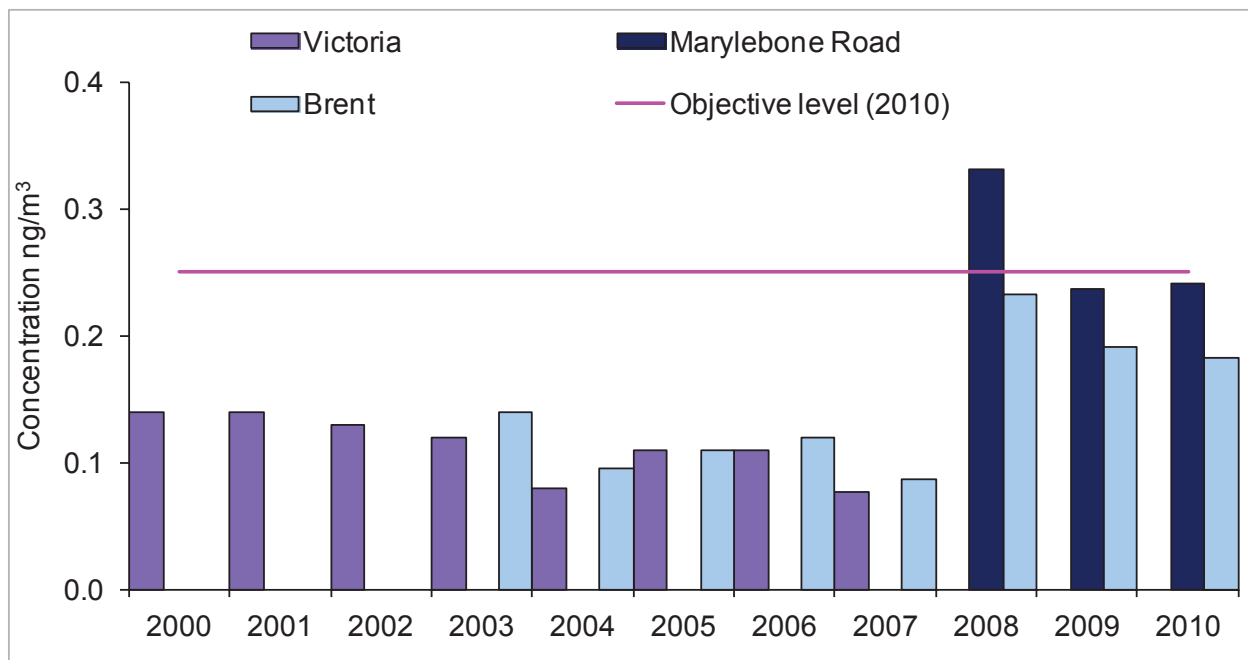
Monitoring methods at the Brent site changed between 2007 and 2008. The chart shows levels increased after this time. It is possible that this change in method is the reason for this. However, we cannot be certain as the monitoring at Marylebone Road,

<sup>3</sup> ng stands for nanogram. A nanogram is one millionth of a milligram or one thousandth of one millionth of a gram

only commenced at the start of 2008 and there is no long term data set available prior to then.

Of the available data it appears that the objective was exceeded only at Marylebone Rd in 2008. Indications are that the levels of benzo(a) pyrene were below the objective level in 2010. The concentrations remained relatively stable between 2009 and 2010.

**Figure 2:11 Trends in Annual Mean Benzo(a)pyrene Concentration Measured at Monitoring Sites in London**



The monitoring method at Brent changed between 2007 and 2008. Marylebone Road monitoring began in 2008.

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 within the 2010 objective.

### Ozone (O<sub>3</sub>)

The objective for ozone (O<sub>3</sub>) is 100µg/m<sup>3</sup> not to be exceeded more than 10 times a year (calculated as the daily maximum 8 hour mean) by 2005. This objective is not included in the LAQM process as 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. Ozone formation is dependent on high temperatures and sunny weather as well as the necessary precursor pollutants such as oxides of nitrogen (NO<sub>x</sub>) and volatile organic compounds. 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 NO<sub>x</sub> emitted from vehicle exhaust and building flues will react with ozone removing it from the atmosphere.

Figure 2:12 shows levels of ozone at a background location in the borough, in comparison to the objective level (as shown by the red line). There is no clear overall trend from 2000 to the present. However, it is clear to see that in 2011, the number of exceedences were above the objective level for the first time in three years.

**Figure 2:12 Trends in the 8-hour ozone exceedences measured at automatic monitoring sites**

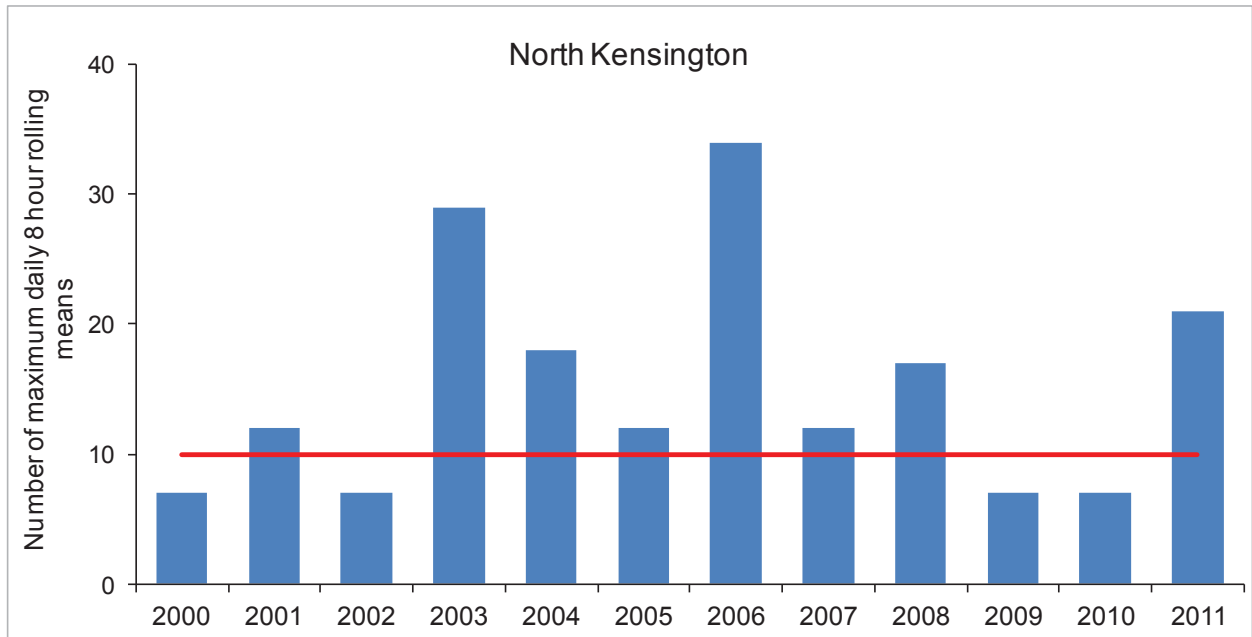
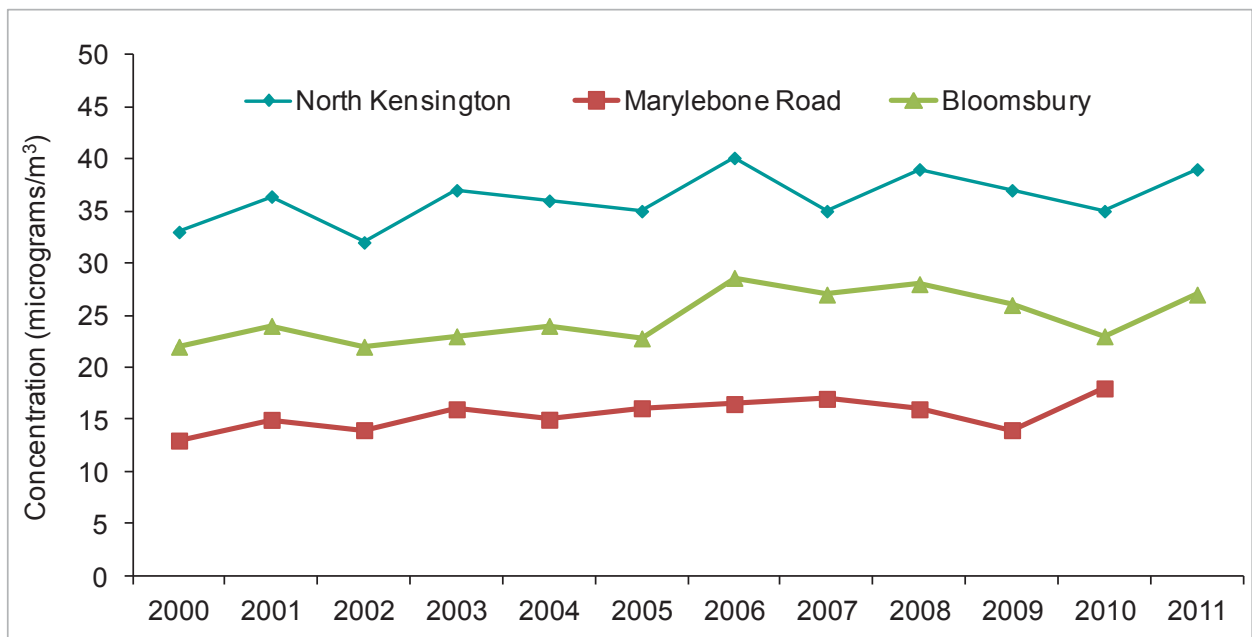


Figure 2:13 below shows annual mean levels of ozone measured at North Kensington, Bloomsbury (background site) and Marylebone Road (a roadside location site) from 2000. Marylebone and Bloomsbury are located outside the borough. Concentrations of ozone at the roadside location are lower due to its oxidation by traffic pollutants. This chart shows that, overall, annual mean levels have increased over the period shown.

**Figure 2:13 Trends in annual mean ozone concentrations measured at automatic monitoring sites**



### 2.2.7 Lead

There are two annual mean objectives for lead, 0.5 µg/m<sup>3</sup> (to be achieved by 2004) and an objective of 0.25 µg/m<sup>3</sup> (to be achieved by 2008).

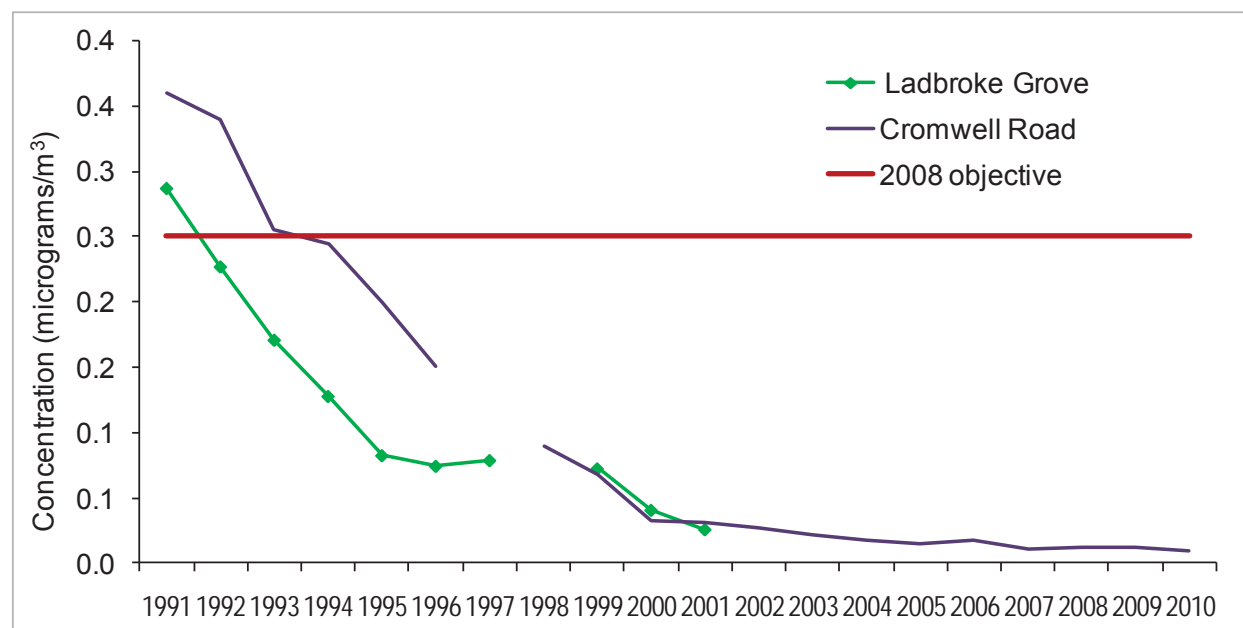
Lead monitoring in the borough is undertaken by Defra at the Cromwell Road monitoring site. Monitoring was previously undertaken by the Council at Ladbroke Grove. When leaded petrol was phased out, monitored levels dropped significantly so the decision was taken to close the site at the end of 2001. Monitoring data is shown in the table below, however, at the time of writing, data for 2011 has not been made available by Defra so cannot be included in this report.

**Table 2.10 Annual Mean Lead levels within the Borough**

Year	Ladbroke Grove (µg/m <sup>3</sup> )	Cromwell Rd (µg/m <sup>3</sup> )
1999	0.073	0.068
2000	0.041	0.032
2001	0.026	0.031
2002	-	0.027
2004	-	0.017
2005	-	0.015
2006	-	0.017
2007	-	0.011
2008	-	0.012
2009	-	0.013
2010	-	0.010
2011	Not available	Not available

As demonstrated in the chart below, monitoring data shows a significant downward trend over the longer term however, whilst the level of reduction in the past few years continues, it does so by a much smaller amount. The 2004 and 2008 objectives have been met at the Ladbroke Grove site since 1992 and at the Cromwell Road site from 1994.

**Figure 2:14 Trends in Annual Mean Lead Concentrations**



### 2.2.8 Carbon Monoxide (CO)

The objective for carbon monoxide (CO) is 10 mg/m<sup>3</sup><sup>(4)</sup> as a maximum daily 8 hour running mean. CO monitoring data recorded in the borough since 2007 is shown in Table 2.11 including data from one other busy kerbside location from central London (Marylebone Road). Data recorded in 2011 shows we continue to meet the objective.

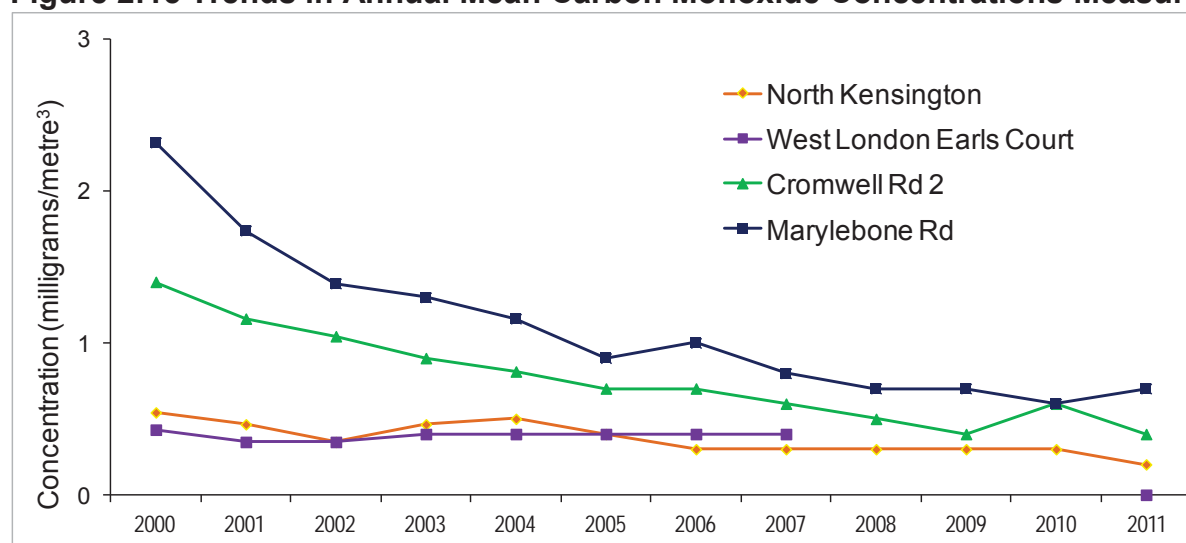
**Table 2.11 Concentrations of CO in the Borough and at one central London site**

Year	Site	Annual mean (mg/m <sup>3</sup> )	Max daily 8-hour running mean (mg/m <sup>3</sup> )	No. of hours above 10mg/m <sup>3</sup>	% Data capture
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
2008	North Kensington	0.3	1.7	0	98
	Cromwell Rd 2	0.5	2.3	0	93
	Marylebone Rd	0.7	2.5	0	98
2009	North Kensington	0.3	1.7	0	98
	Cromwell Rd 2	0.4	2.3	0	97
	Marylebone Rd	0.7	2.5	0	98
2010	North Kensington	0.3	2.8	0	97
	Cromwell Rd 2	0.6	3.4	0	68*
	Marylebone Rd	0.6	2.7	0	96
2011	North Kensington	0.2	1.5	0	97
	Cromwell Rd 2	0.4	1.3	0	97
	Marylebone Rd	0.7	1.9	0	96

\* Warning low data capture

There were no exceedences of the objective in 2011 at any of the monitoring locations in the borough. The maximum daily 8 hour running mean values continue to fall and are well within the 10 mg/m<sup>3</sup> objective level. Generally, annual mean levels at roadside locations are a little higher than concentrations at background locations. The figure below shows the longer term trend in annual mean levels, this demonstrates a fairly steady downward trend at most sites. Levels have generally stabilised in more recent years; though Cromwell Rd and North Kensington declined slightly between 2010 and 2011.

**Figure 2:15 Trends in Annual Mean Carbon Monoxide Concentrations Measured**



<sup>4</sup> mg (milligram) = one thousand of a gram



### 2.2.9 1,3-Butadiene

Measurements should meet the 2003 objective as a running annual mean of  $2.25\mu\text{g}/\text{m}^3$ . 1,3-butadiene is not monitored in the borough, although data are collected by Defra. Whilst this is limited to a few sites within London, it can be used to indicate local levels (see table 2.12 below).

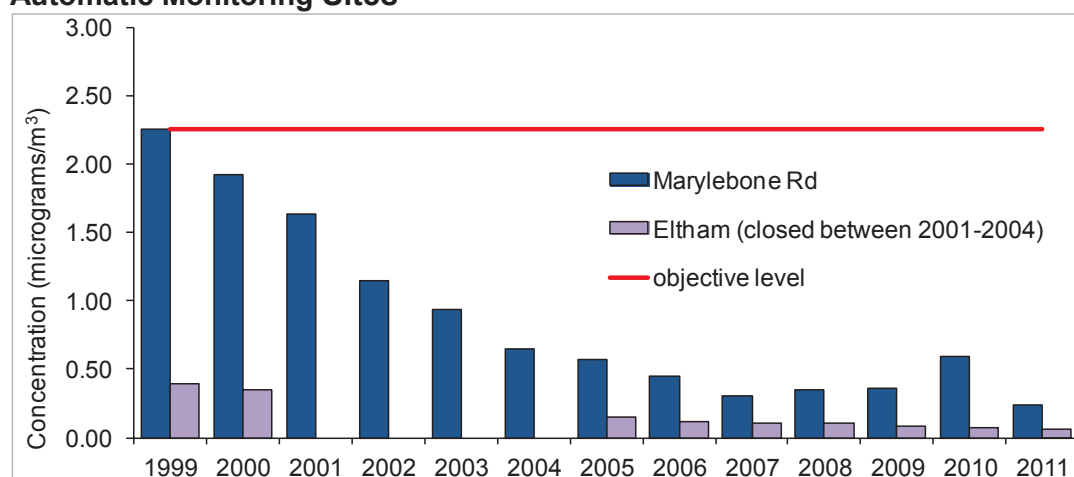
**Table 2.12 Levels of 1,3-butadiene (maximum annual running means) in London**

Year	Site	Annual Mean ( $\mu\text{g}/\text{m}^3$ )	% Data Capture
2001	Marylebone Rd	1.12	86
	Eltham	-	-
2002	Marylebone Rd	0.95	96
	Eltham	-	-
2003	Marylebone Rd	0.64	92
	Eltham	-	-
2004	Marylebone Rd	0.57	81
	Eltham	0.15	91
2005	Marylebone Rd	0.45	89
	Eltham	0.11	94
2006	Marylebone Rd	0.45*	71
	Eltham	0.09	80
2007	Marylebone Rd	0.31	78
	Eltham	0.10	83
2008	Marylebone Rd	0.35	80
	Eltham	0.10	82
2009	Marylebone Rd	0.36	83
	Eltham	0.08	85
2010	Marylebone Rd	0.59	71
	Eltham	0.08	80
2011	Marylebone Rd	0.24	44
	Eltham	0.06	64

\*Incomplete data. Data in italics is provisional

The running annual mean concentration has declined steadily at the Marylebone Road (roadside) site dropping from  $2.25\mu\text{g}/\text{m}^3$  to  $0.31\mu\text{g}/\text{m}^3$  between 1999 and 2007 (though there was a slight increase between 2008 and 2010). The Eltham site, which has operated intermittently, has been well within the objective since 1999 when monitoring started. Levels in 2011 show further slight decline however data capture, especially at Marylebone road was low. These results indicate that there are unlikely to be any exceedences of the 2003 objective in the borough.

**Figure 2:16 Trends in the Maximum Running Annual Mean 1,3-Butadiene Measured at Automatic Monitoring Sites**



**Summary of compliance with AQS objectives**

Kensington and Chelsea Council has examined the results from new monitoring in the borough and other comparable sites over the last twelve months. Preliminary monitoring at the borough's five continuous monitoring sites shows concentrations of sulphur dioxide, benzene, lead, carbon monoxide and 1,3- butadiene meet the relevant air quality objectives.

Continuous monitoring shows that exceedences of the annual mean NO<sub>2</sub> objective level have occurred at all sites apart from the North Kensington background site. Exceedences of the hourly mean objective vary from site to site, from none at the North Kensington to 380 at the Earls Court site (rather than the 18 exceedences permitted).

Monitoring of PM<sub>10</sub> at our three sites shows that these have all met the annual mean objective since 2008, however whilst two sites met the daily mean objective level one site exceeded it. It is therefore possible that there are other locations in the borough that may be close to or above the daily mean objective level. Therefore no changes are proposed to the air quality management order.

Ozone also exceeded the daily maximum 8 hour mean objective but that does not form part of LAQM responsibilities.

### **3 Road Traffic Sources**

#### **3.1 Narrow Congested Streets with Residential Properties Close to the Kerb**

Previous assessments already included narrow congested streets. No new roads have been identified.

Kensington and Chelsea Council confirm that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

#### **3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic**

Previous assessments already included streets where people may spend one hour or more near to busy traffic. No new roads have been identified.

Kensington and Chelsea Council confirm that there are no new/newly identified busy streets where people may spend one hour or more close to traffic.

#### **3.3 Roads with a High Flow of Buses and/or Heavy Goods Vehicles (HGVs).**

Kensington and Chelsea Council confirm that there are no new/newly identified roads with high flows of buses/HGVs.

#### **3.4 Junctions**

Kensington and Chelsea Council confirm that there are no new/newly identified busy junctions/busy roads.

#### **3.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment**

Kensington and Chelsea Council confirm that there are no new/proposed roads.

### **3.6 Roads with Significantly Changed Traffic Flows**

An examination of road traffic data between 2007 and 2011 for link and junctions shows that traffic flow increased by more than 25 per cent at one link location between 2007 and 2009, namely, King's Road. However this is based on manual traffic counts which represent a 'snap shot' of traffic levels. In any case as the borough is already an AQMA for nitrogen dioxide a detailed assessment is not required.

Kensington and Chelsea Council has assessed new/newly identified roads with significantly changed traffic flows, and concluded that it will not be necessary to proceed to a Detailed Assessment.

### **3.7 Bus and Coach Stations**

There are no relevant bus or coach stations in the borough.

Kensington and Chelsea Council confirm that there are no relevant bus stations in the Local Authority area.

## 4 Other Transport Sources

### 4.1 Airports

Kensington and Chelsea Council confirm that there are no airports in the Local Authority area.

### 4.2 Railways (diesel and steam trains)

There are two railways that run through the borough, the West London line and the Paddington main line. Rail contributes approximately 16 per cent (137 tonnes/yr) to nitrogen oxide emissions and to 70 per cent (10 tonnes/yr) of sulphur dioxide emissions within the borough.

#### 4.2.1 Stationary trains

Kensington and Chelsea council confirm that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

There are no signals, goods loops, depots or stations within 15 metres where members of the public are likely to experience trains idling with engines running for 15 minutes or more. Therefore, a detailed assessment of stationary trains in the borough is not required.

#### 4.2.2 Moving trains

Kensington and Chelsea Council has not identified any new locations (since the previous updating and screening assessment) with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

The guidance (TG 09) had previously identified the Paddington to Swansea line as having high level of diesel passenger trains. This rail line crosses the northern end of the borough; the background annual mean nitrogen dioxide level in the area is expected to be above  $25\mu\text{g}/\text{m}^3$ . In addition a number of residential blocks have been identified within 30m of the track.

### 4.3 Ports (shipping)

Kensington and Chelsea Council confirm that there are no ports or shipping that meet the specified criteria within the Local Authority area.

There are no ports within the borough or shipping movements which meet the criteria specified in LAQM (TG09)

## 5 Industrial Sources

### 5.1 Industrial installations

#### 5.1.1 New or proposed installations for which an air quality assessment has been carried out

Kensington and Chelsea Council confirm that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

Since the last USA dry cleaners are the only industrial process that has come within the control of the local authority. In RBKC, there are thirty dry cleaners. These premises are inspected on an annual or three-yearly basis, depending on their risk score. These are not relevant in terms of the Air Quality Strategy pollutants.

#### 5.1.2 Existing installations where emissions have increased substantially or new relevant exposure has been introduced

Kensington and Chelsea Council confirm that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity, within its area or nearby in a neighbouring authority.

#### 5.1.3 New or significantly changed installations with no previous air quality assessment

Kensington and Chelsea Council confirm that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

A pre-application proposal for a gasification and pyrolysis plant which will thermally treat clinical and municipal waste has been received by the Council. It is likely that this process will be regulated by the Environment Agency, however an air quality assessment has been requested and this will need to be submitted with the planning application to assess the impact on local air quality.

### 5.2 Major fuel (petrol) storage depots

Kensington and Chelsea Council confirm there are no major fuel (petrol) storage depots within the borough.

### **5.3 Petrol stations**

The borough has a total of six petrol stations. Monitoring is undertaken in the vicinity of one petrol forecourt location within five metres of a petrol pump. Currently levels are within objective limits for benzene. See Section 2.2.4 for further information on the monitoring and the results. We have four petrol stations with a throughput of more than 3500m<sup>3</sup> per year. These all have stage II recovery. Therefore, a detailed assessment is not required of any of the petrol stations in the borough.

Kensington and Chelsea Council confirm that there are no petrol stations meeting the specified criteria.

### **5.4 Poultry farms**

Kensington and Chelsea Council confirm that there are no poultry farms meeting the specified criteria.

## **6 Commercial and Domestic Sources**

### **6.1 Biomass combustion – individual installations**

At present there are only a few biomass boilers likely to be operating in the borough in the range of 50kW-20MW. The Council's planning section was contacted to provide information on developments that sited biomass boilers, however very few have been installed. Further follow up is being proposed.

When planning applications are received, our advice to the planning department is to discourage biomass because the borough is an AQMA and to draw developer's attention to our air quality supplementary planning document which promotes low emission strategies for new developments. Where applications include biomass boilers they must demonstrate the likely impact on the surrounding area, this has in general resulted in biomass options being rejected. Since the previous USA the number of applications for new developments which include biomass or biofuel boilers has been reduced. Almost all new applications which have come to our attention propose CHP units.

Kensington and Chelsea Council confirm that there are new no biomass combustion plant in the Local Authority area.

### **6.2 Biomass combustion – combined impacts**

There is little evidence that a large number of small biomass boilers are operating in the borough.

Kensington and Chelsea Council confirm that there are no biomass combustion plant in the Local Authority area.

### **6.3 Domestic solid-fuel burning**

There is little evidence that large scale solid fuel burning is being carried out in the borough.

A small but growing number of fireplaces may be using solid fuels, although this is unlikely to be the main source of heating. Few complaints are received by the Environmental Health department about smoke from residential premises.

Kensington and Chelsea Council confirm that there are no areas of significant domestic fuel use in the Local Authority area. This includes the significant burning of coal and smokeless fuel.



## 7 Fugitive or uncontrolled sources

The only potential source of fugitive emissions in the borough is large construction sites. However all large sites are required to follow the Mayor's best practice guidance on construction and demolition and many employ continuous monitoring of PM<sub>10</sub> to enable the works to be monitored and the site manager to be alerted of predetermined trigger levels to either investigate or stop any activities which are likely to be the cause of elevated levels.

Kensington and Chelsea Council confirm that there are no potential sources of fugitive particulate matter emissions in the Local Authority area which have not been covered by previous rounds of review and assessment.

## **8 Conclusions and Proposed Actions**

### **8.1 Conclusions from New Monitoring Data**

The Updating and Screening Assessment has not identified any significant changes to the air quality in the borough, though some improvement in monitored levels of NO<sub>2</sub> has been noted at a number of locations. In summary the results for nitrogen dioxide and particulate matter continue to exceed one or more of the Government's air quality objectives within the borough, therefore it is necessary to continue to maintain the AQMA. As no significant changes have been identified, no changes are proposed to the AQMA are required as a result of new monitoring data.

### **8.2 Conclusions from Assessment of Sources**

A review of sources using the Defra guidance has identified few changes as a result of local developments: road transport, other transport, industrial, commercial, domestic or fugitive emissions. However we continue to discourage the installation of biomass in new developments and request air quality assessments for proposals with Combined Heat and Power plant which can substantially increase levels of NO<sub>x</sub> compared to cleaner low NO<sub>x</sub> boilers.

### **8.3 Proposed Actions**

The next progress report is due to be completed and submitted in 2013, which will include a review of new monitoring data collected for the key pollutants.

Any proposal for a gasification and pyrolysis plant which is received will require an air quality assessment to be submitted with the planning application to assess the impact on local air quality.

## 9 Implementation of Action Plans

### Summary

There are two essential parts to improving air quality, understanding the nature and extent of the problem, as set out in the earlier sections of this report, and having a focused plan of action to tackle the sources and causes of polluting emissions. The current Air Quality Action Plan (2009-14), which continues our work towards achieving the national air quality objectives, has only two years left before it is replaced with a new plan. Inevitably and encouragingly some of the actions have been completed, or taken a slightly different direction as opportunities arise, this is explained in the updating of each individual action. The progress that has been made represents the combined efforts of several Council departments rising to the challenge of reduced resources and the transition to bi-borough working.

The most encouraging advances have been made in improving the emissions from Council vehicles (action 4), reducing emissions from Council buildings (action 6), and like last year, increasing support for cyclists (action 17). Introducing vehicles with smaller engines and reducing the mileage of the Council fleet has resulted in an estimated 15 per cent reduction in oxides of nitrogen (NOx) emissions and 50 per cent reduction in particulate matter (PM) emissions. Overall carbon savings (a proxy measure for the reduction of PM and NOx) now amount to 475 tonnes of carbon dioxide per annum, realised through additional insulation, installation of solar panels and an air source heat pump at Kensington Town Hall, as well as voltage optimisation units fitted to Chelsea Old Town Hall and the Council Offices at Pembroke Road. Once again there has been a large increase in adult cycle training, as well as help with cycle repairs (Dr Bike) and cycle maintenance classes.

Notable progress has also been made in addressing the impacts of redevelopment and in increasing the number of docking stations in the borough for the London Cycle Hire Scheme. On larger sites (action 8) there are a growing number of examples where developers are fitting pollution abatement equipment and photo-voltaic panels, and instead of CHP installing air source heat pumps. By persuading some developers not to install biomass burning boilers (action 15) we have saved an estimated 1 tonne of annual NOx emissions per annum from one site. Most contractors working on major redevelopment sites are now actively measuring and controlling emissions of dust and PM<sub>10</sub> (action 11) with the aid of automatic monitoring equipment. This year for the first time, as a new way of financially supporting our own air quality monitoring, we have collected £5000 from developers for our air quality action fund (action 11) which will go towards the cost of maintaining the equipment.

There are several plans which need more work including PM<sub>2.5</sub> monitoring (action 1) and the boiler survey (action 13) where data remains to be analysed, and Council staff travel (action 5) where we would hope to reduce car travel further and increase cycling and walking. We will also be urging the car club (action 19) to recruit more members, and using the research into options for tightening up the London Low Emissions Zone (action 21) to lobby TfL for early changes.

As indicated in the previous report (2011) two plans have been hampered by external factors. We have only been able to do a certain amount of work collaborating on public health initiatives (action 2) owing to reduced staff resources. Assessing emissions from the housing stock has been made more difficult following the removal of national indicator 194 which provided an obligatory template for data gathering.

However there is a possible opportunity to resume health promotion work, by building on some initial research into raising awareness and engaging the business community in taking their own steps towards improving air quality. Preliminary approaches suggest an untapped enthusiasm for direct participation and leadership in practical action. We hope to report on this in twelve months time.

Finally, over the last 12 months, we have been working with the central London cluster group and a consultant to undertake a review of a wide range of existing measures currently being undertaken by local authorities and new measures that could be adopted. This has involved an analysis of the measures and production of frameworks which examines different scenarios with their associated costs and benefits. Fact sheets have developed for other measures. These are still being finalised, but where appropriate we have incorporated some early results in the action plan summary table. This is an exciting piece of work which will help focus our attention on actions which will have the most impact. Further details will be reported next year, with greater emphasis on costs and benefits.

Table 9.1 Action Plan Progress 2011-12

No	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target annual emission reduction	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
1	Review scope for PM <sub>2.5</sub> monitoring	Review the scope of the current monitoring network to account for the increasing concerns for health effects of fine particles (PM <sub>2.5</sub> )	LA	2009	2010	At least one road side PM <sub>2.5</sub> monitoring station in the borough by Dec 2010	N/a	PM <sub>2.5</sub> monitoring equipment was installed at the Cromwell Road (roadside) monitoring station in August 2009. Data collection in 2011 suffered from a number of site problems and equipment issues. However data has been collected and has been included in this report. Further analysis of the data is still to be undertaken. However, it indicates that concentrations at this location are 16µg/m <sup>3</sup>	Installation was completed in August 2009. Monitoring is on-going	The monitoring of PM <sub>2.5</sub> will help the Council in developing emission reduction measures specific to PM <sub>2.5</sub> .
2	Public Health Collaboration	Work to strengthen collaboration with local health organisations and coordinate efforts in tackling pollution related illness and health inequalities by raising awareness of asthma and indoor air quality and the dangers of second-hand smoke.	LA	2009-2010	2009-2014	A number of joint initiatives on asthma and indoor air quality covering issues such as smoking, carbon monoxide and boiler emissions.	N/a	Reorganisation of the Primary Care Trust (PCT) has hindered collaboration however, presentations to Breathe Easy groups have continued.  Although the Smoke free homes officer post no longer exists we continue to attend events and distribute our Indoor Air Quality leaflets where opportunities arise. Smoking cessation and smoke free homes promotional activity is now undertaken by the PCT.  TfL has produced a series of posters to discourage idling engines which the Council will distribute and display. See action 20 for further details.	Ongoing, unless otherwise stated	N/a

No	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target annual emission reduction	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
3	Raising awareness	Continue to raise awareness of air pollution and its effects on health and promote air quality issues by participation in schemes such as airTEXT and Walkit.com, and working with schools.	LA	2009	2009-2014 (ongoing)	<p>No. of airTEXT users to reach target of 300.</p> <p>Provide presentations and awareness workshops to schools and community groups.</p> <p>Establish links with all schools in the borough.</p>	N/a	<p>RBKC has continued to work in collaboration with other London Boroughs and CERC to support and develop the airTEXT service and its promotional material.</p> <p>In RBKC, the Council has worked with the PCT (relevant to plan 2), to advertise the airTEXT service on Amscreens (TV screens in GP practices).</p> <p>To date, 242 people subscribe to the airTEXT service within Kensington and Chelsea. There were 74 new subscribers during 2011/12. In comparison to 2010/2011, this is an increase of 41 subscribers per year.</p> <p>The target of 300 subscribers has not quite been reached yet due to the deletion of the Air Quality Promotion Officer's post (who was involved in much of this work).</p> <p>The Council continues to raise awareness of air pollution and its effects on health. This year, presentations were delivered to three Breathe easy group meetings, which also gave an opportunity to promote the airTEXT and walk-it services. The Council also spoke at a conference convened for head teachers from schools in the borough.</p> <p>Officers from the Council's Transportation</p>	Monitoring of airTEXT subscription numbers ongoing until otherwise stated. General promotional opportunities will be ongoing (2009-2014).	N/a

No	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target annual emission reduction	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
4	Council and contractors' fleet	Improve emissions from Council and contractors' fleet by requiring the latest Euro Standard, where possible, increasing the number of alternatively fuelled "low emission" vehicles, fitting abatement equipment and providing green driver training.	LA	2009	2009-2014 (ongoing)	Achieve the emission reduction target from the N1194 baseline toolkit (2008/09).	8%	<p>Department have written and distributed idling engine leaflets outside schools to raise awareness of the contribution it can make to poor air quality and its impact on asthma.</p> <p>The Council's indoor air quality web pages have been updated with the creation of an FAQs page. Five priority indoor air quality pollutants have been identified.</p> <p>In March 2011, the Council produced a draft report "Commercial Fleet - Managers and Drivers Manual". This has now been finalised and is in use by our contracts team. The document recommends that energy efficient vehicles are selected when possible.</p> <p>The Council has worked on a Carbon Plan for SITA. The plan included rerouting and reducing collections. SITA has also installed SUPATRAK (onboard vehicle management system) to their vehicles to reduce fuel consumption.</p> <p>The Council is keeping up to date with advances in low emission vehicle technology by attending events held by a range of manufacturers.</p>	2014	<p>Between 2008/09 and 2009/10 (this is the latest information that is available) NO<sub>x</sub> emissions from business mileage by Council vehicles decreased by 15%, and PM<sub>10</sub> emissions decreased by 49.8%. This was due to a move to smaller engine sizes as well as reduced mileage.</p> <p>As part of the Carbon Plan that was produced for SITA, rerouting</p>

No	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target annual emission reduction	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
5.	Council staff travel	Continue to improve emissions from Council staff commuting and business travel and maintain an up to date Council Green Travel Plan.	LA	2009	2009-2014 (ongoing)	Green Travel Plan in place  Targets within the plan include: <ul style="list-style-type: none"> <li>To reduce the number of staff driving to work from 13.4% (2008) to 10% (2012)</li> <li>To increase the number of staff cycling to work for the whole or part of their journey to work from 5.1% (2008) to 8% by (2012)</li> </ul>	N/a	As reported last year, the Council's Travel Plan (2009-2012) has been produced which reviews current modes of staff travel and sets measures and targets for increasing sustainable transport, e.g. cycling.  Since 2008 the proportion of staff driving to work has decreased from 13.4 per cent to 5 per cent, although no further reduction was reflected in the results for 2011.  The proportion of staff cycling to work as a main mode increased from 5.1% (2008) to 7% (2010) but decreased to 6% in 2011. A growing barrier to choosing cycling may be the larger number of staff with a commuting time of more 60 mins (and more than 90 mins in some cases), suggesting a greater distance from work. Between 1 and 2 per cent more staff in 2011 travelled by tube or train.  Staff continue to value the benefit of a	The Travel Plan is in place- this measure is complete.  A comprehensive staff travel survey was carried out in Summer 2011 and a survey is conducted annually.	and reduced collections are estimated to have saved 170t of CO <sub>2</sub> per annum. This project is also likely to have led to a reduction in NO <sub>x</sub> and PM <sub>10</sub> emissions.  A car user review has been carried out to look at ways to reduce Council CO <sub>2</sub> emissions in three main areas; fleet, car user allowances and taxi use. The findings are now being implemented.



No	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target annual emission reduction	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
6.	Council and contractor buildings	Improve emissions from Council owned and/or leased premises by improving energy efficiency and increasing the use of renewable technology.	LA	2009-2010	2009-2014 (ongoing)	<p>NI194 toolkit Reduction target in emissions from 2008/09 baseline level.</p> <p>On-site renewables in at least one Council building</p>	N/a	<p>zone 1 and 2 travel card but do not seem to be aware of the cycling support schemes e.g. Dr Bike.</p> <p>A voltage optimisation unit (VOU) was installed at Chelsea Old Town Hall in April 2011 and at the Council Offices Pembroke Road.</p> <p>In late 2011, solar photovoltaic panels were installed on the roof of Kensington Town Hall saving up to 30 tonnes of CO<sub>2</sub> per year. This switch to renewable technology will also reduce emissions of air pollutants.</p> <p>Double glazing and wall insulation were incorporated into the refurbishment of the Town Hall which has reduced gas consumption required to heat the new areas. This will reduce CO<sub>2</sub> emissions each year by 330 tonnes as well as significant reduction in NOx and PM<sub>10</sub> emissions. A new air conditioning system has also been installed which should be more energy efficient than the old system. New boilers at Kensington Town Hall have been installed and are expected to contribute to a reduction of energy consumption.</p> <p>Following the successful implementation of smart metering to 92 (80 per cent) of the Council's electricity supplies during the 2009/10 period, this programme is</p>	2009-2014 (ongoing)	<p>The VOU at Chelsea Town Hall has reduced electricity consumption by 11.2 per cent and with a CO<sub>2</sub> saving of 37 tonnes per year. At Pembroke Road there has been a 10.6 per cent reduction in fuel usage saving 78t of CO<sub>2</sub>. Air pollutant emissions will also be reduced as a result of this technology.</p>

No	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target annual emission reduction	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
7.	Social and TMO housing stock	The Council will assess its social housing and TMO building stock as part of work on NI194 and set targets for reducing emissions	LA	2009-2010	2010	Baseline year data collected and entered into the NI194 toolkit and target set.	N/a	<p>continuing to be rolled out across the Council's portfolio.</p> <p>A headteachers conference was held in June 2011 to discuss energy efficiency and reduction in Schools.</p> <p>The amount of energy used by each main Council worksite and school is available for staff to view on our internal intranet site here:  <a href="http://kcnet/Plans%20and%20performance/Programmes/Climate%20Change%20Programme/How%20Are%20We%20Doing/Pages/Default.aspx">http://kcnet/Plans%20and%20performance/Programmes/Climate%20Change%20Programme/How%20Are%20We%20Doing/Pages/Default.aspx</a></p> <p>There is no longer a requirement for NI 194 to be reported. Discussions between the TMO Energy Officer and Environmental Health are ongoing in order to collate data on boiler stock within TMO buildings.</p>	December 2011	
8.	Air Quality SPD and LES	Adopt a revised Supplementary Planning Document (SPD) which requires large developments to submit a Low Emission Strategy and implement	LA	2009-2010	2009-2014 (ongoing)	Air Quality SPD adopted and requirements being implemented	N/a	<p>In 2011/12, we requested low emission strategies or set conditions for low NOx boilers and combustion plant assessment for approximately 20 planning applications. We also made observations on approximately five applications that are located in close proximity to the borough boundary.</p> <p>Negotiations with developers have led to</p>	Revised SPD was adopted in June 2009. Action complete Requests for low emission strategies	N/a

No	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target annual emission reduction	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
		mitigation measures in order to offset impact of the development.						a number of developments agreeing to the fitting of abatement equipment and in also agreement to install renewable technologies such as photo voltaic panels and air source heat pumps instead of CHP plant.	are ongoing.	
9.	Air Quality Action Fund	Make use of S106 obligations to require large new developments to make a one-off financial contribution to an air quality action fund.	LA	2009-2010	2009-2014 (ongoing)	Section 106 Planning Obligations SPD adopted and contributions recorded.	N/a	The Council's Section 106 Planning Obligations SPD sets out the approach, policies and procedures in respect of planning obligations. The document outlines the standard contributions for air quality and justifies the approach.  To date, contributions for air quality have been sought for at least two major developments within the borough, with £5000 having been reserved so far. We are currently in discussions to include air quality monitoring projects in the planning infrastructure which will inform the community infrastructure levy.	The Section 106 Planning Obligations SPD was adopted in August 2010  Action complete Requests for financial contributions will be ongoing.	N/a
10.	Green Developers Guide	Produce a Green Developers Guide which will provide guidance to developers on energy efficient building design and use of renewable technology.	LA	2009	2010	Green Developers guide in place. Energy assessment submitted with proposed developments.	N/a	The Green Developers guide has been removed as an action from this plan with resources being devoted to Action 11.	N/a	N/a
11.	Construction	Continue work to	LA	2009	2009-	Planning	N/a	Construction risk assessments continue	2009-2014	N/a

No	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target annual emission reduction	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
	Emissions	minimise emissions from construction sites by requiring all developers to follow the London Council's (2006) <i>Best Practice Guidance – The control of dust and emissions from construction and demolition</i> as a minimum standard.			2014 (Ongoing)	conditions imposed on all large developments, requesting construction risk assessments.		to be requested for large developments.  Since producing the Council's web based best practice guidance tool for builders and developers, which covers air quality, we continue to update it as new best practice emerges.  <a href="http://www.rbkc.gov.uk/environmentandtransport/airquality/adviceforbuilders.aspx">http://www.rbkc.gov.uk/environmentandtransport/airquality/adviceforbuilders.aspx</a>  On planning applications, the Council adds a condition to permissions granted to ensure the development is assessed in accordance with the Mayor's Best Practice Guidance 'The Control of Dust and Emissions from Construction and Demolition.' On major sites, air pollution monitoring and management systems which triggers intervention if pollution concentrations exceed certain limits, is becoming common practice within the borough.  The GLA's Best Practice guidance, first published in 2006 is now being updated. The Council provided draft comments to the GLA on an early version.	(Ongoing)	
12.	Energy Efficiency	Continue to promote energy-efficiency measures in homes in the borough, within the Council's	LA	2009	2009-2014 (ongoing)	100% RSL and TMO homes in the borough meet "decent homes" thermal efficiency standards.	N/a	95% of Registered Providers total housing stock has achieved the Decent Homes standard which is an improvement on last year. Continuing to work towards 100%.  The TMO continue to achieve the 100%	Uncertain exactly when 100% of RSLs will be achieved but will continue to work	

No	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target annual emission reduction	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
		HECA and Affordable Warmth work.				Year on year increase in the number of qualifying households taking grants.		<p><i>Decent Homes</i> standard. They also continue to improve thermal efficiency by undertaking loft and cavity wall insulation projects and communal boiler upgrades.</p> <p>A number of schemes are available to help people improve the energy efficiency of their living accommodation:</p> <p><i>Warm Front</i>- a national scheme available to those on certain benefits, providing financial assistance to upgrade heating systems and improve insulation. 2 Warm Front grants have been approved this year.</p> <p><i>West London- Warm Zone</i>- grants for free heating and insulation are available to homeowners and private tenants in receipt of means tested benefits. It also provides free loft insulation to those over 70 years of age and heavily subsidises loft insulation to all other residents. 30 Warm Zones grants have been awarded this year, an increase of 15 from last year.</p> <p><i>Kensington and Chelsea 'Keep Warm Grant'</i> Financial assistance is available to homeowners and private tenants on benefits or low income to upgrade or install heating and insulation. 8 grants amounting to £20,469 have been awarded this year.</p>	<p>towards this.</p> <p>TMO achieved 100% so measure is complete.</p> <p>The Warm Zone fund has just come to an end and the last grants are now being awarded.</p> <p>The Keep Warm grant has been retained despite the reduction in the overall grants</p>	

No	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target annual emission reduction	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
13.	Borough-wide Boiler Survey	Research emissions associated with existing heating plant in RBKC by carrying out a borough-wide boiler survey	LA	2009-2011	2011	Compiling an emissions inventory	N/a	<p>Also in the past year, five loft insulation grants have been awarded.</p> <p>The Renew Project in Earls Court and Northern Wards has just been completed. 1200 homes were visited and given energy efficiency advice and small measures installed. Where applicable, referrals were made to insulation schemes.</p> <p>A successful bid to the Department of Health, Warm Homes Healthy People fund has provided the Council with funding for emergency heating repairs and draught proofing doors and windows in residential home. The scheme has started but will continue in 2012/13.</p> <p>The Council is currently offering Smart Meters on loan from Kensington Central Library; these help people to identify how much energy is being used at home. Between November 2010 and September 2011, 116 meters have been loaned.</p>	2012	N/a
								programme and will continue into next year. Visits completed 13/04/12		Project now complete. The Council is waiting for the final data to be forwarded.

No	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target annual emission reduction	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
14.	Integrating air quality and climate change measures	Aim to identify the most effective emission reduction measures which provide the greatest benefits in terms of CO <sub>2</sub> and air quality emissions.	LA	2009-2010	2011	Produce a NI194 toolkit/ policy changes	N/a	September 2011. NI194 has been withdrawn. Climate change has been considered as part of the work with the central London Cluster Group to review the cost and benefits of individual measures that could be taken to improve air quality.	2011	Each air quality measure is assessed for benefits per tonne CO <sub>2</sub> reduced (NPV), £/tonne and the total CO <sub>2</sub> reduction in tonnes. Figures are being finalised and will be reported next year.
15.	Controlling Emissions from Biomass	Make use of planning conditions and obligations in order to set requirements for controlling pollutant emissions from biomass and biofuel boilers and CHP.	LA	2009	2009-2014 (ongoing)	Planning conditions or obligations.	N/a	A detailed air quality assessment with dispersion modelling is requested for all major developments proposing to use biomass and biofuel. In addition discussions are held with developers to ensure that alternative non combustion renewable technologies are considered.  Biomass was original proposed for the Earls Court re-development but the Council was able to use the air quality assessments submitted with the application to demonstrate the air quality impacts which has lead to the removal of proposals for biomass boilers in the new development. However, it is important to note that CHP is often proposed as an alternative and this too presents risks to improvements in air quality as it is often	2014	Potential emissions that would have resulted if the biomass option had been adopted would have led to an additional 1 tonne of NOX per annum and increases in ground level annual mean concentrations of 2.2 µg/m <sup>3</sup> and increase of annual mean PM <sub>10</sub> of 0.4 µg/m <sup>3</sup> .

<sup>5</sup> Earls Court Development Proposals, Outline Low Emission Strategy, June 2011

No	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target annual emission reduction	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
16.	School Travel Plans	The focus of this measure has now changed from requiring school travel plans in all schools (LEA and independent) in the borough to 'monitoring travel plans within LEA and Independent Schools in the borough'.	LA	2009	2010	50% of all schools have an active travel plan (meaning that the school has submitted an updated travel plan document including mode of travel to school data)	N/a	Previously 98.6 per cent of all schools and colleges in the borough achieved an approved travel plan. Currently 50 out of 70 schools (71 per cent) have <u>active</u> travel plans in place.  There has been an apparent reduction in active participation, but schools can now choose to update their travel plans on-line using a new toolkit developed by Transport for London	Target complete, but ongoing process – each school monitors their travel plan annually.	School Travel Plans encourage sustainable transport through initiatives such as free cycle, scooter and pedestrian skills training. Facilities such as scooter and cycle storage areas are also installed in the schools.
17.	Encouraging Cycling	Continue to encourage safe cycling in the borough by improving facilities and providing free cycle training to residents	LA	2009-2010	2009-2014 (ongoing)	Annual increase in cycling numbers	N/a	Delivered 290 free adult cycle training lessons (90 more than last year)  Provided 91 free cycle maintenance sessions (Dr Bike) to the public and workplaces, 28 more than last year.  Delivered 21 cycle mechanic training sessions, 13 more than last year.	2014	N/a



No	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target annual emission reduction	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
18.	London Cycle Hire Scheme	The Council will support TfL in implementing a Central London Cycle Hire Scheme based on the Paris model.	TfL and LA	2009-2010	2010	50 docking stations installed in the borough	N/a	The total of docking stations now stands at 68 (and increase of 20 since we last reported), well in excess of the original target.  There are now 8000 cycles available for hire in the central London area.	30 <sup>th</sup> July 2010  Action completed	This scheme aims to encourage bicycle use, especially for short journeys. These can help to reduce the impact of using cars for short journeys.
19.	Car club Expansion	Double the number of on-street car club bays available in the borough and increase the number of low emitting vehicles in the car club fleet.	LA	2009-2010	2014	No. of car club members in the borough  200 on-street car club bays in the borough.  33% of the fleet within VED band A-B.	N/a	In the past 12 months there has been a slight increase in the total number of on-street bays which now stands at 200.  More than 50 per cent of the fleet are within VED band A-B (Based on 118 vehicles with 12 month permits).  Since two car clubs have merged there has been an apparent fall in the number of members, but usage has remained constant.  Virtually all residents are within a three minutes walk of a bay.	2014	New pricing structure for car club parking permits will increase number in VED band A-B. The structure also gives an incentive for vehicles in VED band C. Each car club vehicles takes at least 4 private vehicles off the road and reduces the mileage driven by its members.
20.	Idling Engines	Undertake an awareness raising campaign to inform drivers of the idling engines regulation and continue to monitor hotspots and use the	LA	2009-2010	2009-2014 (ongoing)	Number of warnings and complaints	N/a	The Highways Enforcement Team continues to conduct regular checks at known trouble spots. These areas include Kings road, Kensington High Street, Exhibition road and Cromwell Road.  Areas likely to cause nuisance are also targeted such as cab ranks, bus stops coach stops and areas around schools.	Ongoing  Ad-hoc checks will continue throughout the year	When a vehicle is waiting for longer than 30 seconds then engine should be switched off to stop emissions and fuel consumption.

No	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target annual emission reduction	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
		available enforcement powers to encourage drivers to switch off their engines.						<p>Leaflets have been distributed to those car/van/bus/coach drivers who are sitting in vehicles running idle engines. Leaflets have also been distributed outside schools.</p> <p>The Highways Enforcement Team has worked with schools to produce leaflets to address issues with parking congestion and illegal parking. Since September, these leaflets have also addressed idling engines. The schools include: Avondale Park School, Bassett House School, St Philips School, GEMS Hampshire School (early Years section) and Our Lady of the Victories School.</p> <p>TfL has produced a series of posters as part of a campaign to discourage idling engines. These will be displayed in the car parks of Kensington Town Hall and, Chelsea Old Town Hall. Posters will also be distributed and displayed where opportunities arise.</p> <p>During 2011/2012, enforcement officers responded to 5 complaints of vehicles parked with idling engines running. Three of these complaints arose in the north of the borough while 2 complaints were located in the south. This is six fewer complaints than that received during the previous year (2010/2011). Complaints were mainly associated with</p>		

No	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target annual emission reduction	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
21.	Investigate the effects of a more robust LEZ	Assess the effectiveness of a number of scenarios for an alternative central London Low Emission Zone (LEZ) and lobby the Mayor of London to implement the most cost-effective option.	LA	2010	2011	Investigation completed and results submitted to TfL and GLA.	N/a	As part of the joint air quality best practice guidance commissioned on behalf of the Central London Air quality Cluster group three overall low emission zone scenarios, including taxi retrofit, high level exhaust for buses (two options) and a Euro V requirement for TfL buses have been considered.	2011	The existing London LEZ has lead to a reduction in emissions but is being progressively strengthened eventually with an emphasis on NOx.  These scenarios have the potential to lead to NOx reductions p.a. of 1,5t-2,7t (bus high level exhaust) and 204t (Euro V bus). For PM <sub>10</sub> reductions p.a. of 18t; 11.8t-21t and 1.3t respectively for the three scenarios.
22.	Parking Charges	Review the surcharge for diesel vehicles  Review the graduated parking	LA	2009	2010-2011	Changes implemented to residents parking permit charges	N/a	Residents parking charges are reviewed on a yearly basis. At the most recent review, the price of all bands was increased to reflect the increase in the Retail Price Index (around 6.6%). The diesel surcharge was increased from £15	The parking charges will continue to be reviewed on an annual basis.	It is hoped that any future changes to residents parking permits will further reward residents who have chosen

No	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target annual emission reduction	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
		permits system to incorporate discounts for low emission vehicles (electric vehicles)						to £16 but no surcharge will be applied to the new Euro V standard diesel vehicles. We have also reduced the price of Euro V diesel car club vehicles so that these are the same price as the lower emission Petrol vehicles (bands A to C).  •Electric vehicles continue to be charged at the lowest parking permit rate.		low emission vehicles such as electric, and place a surcharge on vehicles which are most polluting.
23.	Encourage the creation of electric recharging infrastructure	Actively encourage the creation of electric recharging infrastructure within the borough by requiring charging points to be incorporated in development and promoting grants to local businesses.	LA	2009	2009-2014 (ongoing)	Electric Charging Points (ECPs) installed by developers and on business premises:  50% of on-site parking spaces in new development with ECPs by March 2012  100% parking spaces with ECPs by March 2014	N/a	<p>•The Council now require ECPs with all new developments. This is enforced through the use of planning conditions.</p> <p>The Council is currently requesting that ECPs are installed at around 20 per cent of on-site parking spaces in new developments.</p> <p>The Mayors target for charging points in new developments has been set at 20 per cent. This will make it harder to justify a higher proportion of electric charging points. However we are urging developers to install passive provision for connection later on if demand justifies it.</p> <p>A feasibility study was undertaken to investigate on street charging points. A decision has been taken to install one in Talbot Road and the second in Hans Road, both in prominent positions, which should be ready for use in the autumn of 2012. . Each point will provide both a 13 and 32 amp charging socket.</p>	On target for completion of reduced Mayoral targets.	

## 10 References

Maggs, R., Harrison, D., Carslaw, D. , Stevenson, K. (2009) Analysis of Trends in Gravimetric Particulate Mass Measurements in the United Kingdom

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RBKC (2008) The Climate Change Strategy 2008-2015

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Defra's Local Air Quality Management Support Pages

[http://www.laqmsupport.org.uk/Summary\\_of\\_Laboratory\\_Performance\\_in\\_WASP\\_R1\\_03-107.pdf](http://www.laqmsupport.org.uk/Summary_of_Laboratory_Performance_in_WASP_R1_03-107.pdf)

## **Appendices**

Appendix A: QA/QC Data

Appendix B: Monthly Mean Value Results of Nitrogen Dioxide Diffusion Tubes

Appendix C: Glossary

## Appendix A: QA:QC Data

### Diffusion Tube Bias Adjustment Factors

#### NO<sub>2</sub> diffusion tubes

Bureau Veritas manage the data from the London Wide Environmental Programme (LWEP) diffusion tube networks, however the supply and analysis of the tubes is undertaken by Gradko International Ltd. The preparation method is 50% TEA v/v in Acetone and the analytical method is U.V. Spectrophotometry.

#### Factor from Local Co-location Studies

Bureau Veritas conduct an 'in-house' co-location study to establish an LWEP bias adjustment factor based on triplicate NO<sub>2</sub> diffusion tubes sampling concurrently located with continuous analysers for a number of local authorities. They employ the DIFTAB.xls spreadsheet to calculate the factor.

#### NO<sub>2</sub> diffusion tube bias adjustment factors for 2006 to 2011

Year	Mean Adjustment	Mean% Bias
2006	1.06	-4.00
2007	1.01	-1.06
2008	0.98	3.92
2009	1.00	1.14
2010	1.06	-5.00
2011	1.02	-1.20

#### Bias adjustment 2011

	Diffusion Tube	Continuous Analyser	Correction Factor (A)	% Bias based on continuous monitor (B)
Kensington 1, North Kensington	31.1	35.9	1.14	-12
LWEP Bloomsbury	43.5	48.1	1.14	-12
Greenwich 4, Eltham	22.7	24.6	1.08	-8
Hounslow, Cranford	30.2	27.7	0.98	2
Greenwich 7, Blackheath	49.8	47.4	0.96	4
Hillingdon, AURN, Sipson Rd	61.4	55.3	1.07	-7
Hounslow 4, Chiswick High Road	55.8	55.9	0.93	8
Hounslow, Brentford	47.9	51.4	0.98	2
Kensington 2, Cromwell Road	71.8	66.2	0.90	11
Croydon 5, London Road (Norbury Rd)	47.7	60.8	1.00	0
		Overall % Bias		-1.20
		Mean Bias Adjustment Factor	1.02	

Calculations provided by Bureau Veritas

#### Choice of Factor

The LWEP factor has been selected as being the most suitable as it includes sites in the borough and is based on a large number of co-located automated and diffusion tube samplers.

**Benzene diffusion tubes**

Benzene data is also collected as part of the LWEP managed by Bureau Veritas. The tubes are analysed using desorption scanning gas chromatography/mass spectrometry (GC/MS). Comparison of the LWEP data with the calculated mean data for the Automatic Hydrocarbon Monitoring Network (AHMN) indicates that the concentrations recorded were very comparable. However there is no bias adjustment factor for benzene measurements.

**PM Monitoring Adjustment****TEOM**

In the past TEOM data was corrected using a simple multiplication factor of 1.3. Co-located instruments (TEOM and Partisol) at North Kensington in the past enabled us to compare the results, this had shown that adjusting the TEOM data by a factor of 1.3 gave a reasonable approximation of the annual average as less reliable when applied to exceedences of the daily objective. However co-location studies have shown that the instrument was not equivalent to the reference method and the FDMS measurement device was developed to correct the problem and in comparisons was shown to be equivalent to the EU reference method. In 2008/09 Defra began the replacement of TEOM units with FDMS units on the particulate monitoring network. Government guidance LAQM TG(09) states that the Volatile Correction Model (VCM) should be used to correct TEOM measurements for Local Air Quality Management purposes.

Data has been collected from the London Air Quality Network (LAQN) website ([www.londonair.org.uk](http://www.londonair.org.uk)) operated by King's ERG. TEOM measurements on the website are now adjusted by the CVC. The VCM uses FDMS purge measurements to correct TEOM measurements for the loss of volatile material. This method is now recommended in Defra's TG (09) as the preferred method for correcting TEOM measurements for Local Air Quality Management purposes. This correction has been undertaken for data in the Council's two TEOM sites from 2004. Data corrected using both the simple multiplication factor and the VCM method is included in the report.

**QA/QC of Automatic Monitoring****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 LAQN 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 (AURN) 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.



## **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-FDMS) for the purposes of calibration, filter changes and instrument cleaning. Equipment is additionally serviced at regular intervals. Routine calibrations are undertaken by contractors.

Independent calibration and audit is carried out by Defra appointed contractors as part of their AURN responsibilities for the North Kensington site and for the Cromwell Rd site through a separate contract. Calibration certificates are provided by AEAT. The 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<sub>x</sub> 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<sub>3</sub> which is subsequently converted to NO<sub>2</sub>.

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.

## **QA/QC of Gravimetric monitoring-Partisol**

The Partisol operating at the Earls Court Road site since May 2002 is a gravimetric sampler which is equivalent to the EU reference method. Reference to the report has also been made to other Partisols operating in the borough by Defra. However the co-location trial<sup>6</sup> raised concerns over the filter media used in these instruments and showed that an over estimation in measured concentrations resulted from the

<sup>6</sup> Maggs, R., Harrison, D., Carslaw, D., Stevenson, K. (2009) Analysis of Trends in Gravimetric Particulate Mass Measurements in the United Kingdom

use of quartz filters. The filters used at the site are Teflon coated glass fibre (Emfab) filters which are not affected in the same way as quartz filters<sup>7</sup>. No correction factor is required for gravimetric instruments.

Verification of ambient temperature, verification of filter temperature, verification of ambient pressure and humidity, internal leak check, external leak check and flow verification are undertaken for the partisol at the time of audit and service.

### QA/QC of Diffusion tube data

#### Nitrogen dioxide

The laboratory of Gradko International Ltd follows the Practical Guidance document "Diffusion Tubes for Ambient NO<sub>2</sub> Monitoring: Practical Guidance for users and laboratories (Feb 2008)" (AEA on behalf of Defra). The preparation method: 50% TEA v/v in Acetone and the analytical method is U.V. Spectrophotometry. Analysis is carried out in accordance with documented in-house Laboratory Method GLM6. Results are blank subtracted.

Uncertainty of measurement - 5.2%+/-      Limit of Detection - 0.07mg/m<sup>3</sup>\*

Gradko International Ltd participates in the Workplace Analysis Scheme for Proficiency (WASP). This is a recognised performance-testing programme for laboratories undertaking NO<sub>2</sub> diffusion tube analysis as part of the UK NO<sub>2</sub> monitoring network. The scheme is designed to help laboratories meet the European Standard EN48213.

The Laboratory performance was deemed satisfactory for 100% of samples that were submitted between June 2010 and June 2011.<sup>7</sup>

They also participate in the Network Field Inter-comparison Exercise which complements the WASP scheme in assessing sampling and analytical performance of diffusion tubes under normal operating conditions. This involves the regular exposure of a triplet of tubes at an Automatic Urban Network site (AURN) site. These sites employ continuous chemiluminescent analysers to measure NO<sub>2</sub> concentrations. The results indicate that Gradko International Ltd diffusion tubes are well within the performance targets set by NETCEN.

### Summary of NO<sub>2</sub> Network Field Inter-comparison Results, 2011

Annual Mean Bias		Precision	
Performance Target	Gradko Annual Mean Bias	Performance Target	Gradko Precision
<b>±25%</b>	<b>- 2%</b>	<b>10%</b>	<b>6%</b>

<sup>7</sup> Defra's Local Air Quality Management Support Pages  
[http://laqm.defra.gov.uk/documents/WASP-NO2-Scheme-for-Rounds-105-113-\(April-2009---June-2011\).pdf](http://laqm.defra.gov.uk/documents/WASP-NO2-Scheme-for-Rounds-105-113-(April-2009---June-2011).pdf)

**Benzene**

All benzene 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. Comparison of the LWEP data with the calculated mean data for the AHMN indicates that the concentrations recorded are comparable.

The measurement method used in the benzene survey was consistent with the sampling, analysis and QA/QC requirements of EN 14662-4: 2005 Ambient air quality – Standard method for measurement of benzene concentrations – Part 4: Diffusive sampling followed by thermal desorption and gas. As part of quality control procedures integral to the London-Wide Benzene Survey, a selection of boroughs are sent one or two extra diffusion tubes for duplicate or triplicate exposure at a monitoring site within their borough. In 2009, duplicate exposures were successful on eleven occasions and triplicate exposures on eight. The results of these tubes indicate satisfactory agreement between duplicate and triplicate tubes. The maximum difference between duplicates is  $\pm 1.0 \mu\text{g}/\text{m}^3$  and the maximum difference between triplicates is  $\pm 1.2 \mu\text{g}/\text{m}^3$ .

## Appendix B: Monthly Mean Value Results of Nitrogen Dioxide Diffusion Tubes

Full dataset (monthly mean values) for the nitrogen dioxide diffusion tubes 2011 (unadjusted)

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Mean
Ladbroke Grove	57.8	53.2	60.2	60.1	40.9	45.6	54.7	44.7	40.9	53.4	67.3	43.4	51.8
Holland Park	34	35.7	33.2	29.9	22.6	22.7	22.9	25.2	24.1	30.1	31.9	29.2	28.5
Cromwell Road	79.7	71.5	77.9	83.8	93.7	52.6	80.3		105	89.3	88.2	80.2	82
Dovehouse St	52.1	50.1	48.9	41	36.2	36.6	33.3	32.4	38	43.4	50.6	38.5	41.8
Brompton Road/Cottage Place	58.5	58.9	62.4		73.7	72.0		66.4	80.5	76.2	82.7	72.7	70.4
Earls Court (station)	91.4	89.6	79.2	84.9	93.2	111	83.0	103	104	89.7	95.1	97.0	93.4
Lots Rd/Uperne Rd	41.2	33.4	43.6	31.8	23.8	33.3	28.3	24.8	28.2	33.7	41.8	28.5	32.7
Brompton Road	52.5	52	54.6	44.1	45.2	48.9	39.4	42.7	50.5	52.8	59.3	45.4	48.9
Ladbroke Crescent	43.9	41.9	46.8	38.4	22.4	27.2	27.5	26.6	25.4	34.6	45.6	37.9	34.8
Pembridge Square	49.6	45.4	52.4	43.7	38.3	37.1	38.4	36.2	39.1	41.9	49.4	39.9	42.6
St Marks Gove	44.7	38.3	46.8	38.9	23.7	27.4	23.8	27.1	23.2	35.8	48.7	31.4	34.1
Donne Place	53.8		42.2	36.5	27.0	34.3	32.0	34.0	38.9	43.0	48.2	40.1	39.1
Chatsworth Court	49.2	56.8	57.8	56.0	44.0	47.1	40.6	42.3	48.6	62.1	62.5	40.8	50.7
Sion Manning	38.9	36.0	39.1	29.0	22.9	24.4	25.0	24.6	25.9	37.0	45.8	31.5	31.7
Sion Manning	38.3	35.3	38.3	33.6	22.9	6.2	23.3	23.2	24.3	34.6	42.8	31.4	29.5
Sion Manning	39.7	36.3	35.8	30.1	21.5	21.1	26.2	25.0	26.2	29.5	45.1	31.0	30.6
Sloane Square	77.8	76.0	71.0	93.7	74.7	83.5	96.3	79.6	82.9	78.0	80.1	76.0	80.8
Harrods	70.9	78.4	84.7	84.2	53.3	69.5	84.1	59.4	50.9	60.5	78.1	56.4	69.2
CPG Gate	64.2	57.4	60.5	40.5	55.0	57.5	44.3	48.9	53.5	61.6	65.3	55.1	55.3
CPG Met	41.0		41.0	31.0	24.9	24.4	37.9	27.2	27.0	32.4	39.9	31.0	32.5
Marlborough Primary School/ Sloane avenue	57.6	50.1	63.8	60.6	50.0	43.9	30.0	43.6	47.5	55.8	55.7	47.6	50.5
Walmer House	50.2	48.5	44.0	49.0	46.4	47.9	43.8	46.1	46.5	49.6	53.4	18.8	45.4
Natural History Museum	76.4	79.9	64.1	81.0	69.9	78.3	67.4	66.4	66.1	80.4	77.4	69.2	73.0
Natural History Museum	75.5	66.6	72.7	84.5	71.3	72.7	66.5	55.5	70.0	75.8	77.1	71.0	71.6
Natural History Museum	52.4	79.6	74.2	77.4	68.9	72.5	68.2	61.7	62.1	83.8	75.4	71.4	70.6
Blantyre St		46.1	58.1	39.0	30.9	36.0	31.9	30.7	32.8	43.4	54.0	35.2	39.8
Chelsea Old TH	71.3	78.7	77.4	89.6	80.8	88.7	84.5	75.3	93.1	82.7	86.3	82.7	82.6
Pavillion St/Sloane Ave	57.7	51.0	59.3	57.2	44.8	45.5	56.4	44.0	44.5	55.1	59.5	43.0	51.5
Kensington H St/Campden Hill Rd	57.5	50.2	62.0	64.8	57.5	58.4	60.0	54.7	51.5	59.7	56.0	51.2	57.0
Kensington H St/Argyll St	75.1	71.0	87.7	82.4	89.0	82.5	86.9	83.7	79.0	81.7	76.1	81.8	81.4
Old Brompton Rd		84.4	66.8			41.6		57.2	70.3	76.9	79.6	66.5	67.9
Fulham Rd/Limerston St	71.4	58.3	60.3	65.0	51.9	56.6	63.4	53.2	50.0	59.7	62.3	59.2	59.3
Warwick Road	52.0	50.7	60.9	60.6	34.8	35.2	47.1	40.4		47.5	62.9	36.2	48.0
Barbly road	43.4	42.7	54.8	42.4	28.2	28.8	33.5	30.2	29.1	41.9	48.4	32.9	38.0
Acklam Road	49.2	46.1	52.9	45.2	37.4	33.8	33.5	37.5	36.0	46.3	52.1	41.9	42.6
Southern Row	47.2	51.5	50.3	44.9	40.1	36.5	35.3	39.5	36.3	45.6	45.5	42.0	42.9
Exhibition Road	57.2	57.6	59.2		43.9				94.5	55.7		47.9	59.4
mean Sion Manning	51.6	35.9	37.8	30.9	22.5	17.2	24.9	24.3	25.4	33.7	44.6	31.3	31.7
Mean Natural History Museum	68.1	75.3	70.3	81.0	70.0	74.5	67.4	61.2	66.1	80.0	76.6	70.5	71.8

Mean results from Sion Manning and the Natural History Museum (KC47 and KC54) are the mean results from multiple tube exposures (triplicate tubes).

Note: This data has not been corrected for bias.

## Appendix C: 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.

**AQAP** - 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**- Automatic Urban and Rural Network- A Defra air quality monitoring network.

**AURN affiliate**- a monitoring site owned and operated by a local authority but included in the Defra network of sites.

**AHMN**- Automatic Hydrocarbon Monitoring Network

**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 (CO)**- gas formed by the incomplete combustion of carbon containing fuels

**Defra**- Department for Environment, Food & Rural Affairs

**Diffusion tube**- a small tube used to monitor pollutants by passively absorbing a pollutant over a specific time period, and is then collected and analysed

**Emissions inventory**- a comprehensive data set of pollution emitted from a variety of sources

**FDMS**- Fluid Dynamic Measurement System- an airborne particulate monitor based on TEOM technology measuring the core and volatile fractions of the collected mass

**Fine particles**- see Particles

**Gravimetric method**- a method of sampling particulate matter by collecting it on a filter which is then weighed later under controlled conditions, e.g. Partisol

**HGV**- heavy goods vehicle, a goods carrying vehicle of 3.5T (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 (Pb)** - one of the heavy metals that are a toxic and acts as a cumulative poison

**LWEP**- London Wide Environmental Programme- provision and analysis of diffusion tubes led by Bureau Veritas in a number of London boroughs

**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

**Microgram  $\mu\text{g}$**  – a unit of mass equivalent to one millionth of a gram or one thousandth of a milligram

**Milligram (mg)** – a unit of mass equivalent to one thousandth of a gram

**$\mu\text{g}/\text{m}^3$** - a microgram of pollutant in a cubic metre of air

**Nanogram (ng)**- a unit of mass equivalent to one thousandth of one millionth of a gram

**$\text{ng}/\text{m}^3$**  nanogram of pollutant in a cubic metre of air

**Oxides of nitrogen ( $\text{NO}_x$ )**- a mixture of NO and  $\text{NO}_2$

**Nitric oxide (NO)**- a colourless toxic gas arising from the combination of atmospheric nitrogen with oxygen in high temperature combustion

**Nitrogen dioxide ( $\text{NO}_2$ )**- a stable brown gas largely produced by the oxidation of NO.  $\text{NO}_2$  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  $10\mu$  to  $0.1\mu$

**Pollutant specific guidance**- issued by Defra, provides advice on review and assessment for each pollutant identified in the air quality regulations

**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

**$\text{PM}_{10}$** - particulate matter less than  $10\mu$  (micrometres) in diameter

**$\text{PM}_{2.5}$** - particulate matter less than  $2.5\mu$  (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 ( $\text{SO}_2$ )** - a colourless toxic and acid forming gas, it is the main product of the combustion of sulphur contained in fuels

**TEOM-** Tampered Element Oscillating Microbalance- a monitor to measure the mass of particles collected on a filter continuously

**VCM-** Volatile Correction Model- a model to correct measurements of PM<sub>10</sub> by the TEOM so that they can be used to compare against the EU Limit Value in the UK.