2015 Updating and Screening Assessment
Royal Borough of Kensington and Chelsea

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

April 2015

THE ROYAL BOROUGH OF
KENSINGTON
AND CHELSEA

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Executive Summary

Under the government's Air Quality Strategy, all local authorities are required to assess air quality within their borough annually. Kensington and Chelsea Council has been doing this for two decades and continues to be seriously concerned about the impact of air pollution on health. During this time evidence for the health effects has grown.

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 would take to work towards meeting these objectives. In September 2009, the Council published its current Action Plan as this comes to the end we are in the process of developing a new plan and engaging with stakeholders.

This latest progress report, an updating and screening assessment, reviews air quality data collected in 2014 for the strategy pollutants; nitrogen dioxide (NO2), particulate matter (PM10) carbon monoxide, sulphur dioxide and benzene, 1, 3- butadiene, lead, benzo(a)pyrene (which is used as a marker for a complex group of hydrocarbons - PAH). Information on PM2.5, and ozone is also included as these pollutants are also regarded as significant threats to health.

The second part of this report provides a summary of the implementation of the actions contained in the Air Quality Action Plan 2009 -2014 (Section 9). This reports good progress with most plans. We have continued to reduce emissions from Council buildings and vehicles and have seen increased collaborative working with our Public Health Team on raising awareness of the health impacts of poor air quality. With financial support from Defra and the Mayor of London we have also completed projects working with businesses and several schools to raise awareness and consider measures they may be able to introduce to reduce emissions and personal exposure to these.

It is of some comfort to note that the review of the monitoring data shows that most pollutants (excluding NO2, PM10 and ozone) remain well within their respective objective levels. But the situation for NO2 remains a concern. Monitoring at the borough's five continuous monitoring sites show that exceedences of the annual mean NO2 objective level have occurred at all sites apart from the North Kensington background site. There was a decline at many of our sites. However we still require large reductions in concentrations of around 50µg/m3 at the worst affected road side locations. Exceedences of the hourly mean objective vary from site to site, from none at the North Kensington background site to 212 at the Earls court roadside site (compared to the 18 exceedences permitted). Monitoring of PM10 at our three sites shows that these have all met the annual mean objective since 2008. All three sites met the daily mean objective, including Earls court for the first time.

The lack of progress in reducing NO2 levels is seriously worrying, particularly given the substantial reduction needed to meet the objective levels for NO2 and the EU time limit of 2015. And while the daily mean PM10 objective level has been met for all sites in 2014 we are aware that health effects occur below the objective level.

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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.

Although the borough is geographically one of the smallest in London, at just over 4.7 square miles, it is the fourth most densely populated areas in the country. The current population is estimated at 158,649 people, a drop on previous estimates. The borough is primarily residential in character. The last census shows that out of a total 78500 households there is approximately 28,000 in the private rented sector; 29000 owner occupied and approximately 1900 homes available for social renting.

In addition to residential accommodation, the borough is also home to internationally recognised shopping centres, 12,000 businesses and over 120,000 jobs, three of the most visited museums in the UK and the second largest number of hotel beds in any London borough.

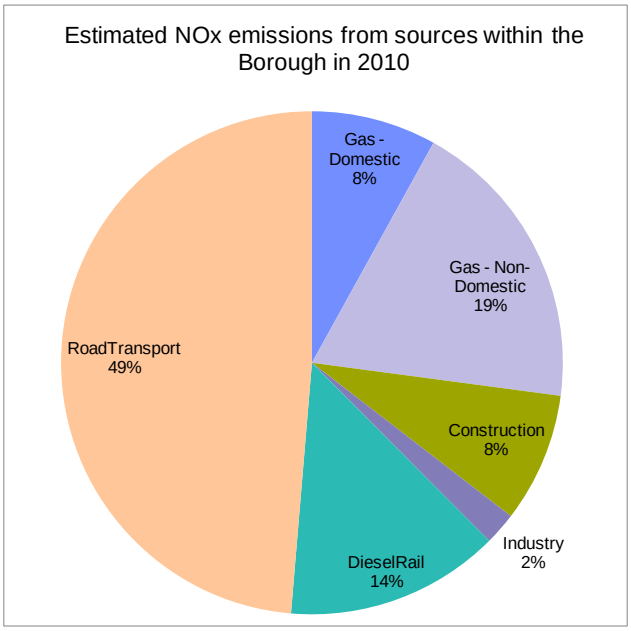
The borough has a large volume of commuter traffic; people both travelling across and into the area, and local residents travelling within and outside the borough. The area is relatively well served by the London Underground network with the Circle, District, Central, Piccadilly and Hammersmith and City 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.

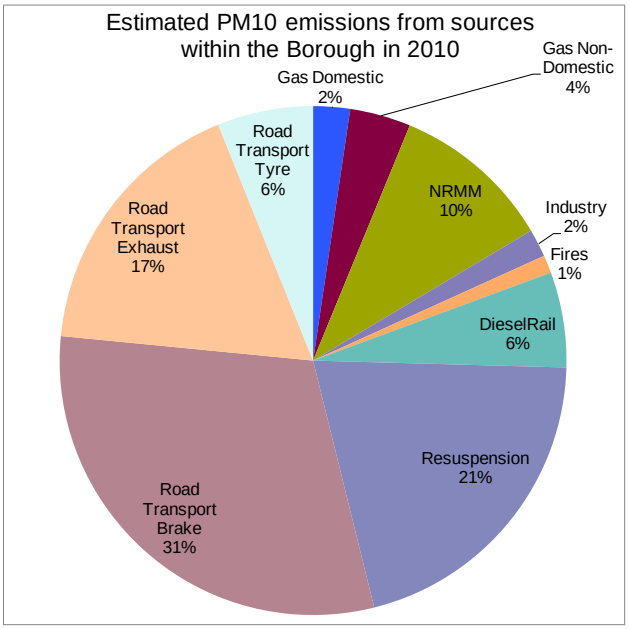
There are 207 km (127 miles) of roads in the Borough. The Westway (A40), Cromwell Road (A4), the Earl's Court one-way system (A3220) and Chelsea Embankment (A3212) are all part of the Red Route network and Transport for London (TfL) is the Highway Authority for these routes they make up 12.5 km of the roads in the borough. The Council is the Highway Authority for all other adopted roads. The available north/south or east/west routes are constrained by bridges which mean that these are heavily trafficked. They are also often major retail areas with heavy pedestrian flows.

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 urban area as a whole and further afield from national and European sources. The contribution of NO_x and PM_{10} from the various sources within the borough in 2010 (is based on the LAEI

released in 2013). Changes in the assumptions used for predicting emissions shows that emissions of NOx from transport are a bigger proportion than in previous inventories; this is likely to be due to a greater understanding of that emissions reductions are not occurring as expected. For PM10 information is now also available for re-suspension, tyre and brake wear. Other sources which account for less than one percent are not shown (for NOx these include aviation, construction, oil, shipping etc).

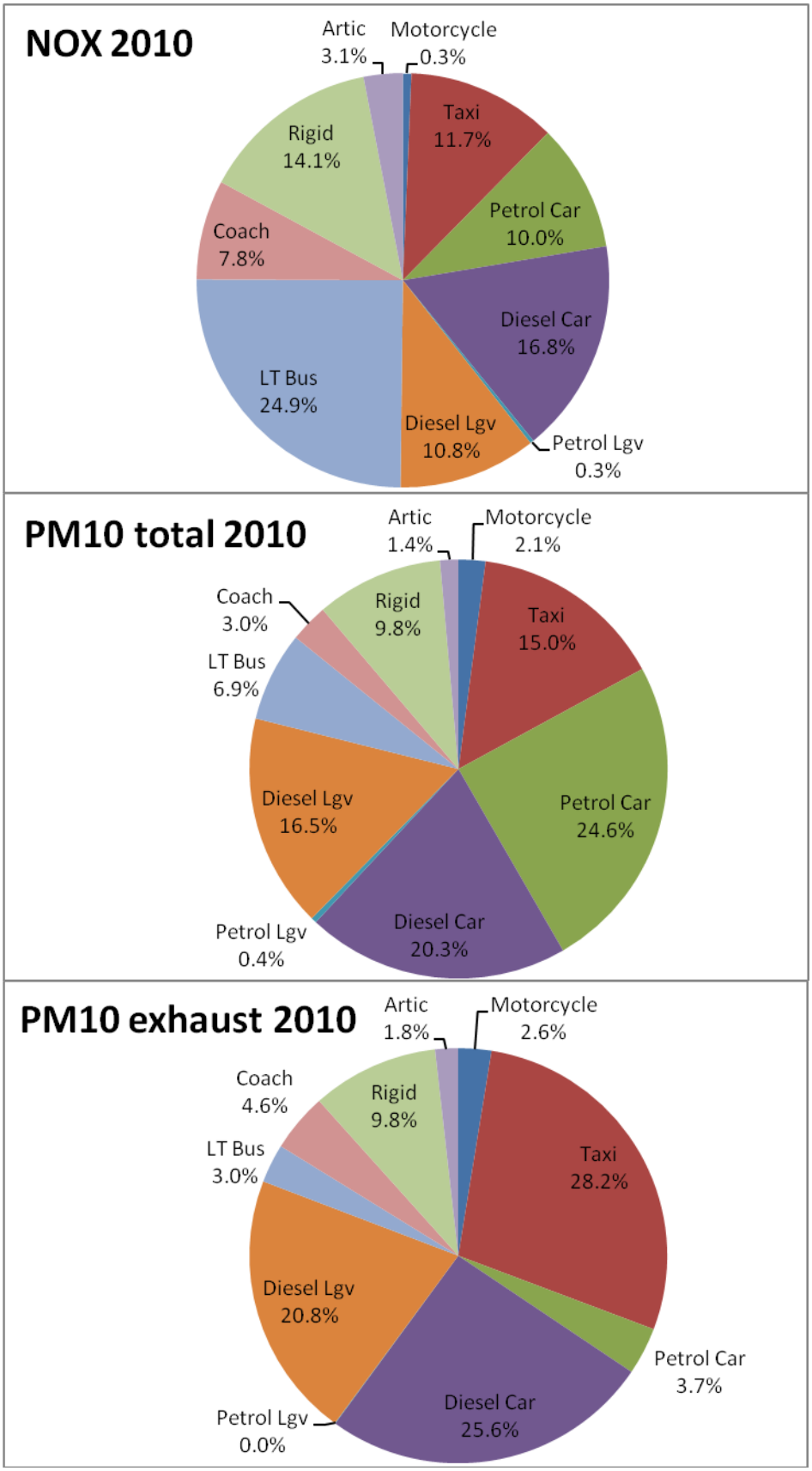




Data source LAEI 2010 (Published **2013**) showing predicted emissions for 2010.

The latest inventory shows the most significant source of NOx is road transport followed by gas emissions based (predictions for 2010) followed by Diesel rail and construction. The most significant source of PM_{10} from within the borough is road transport (a combination of exhaust and road/tyre breakdown); however the next most important source is re-suspended materials and Non Road Mobile Machinery (note this will be based on assumptions regarding the level of construction activity in the borough).

The charts overleaf focussing on transport emissions show the breakdown of emissions of NOx and PM10 from different vehicle and fuel types. These show that emissions from diesel vehicles accounts for 90% of transport emissions of NOx and 96% of tail pipe emissions of PM10. Additionally for PM10 the total emissions which include tyre and brake wear emissions are also estimated as these are now included in the latest inventory.



1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management 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. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to 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 (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

The objective of this Updating and Screening Assessment is to identify any matters that have changed which may lead to risk of an air quality objective being exceeded. A checklist approach and screening tools are used to identify significant new sources or changes and whether there is a need for a Detailed Assessment. The USA report should provide an update of any outstanding information requested previously in Review and Assessment reports.

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), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043), and are shown in Table 1.1. This table shows the objectives in units of micrograms per cubic metre $\mu g/m^3$ (milligrams per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table 1.1 Air Quality Objectives included in Regulations for the purpose of LAQM in England

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu g/m^3$	Running annual mean	31.12.2003
	5.00 $\mu g/m^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu g/m^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu g/m^3$	Annual mean	31.12.2004
	0.25 $\mu g/m^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu g/m^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu g/m^3$	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50 $\mu g/m^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu g/m^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu g/m^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004

	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

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 1.1 Summary of results of first round of Review and Assessment

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

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_2) and particulate matter (PM_{10}).

Figure 1.1 Map of AQMA Boundaries

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_2 and PM_{10}. 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.

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.

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.

Fourth round of Review and Assessment

An Updating and Screening Assessment was completed 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.

Fifth round of Review and Assessment

An Updating and Screening Assessment was completed in 2012 followed by Progress Reports in 2013 and 2014. 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. 2.0 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

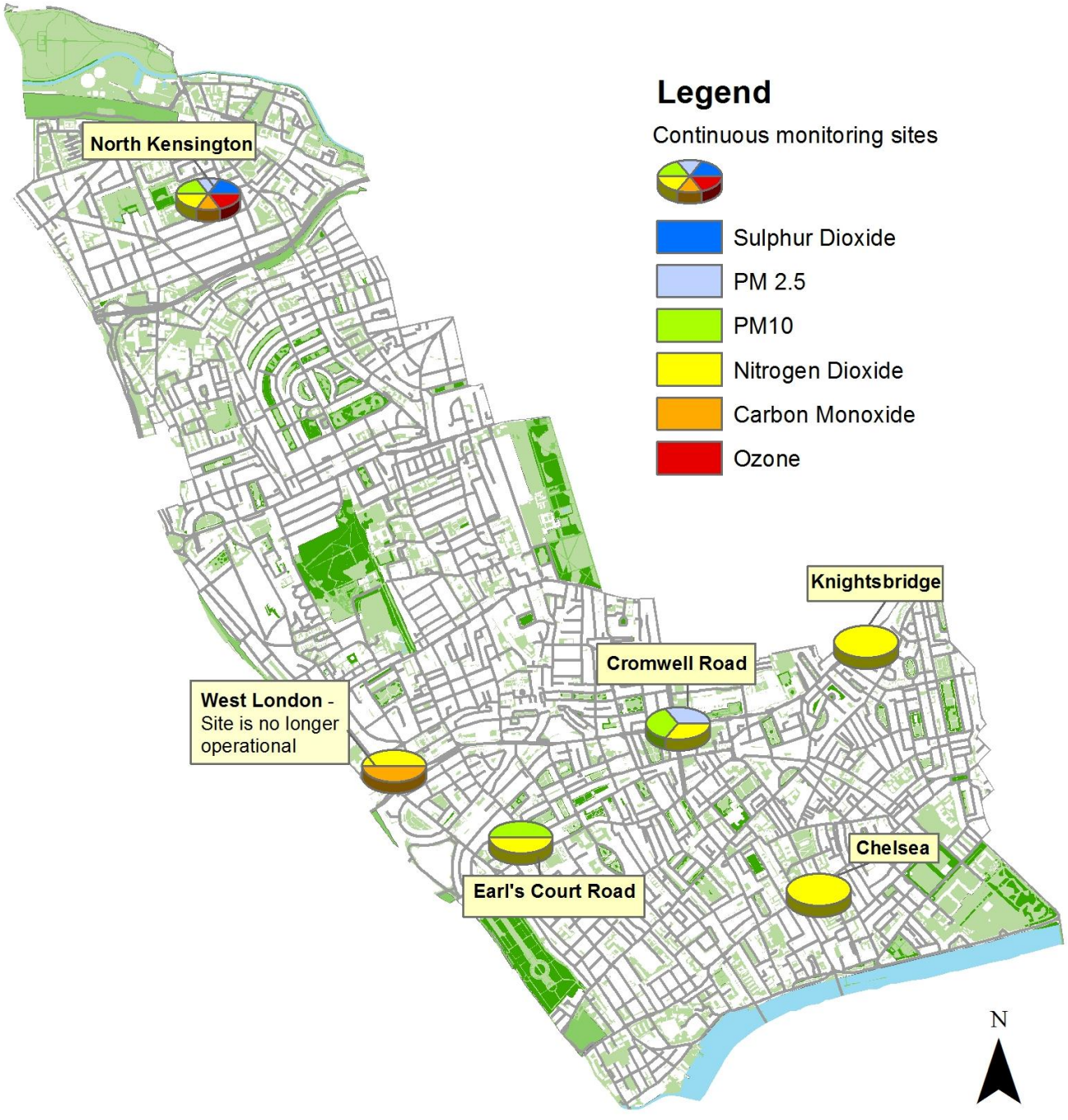
We have automated continuous monitoring at five sites in the borough. Figure 2.1 shows the locations of these sites in the borough and detailed information about each is contained in Table 2.1. In addition, information is included for the West London and Cromwell Road sites that were operated by Defra because data from these are included in the report. In addition to FDMS units used to monitor PM10 and PM2.5 the Council also operates 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. Data from FDMS /partisols instruments do not require adjustment.

The Council took over the operation of the NOx analyser at Cromwell Road site due to the continued exceedence of the NO2 objective following Defra's decision to stop gaseous pollutant monitoring at the long running site at the end of September 2012. In addition Defra also ceased to monitor heavy metals (including lead) at the same site at the end of 2013. The West London site, though closed by Defra in 2007, is retained in the table as long term trends incorporate data from here. Air quality data for 2014 has been included in the report where it is available but includes data which is provisional. The map overleaf shows continuous sites operating between 2006 and 2014.

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 College London and is disseminated via the London Air Website. 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(s) of Automatic Monitoring Sites (if applicable)



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Date: April 2014
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	X 524045	Y 181752	Nitrogen oxides PM_{10} Carbon monoxide Sulphur dioxide Ozone Other Defra/ERG monitoring undertaken: PM_{10} & $PM_{2.5}$	Chemiluminescent FDMS and TEOM GFC Fluorescence UV Photometric FDMS , partisols	Y	Y	N/A	N
AURN to Sept 2012	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_{10} $PM_{2.5}$	FDMS FDMS	Y	Y	Approx within 8m of Cromwell Rd and 5m of Queens Gate.	N
AURN	West London Closed in 2007	Urban background AURN	X 25026	Y 178741	Nitrogen oxides Carbon monoxide	Chemiluminescent	Y	Y	50m from Warwick Rd	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_{10} gravimetric Nitrogen oxides	Partisol plus Chemiluminescent	Y	Y	Sited on the kerb of Earls Court Rd	Y

Non-Automatic Monitoring Sites

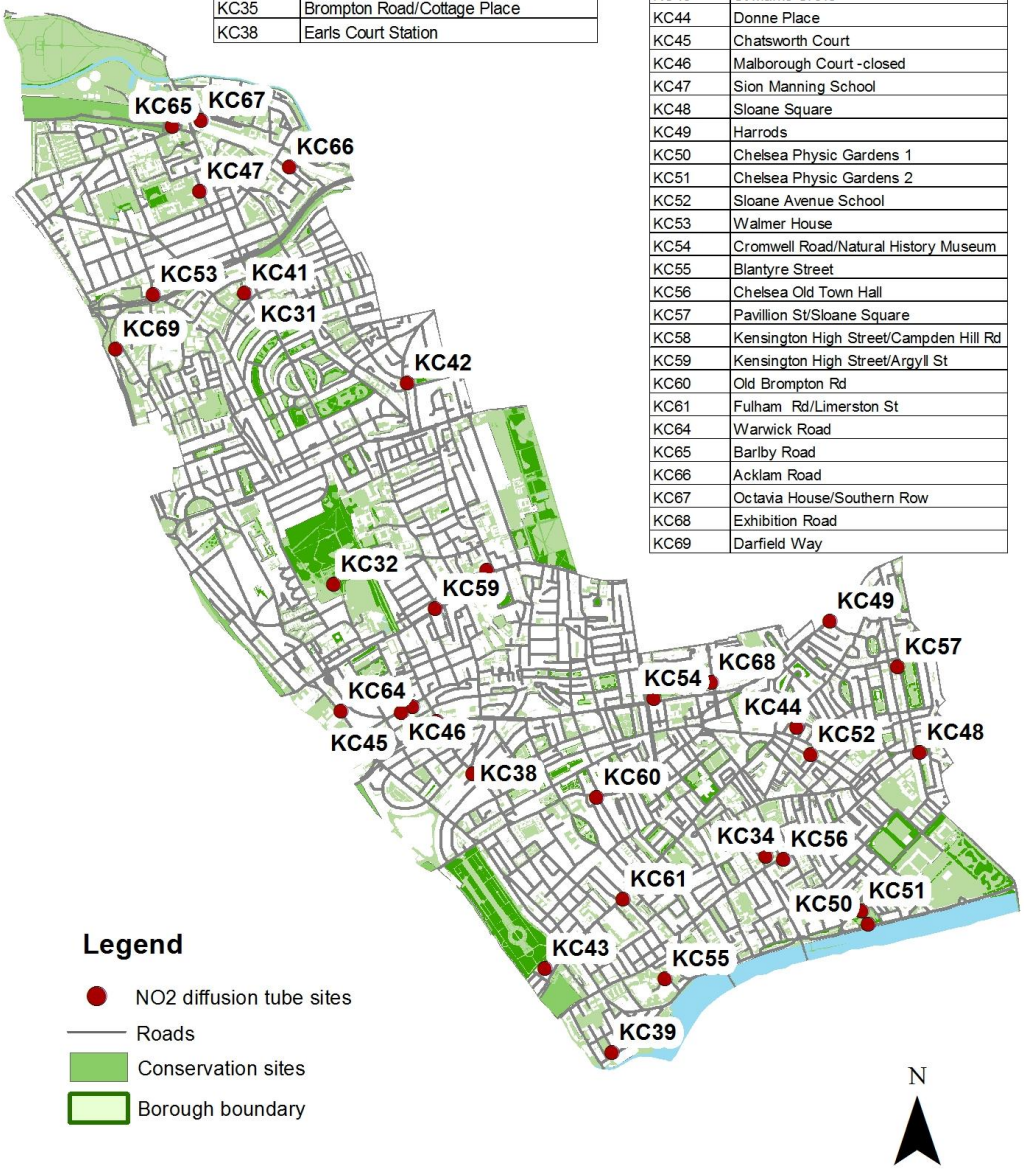
2.1.2 Non-Automatic Monitoring

Monitoring data for benzene and nitrogen dioxide (NO_2) 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 NO2 diffusion tubes. Further details on the laboratory, method, bias adjustment and quality control are in Appendix A.

Figure 2.2 Map of Non-Automatic Monitoring

Site code	Diffusion tube location
KC31	Ladbroke Grove/North Kensington Library
KC32	Holland Park
KC33	Cromwell Road/Earls Court Road
KC34	Dovehouse Street
KC35	Brompton Road/Cottage Place
KC38	Earls Court Station

Site code	Diffusion tube location
KC39	Lots Road/Upcerne Road
KC40	Brompton Road
KC41	Ladbroke Crescent
KC42	Pembridge Square
KC43	St Marks Grove
KC44	Donne Place
KC45	Chatsworth Court
KC46	Malborough Court -closed
KC47	Sion Manning School
KC48	Sloane Square
KC49	Harrods
KC50	Chelsea Physic Gardens 1
KC51	Chelsea Physic Gardens 2
KC52	Sloane Avenue School
KC53	Walmer House
KC54	Cromwell Road/Natural History Museum
KC55	Blantyre Street
KC56	Chelsea Old Town Hall
KC57	Pavillion St/Sloane Square
KC58	Kensington High Street/Campden Hill Rd
KC59	Kensington High Street/Argyll St
KC60	Old Brompton Rd
KC61	Fulham Rd/Limerston St
KC64	Warwick Road
KC65	Barlby Road
KC66	Acklam Road
KC67	Octavia House/Southern Row
KC68	Exhibition Road
KC69	Darfield Way



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Sites

Figure 2:1 Map of non-automatic benzene monitoring sites

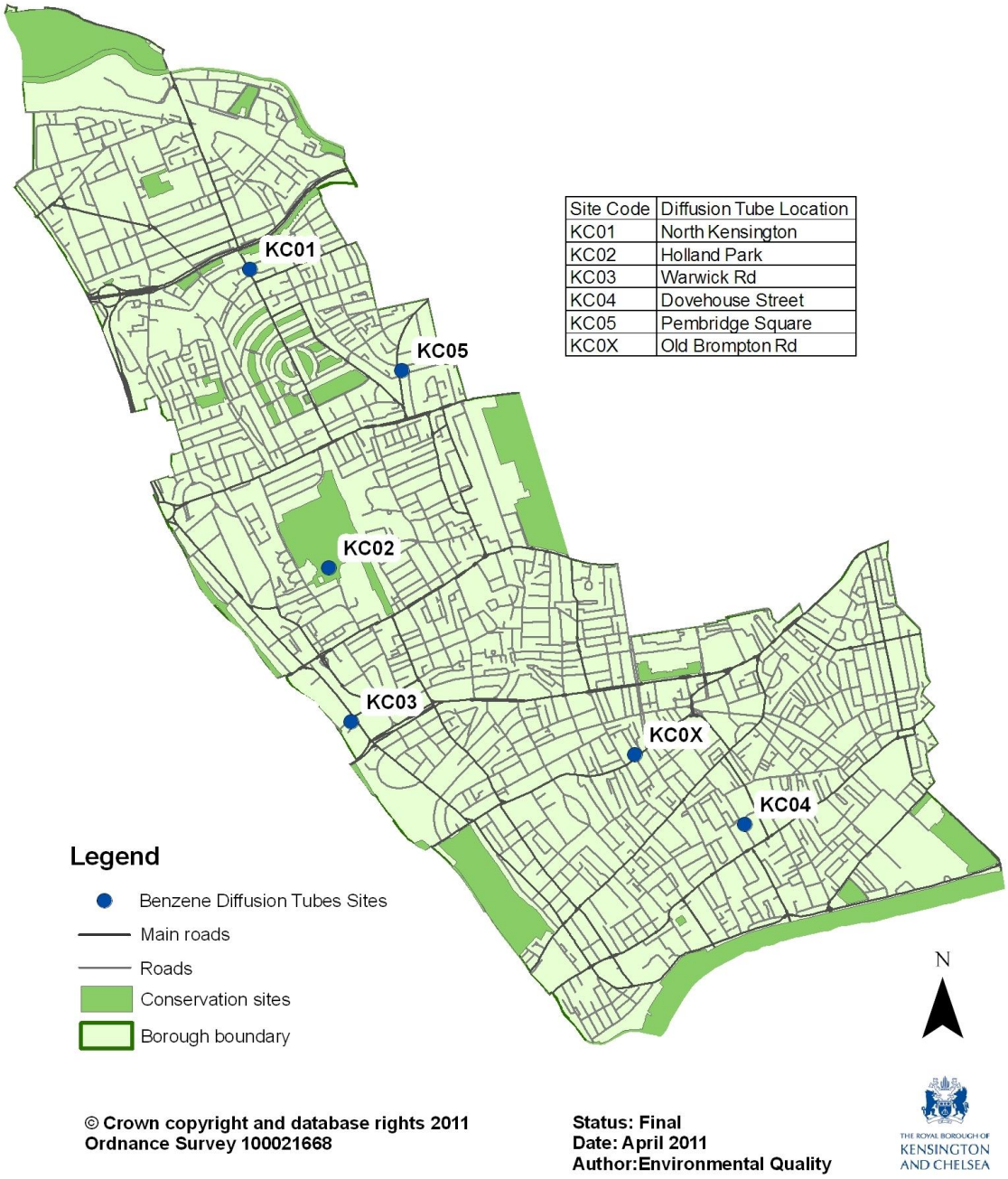


Table 2.2 overleaf provides further details of the 33 NO_2 and five benzene diffusion tube sites operating in the borough in 2014.

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)*	Worst-case Location?
KC31	Ladbroke Grove/Nth Ken Library	Roadside	X 524342	Y 181271	NO_2	Y	Y	3.5m	No
KC32	Holland Park	Urban Background	X 524784	Y 179599	NO_2	Y	Y	380m	No
KC33	Cromwell Rd/ Earls Court Rd	Roadside	X 525355	Y 178841	NO_2	Y	Y	1.1m	Yes
KC34	Dovehouse Street	Urban Centre	X 527164	Y 178103	NO_2	Y	Y	26m	No
KC35	Brompton Road/ Cottage Place	Roadside	X 527192	Y 179185	NO_2	Y	Y	8m	No
KC38	Earls Court Station	Roadside	X 525548	Y 178556	NO_2	Y	Y	1.7m	Yes
KC39	Lots Road/ Upcerne Road	Roadside	X 526317	Y 177022	NO_2	Y	Y	8.1m	No
KC40	Brompton Road	Urban Centre	X 527214	Y 179153	NO_2	Y	Y	65m	No
KC41	Ladbroke Crescent	Urban Background	X 524294	Y 181200	NO_2	Y	Y	70m	No
KC42	Pembridge Square Library	Roadside	X 525191	Y 180705	NO_2	Y	Y	6m	No
KC43	St Marks Grove	Urban Background	X 525950	Y 177487	NO_2	Y	Y	38m	No
KC44	Donne Place	Urban Background	X 527335	Y 178810	NO_2	Y	Y	55m	No
KC45	Chatsworth Court	Roadside	X 525263	Y 178936	NO_2	Y	Y	13m	No
KC46	Marlborough Court- closed	Roadside	X 525157	Y 178892	NO_2	Y	Y	8m	No
KC47	Sion Manning School	Urban Background	X 524046	Y 181758	NO_2	Y	Y	8.5m	No
KC48	Sloane Square	Roadside	X 528011	Y 178675	NO_2	Y	Y	7m	No
KC49	Harrods	Urban Centre	X 527516	Y 179395	NO_2	Y	Y	4m	Yes
KC50	Chelsea Physic Garden (Gate)	Roadside	X 527726	Y 177727	NO_2	Y	Y	4m	No
KC51	Chelsea Physic Garden (Met Station)	Urban Background	X 527690	Y 177800	NO_2	Y	Y	92m	No
KC52	Sloane Avenue	Roadside	X 527411	Y 178659	NO_2	Y	Y	2.6m	No
KC53	Walmer House	Urban Background	X 523792	Y 181189	NO_2	Y	Y	12.5m	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?
KC54	Cromwell Rd/ Natural History Museum	Roadside	X 526550	Y 178968	NO_2	Y	Y	3.1m	No
KC55	Blantyre St	Urban Background	X 526608	Y 177429	NO_2	Y	Y	100m	No
KC56	Chelsea Old Town Hall	Roadside	X 527268	Y 178089	NO_2	Y	Y	9m	No
KC57	Pavilion St/ Sloane Ave	Roadside	X 527889	Y 179145	NO_2	Y	Y	3m	No
KC58	Kensington H St/Kensington Church St	Roadside	X 525630	Y 179674	NO_2	Y	Y	13m	No
KC59	Kensington High St/Argyll St	Kerbside	X 525342	Y 179464	NO_2	Y	Y	0.7m	No
KC60	Old Brompton Rd/ Draycott Ave	Kerbside	X 526231	Y 178425	NO_2	Y	Y	0.7m	No
KC61	Fulham Rd/ Limerston St	Roadside	X 526377	Y 177867	NO_2	Y	Y	10m	No
KC64	Warwick Road	Roadside	X 524825	Y 178902	NO_2	Y	Y	3.5m	No
KC65	Barlby Road	Roadside	X 523899	Y 182113	NO_2	Y	Y	0.5m	No
KC66	Acklam Road	Railway	X 524541	Y 181893	NO_2	Y	Y	16m	No
KC67	Southern Row	Railway	X 524056	Y 182148	NO_2	Y	Y	38m	Yes
KC68	Exhibition Road	Kerbside	X 526863	Y 179060	NO_2	Y	Y	0.5m	Yes
KC69	Darfield Way	Background	X 523587	Y180893	NO2	Y	Y	11.7m	No
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 St	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_2). A short term objective of 200µg/m^3 not to be exceeded more than 18 times as a one hour mean, and a longer term objective of 40µg/m^3 as an annual mean. The deadline for achieving these objectives was the end of 2005. The whole of the borough was declared an Air Quality Management Area in 2000 on the basis that NO_2 and PM_{10} (to a lesser extent) would not meet their objectives.

Monitoring data

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

Automatic Monitoring Data

Continuous monitoring is undertaken at five sites in the borough. Details of these sites are included in Table 2.11. 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 2.1 Results of automatic monitoring for nitrogen dioxide: comparison with annual mean objective

Site ID	Location	Within AQMA?	% Data Capture calendar year 2014	Annual mean concentrations (µg/m^3)				
				2010	2011	2012	2013	2014
KC1	North Kensington	Y	99	37	36	37	37	*33*
KC5	Earls Court	Y	91	**113**	**100**	**101**	**95**	***93***
KC2	Cromwell Rd 2	Y	57	**74**	**66**	**69**	**60**	***56****
KC3	Knightsbridge	Y	98	**91**	**81**	**92**	**90**	***71***
KC4	Kings Road Chelsea	Y	95	**91**	**91**	**92**	**84**	***73***
AURN	Marylebone Rd	Y	99	**98**	**97**	**94**	**85**	***79***

*Data capture for Cromwell Rd site is 69% (2013) and 57% (2014). 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 for 2014 are shown in Table 2.3 (data for 2013 has also been updated following that reported in the previous progress report with some concentrations being revised upward after final data ratification had been completed). All sites showed a drop in levels compared to the 2013; especially significant are the reductions at the Knightsbridge and Chelsea monitoring sites (this should be treated with some caution as data for 2014 is not fully ratified). However all sites other than the background site remain significantly

above the annual mean NO_2 objective level of 40 µg/m^3 and by more than twice the concentration at one location.

Figure 2.4 shows the longer term trend since 2000 in the borough (plus one other site in central London). All continuous monitoring sites have seen concentrations decline compared to 2013, showing the first significant reduction in annual mean levels for some time.

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

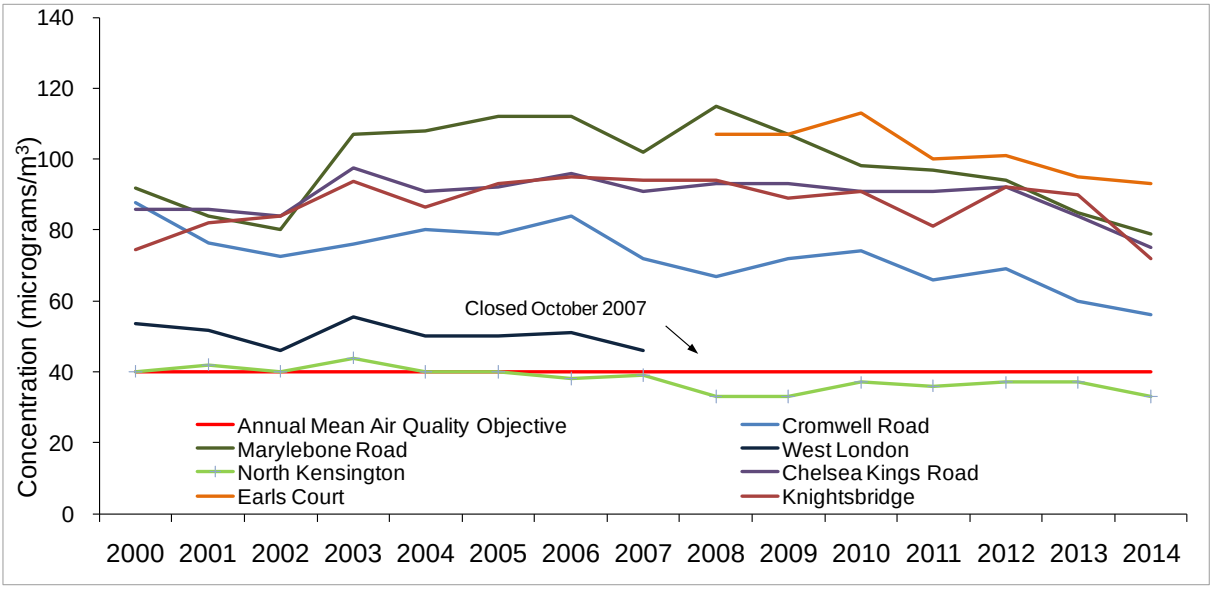


Table 2.2 Results of automatic monitoring for nitrogen dioxide: comparison with 1-hour mean objective

Site ID	Location	Within AQMA ?	% Data Capture calendar year 2013	Number of Exceedences of hourly mean (200 µg/m^3). Where valid data is less than 90% the 99.8th percentile of hourly means is shown in brackets				
				2010	2011	2012	2013	2014
KC1	North Kensington	Y	99	0	0	1	0	*0*
KC5	Earls Court*	Y	91	**515**	**386**	**323**	**140**	***212***
KC2	Cromwell Rd 2	Y	57	1	4	2	0	*0*(119.7)*
KC3	Knightsbridge	Y	98	**307**	**181**	**500**	**466**	***109***
KC4	Kings Road Chelsea	Y	95	**63**	**76**	**74**	**47**	*5*
AURN	Marylebone Rd	-	99	**534**	**222**	**132**	**59**	12

2014 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).

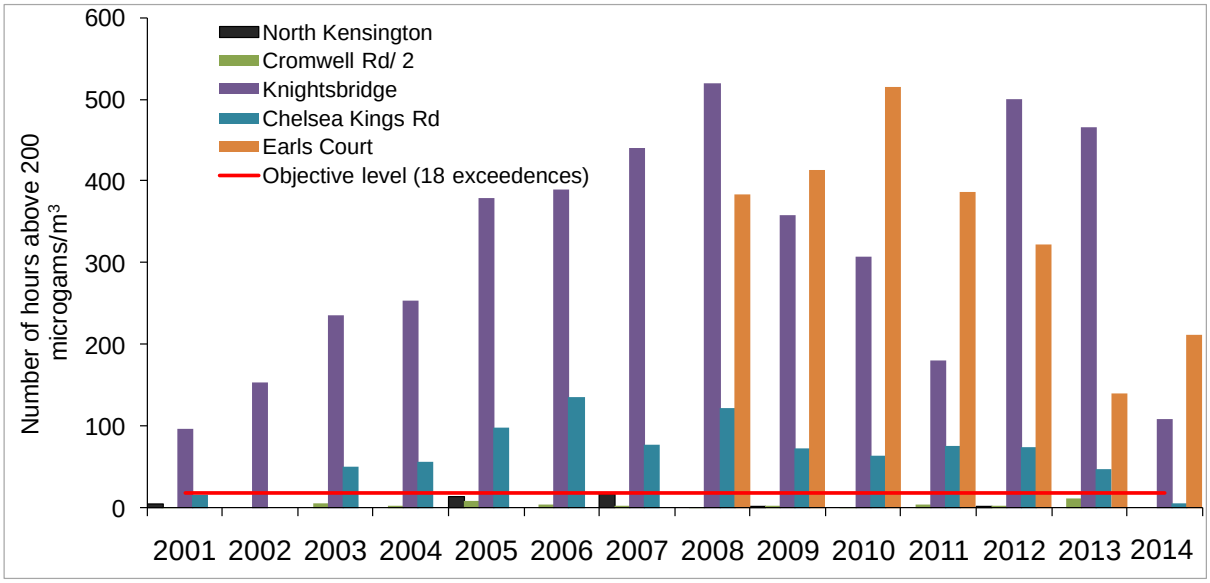
Table 2.4 shows exceedences of the hourly mean (above 200µg/m^3) for NO_2. The preliminary data shows considerable variation from site to site, with no exceedences at the background site and Cromwell Road (low data capture rate), however there were between 5 and 212 exceedences at the remaining sites. Only 18 exceedences are permitted. Levels have dropped compared to 2013 at three sites in the borough however the levels have

increased at the Earls Court site. Only two sites, compared to the previous year when three, sites, exceeded the hourly mean objective.

The significant differences in the number of exceedences illustrate that local site characteristics and vehicle fleet mix at each location play a very important part. Two of the five sites in the borough exceed the objective by a very wide margin.

The chart below shows the number of hourly exceedences measured at sites in the borough since 2001 (monitoring at Earls Court began in 2008). As mentioned, the hourly objective should not be exceeded more than 18 times in a year. The highest exceedences were measured in 2008 at the Knightsbridge site and at the Earls court site in 2010.

Figure 2:3 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 NO_2 was collected at 34 locations in 2014, including a site at Darfield Way. The details of all the diffusion tube sites can be found in Table 2.2, in addition Appendix B shows a map of diffusion tubes and residential properties in the borough.

Table 2.5 (overleaf) presents the factored annual mean concentrations for 34 sites in 2014. 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 at the borough's AURN affiliated site at North Kensington. The bias adjustment factor for 2014 has been calculated as 1.03. Details of the analytical laboratory and bias adjustment methodology are described in Appendix A.

The results indicate that 27 sites were above the objective level. Of these, nine are at risk of exceeding the hourly mean objective i.e. where the annual mean is above 60$\mu g/m^3$ (underlined). This is consistent with the results from the continuous monitoring sites. The highest annual mean concentrations were recorded outside Earls Court station and at the junction of Cromwell Road/Earls Court Road. Those not exceeding the objective were largely urban background sites such as Holland Park, Chelsea Physic Garden and Sion Manning School.

A comparison of annual mean levels showed that all sites measured lower concentrations in 2014 compared to 2013.

Overall nitrogen dioxide conclusions

Despite some improvements in nitrogen dioxide levels at some sites, the borough continues to exceed the annual mean objective by an appreciable margin. The annual mean is exceeded at four out of five of the boroughs continuous sites and twenty-seven of the diffusion tube sites. Reductions of almost 60$\mu g/m^3$ are required at the worst road side positions; up to 40$\mu g/m^3$ are required at building facade locations on busy and congested roads, e.g. at distances of 8m as typified by the Kings Road/Knightsbridge sites. Roads which are less trafficked or where better dispersal characteristics exist, reductions of a few micrograms to 20$\mu g/m^3$ 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 exceeded at two out of five of the continuous roadside monitoring sites and is likely to be exceeded at approximately at just under a third of diffusion tube monitoring locations.

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 for this borough and other parts of inner London to meet the EU objectives by 2015.

Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes (2010 to 2014)

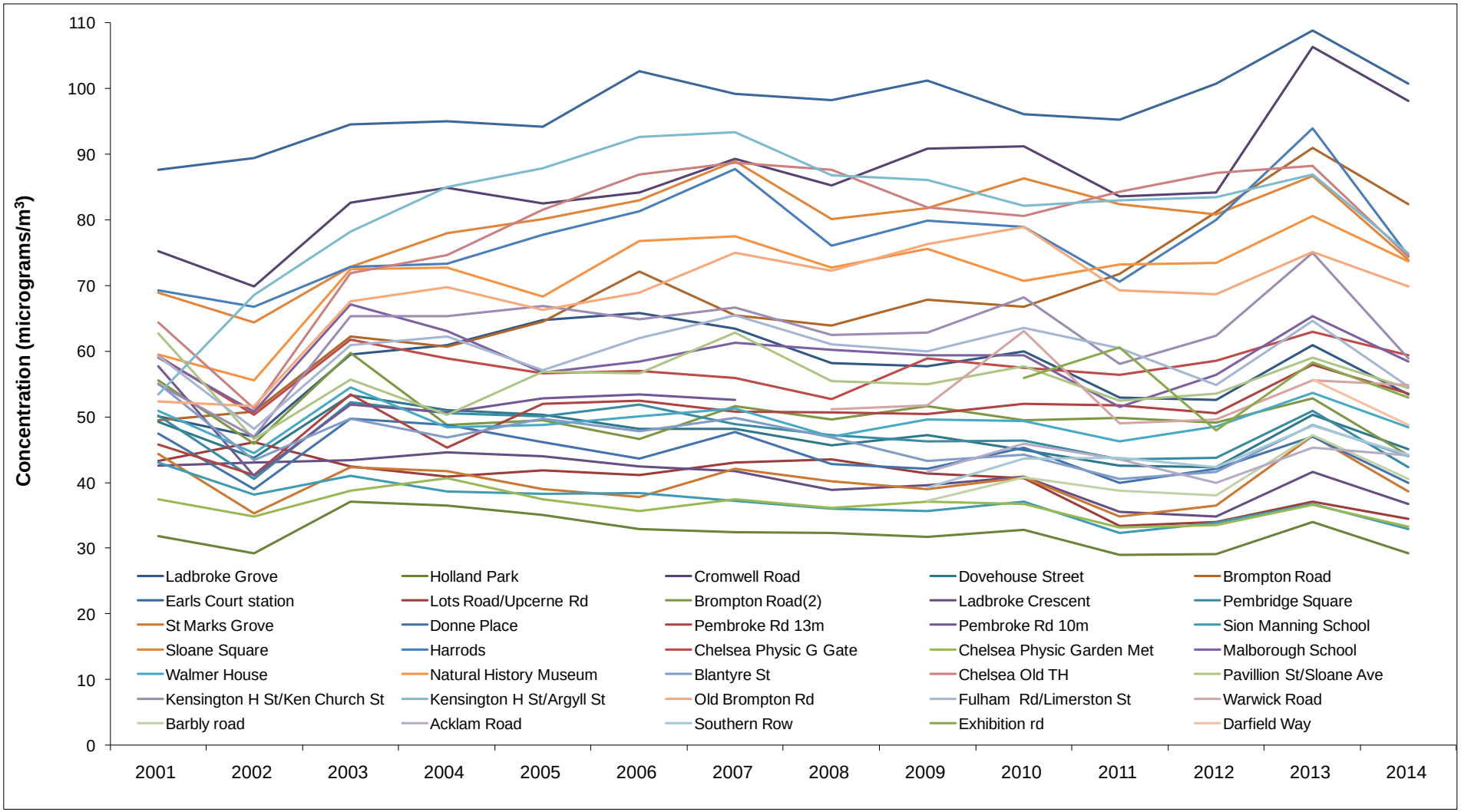
Site ID	Location	Within AQMA?	2014 Data Capture No. of months	Annual mean concentrations (μg/m^3) Adjusted for bias (shown below)				
				2010 1.06	2011 1.02	2012 1.04	2013 1.14	2014 1.03
KC31	Ladbroke Grove/Nth Ken Library	Y	11	**60.0**	**52.9**	**52.6**	**60.9**	**53.5**
KC32	Holland Park	Y	12	32.8	29.0	29.1	34.0	29.2
KC33	Cromwell Road/Earls Court Rd	Y	12	**91.2**	**83.6**	**84.2**	**106.3**	**98.2**
KC34	Dovehouse Street	Y	12	**44.9**	**42.6**	**42.4**	**50.3**	**45.1**
KC35	Brompton Road/Cottage Place	Y	10	**66.8**	**71.8**	**81.3**	**90.9**	**82.4**
KC38	Earls Court Station	Y	12	**96.1**	**95.3**	**100.7**	**108.8**	**100.7**
KC39	Lots Road/Upcerne Road	Y	12	**40.7**	33.4	34.0	37.1	34.5
KC40	Brompton Road	Y	12	**49.5**	**49.9**	**49.1**	**52.9**	**44.1**
KC41	Ladbroke Crescent	Y	12	**40.9**	35.5	34.8	**41.7**	36.7
KC42	Pembridge Square Library	Y	12	**46.4**	**43.5**	**43.8**	**50.9**	**42.4**
KC43	St Marks Grove	Y	11	**40.8**	34.8	36.5	**47.1**	38.7
KC44	Donne Place	Y	11	**45.3**	**39.9**	**42.1**	**47.0**	40.0
KC45	Chatsworth Court	Y	12	**52.0**	**51.7**	**50.5**	**57.9**	**53.5**
KC47	Sion Manning School	Y	12	37.1	32.3	33.8	36.7	32.9
KC48	Sloane Square	Y	12	**86.3**	**82.4**	**80.8**	**86.6**	**73.9**
KC49	Harrods	Y	12	**79.0**	**70.6**	**80.0**	**94.0**	**74.5**
KC50	Chelsea Physic Garden (Gate)	Y	12	**57.5**	**56.4**	**58.5**	**62.9**	**59.4**
KC51	Chelsea Physic Garden (Met Station)	Y	12	36.8	33.2	33.5	36.6	33.3
KC52	Sloane Ave. nr Marlborough school	Y	12	**59.4**	**51.5**	**56.5**	**65.3**	**58.4**
KC53	Walmer House	Y	12	**49.4**	**46.3**	**48.5**	**53.6**	**48.4**
KC54	Cromwell Rd/Natural History Museum	Y	12	**70.7**	**73.2**	**73.4**	**80.6**	**73.7**
KC55	Blantyre St	Y	12	**44.3**	**40.6**	**41.7**	**48.8**	**44.1**
KC56	Chelsea Old Town Hall	Y	12	**80.6**	**84.3**	**87.1**	**88.2**	**74.4**
KC57	Pavilion St/Sloane Ave	Y	11	**57.7**	**52.5**	**53.5**	**59.0**	**54.4**
KC58	Kensington H St/Kensington Church St	Y	11	**68.2**	**58.1**	**62.4**	**75.0**	**58.9**
KC59	Kensington H St/Argyll St	Y	12	**82.2**	**83.0**	**83.4**	**86.9**	**74.9**
KC60	Old Brompton Rd/Draycott Ave	Y	12	**78. 9**	**69.3**	**68.6**	**75.1**	**69.9**
KC61	Fulham Rd/Limerston St	Y	12	**63.5**	**60.5**	**54.9**	**64.7**	**54.6**
KC64	Warwick Rd	Y	12	**63.0**	**49.0**	**49.6**	**55.5**	**54.8**
KC56	Barlby Road*	Y	12	**40.8**	38.8	38.0	**47.2**	**40.5**
KC66	Acklam Road*	Y	11	**45 9**	**43.5**	39.9	**45.4**	**44.2**
KC67	Southern Row*	Y	11	**43.6**	**43.8**	**42.3**	**48.7**	**44.2**
KC68	Exhibition Road	Y	12	**55.9**	**60.6**	**48.0**	**58.3**	**52.9**
KC69	Darfield Way	Y	12					**48.7**

KC47 and KC54 are the mean results of triplicate exposure. Additionally KC47, KC49, KC54 and KC56 are all co-located with continuous analysers. **Bold** indicates an exceedence of the annual mean objective of 40 μg/m^3 (Table 1.1). Underlined figures indicate a risk that the 1-hour objective may also be exceeded.

[c] Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year.

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

Figure 2.4 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites



2.2.2 Particulate Matter (PM_{10})

There are two objectives for particulate matter (PM_{10}), to be achieved by 2004, which are incorporated in the Air Quality Regulations; 40µg/m^3 as an annual mean and 50µg/m^3 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_{10} objectives at certain locations.

Monitoring data PM_{10}

Monitoring of PM_{10} 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. The monitoring data included in the report includes monitoring data from a number of different methods, including TEOM, FDMS and partisol instruments. Where TEOM data has been included the Volatile Correction Method (VCM) correction factors have been included. 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 that 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.

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 2010 and 2014. Data for partisol instruments at Marylebone Road and North Kensington was not available from the Defra Archive at the time of preparing this report.

All monitoring sites within the borough met the annual mean objective level in 2014. Only small increases have been observed at North Kensington and Cromwell Road however it is important to note that the more stringent objective for PM10 was never adopted.

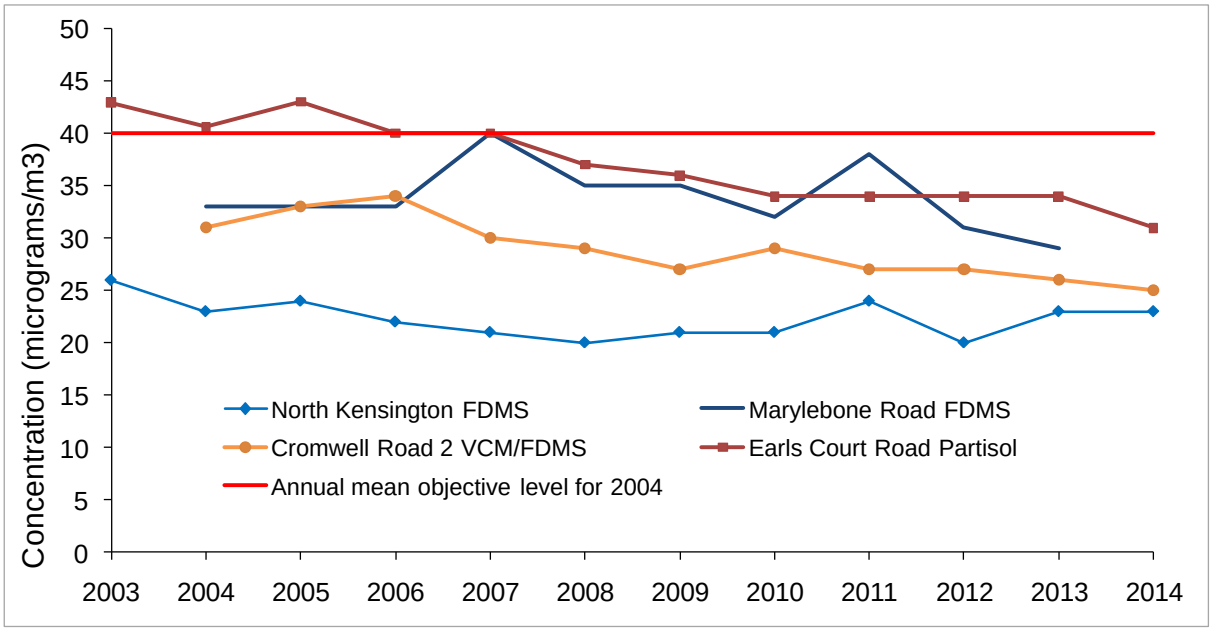
Table 2.3 Results of PM_{10} automatic monitoring: comparison with annual mean objective

Site ID	Location and method	Adjst. Method	Within AQMA ?	Data Capture %					Annual mean concentrations ($\mu g/m^3$)				
				2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
KC1	N Kensington TEOM	VCM	Y	96	93	97	99	96	20	23	20	23	17
KC1	N Kensington FDMS	None	Y	64	84	81	95	74	21	24	20	23	*23*
AURN	N Kensington Partisol	None	Y	95	95	98	98	N/A	16	19	18	*19*	*N/A*
KC2	Cromwell Rd 2 VCM corrected /FDMS from 2010	VCM	Y	62	74	67	91	63	29	27	27	26	*25*
KC5	Earls Court Partisol	None	Y	98	87	96	87	92	34	33	34	34	*31*
AURN	Marylebone Rd TEOM	VCM	-	96	97	93	99	97	35	41	37	33	31
AURN	Marylebone Rd FDMS	none	-	91	93	85	94	93	32	38	31	29	26
AURN	Marylebone Rd Partisol	none	-	82	81	96	98	N/A	30	35	32	*29*	*N/A*

Data in *italics* is provisional and should be treated with caution.

The chart below (Figure 2.7) indicates that sites in the borough over the longer term have show an overall downward trend though more recently concentrations have remained steady at north Kensington between 2013 and 2014.

Figure 2:4 Trends in annual mean PM_{10} 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 in the borough met the daily mean objective level including the Earls Court site which met the objective for the first time since 2010. There continues to be a notable number of days above 50µg/m^3, 10 at North Kensington, 11 at Cromwell Road, and 25 at Earls Court, though these are within the objective level.

Table 2.4 Results of PM_{10} automatic monitoring: comparison with 24-hour mean objective

Site ID	Location and method	Factor	Within AQMA ?	Data Capture %					Number of exceedences of 24 hourly mean >50 µg/m^3 - 35 are permitted 90th %tile shown in brackets where data capture less than 90 %				
				2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
KC1	N. Kensington TEOM	VCM	Y	96	93	97	99	96	3	15	7	9	*0*
KC1	North Kensington FDMS		Y	65	84	81	95	74	3	17	12	9	*10 (36.7)*
AURN	North Kensington Partisol	None	Y	95	95	98	98	N/A	2	14	11	*8*	*N/A*
KC2	Cromwell Rd2 TEOM/FDMS	VCM to 2010	Y	62	74	67	91	63	11	8 (42.1)	13	12	*11 (39.1)*
KC5	Earls Court Partisol	None	Y	90	98	96	87	92	30	42	43	39	*25*
AURN	Marylebone Rd TEOM	VCM	Y	96	97	93	99	97	46	76	44	29	17
AURN	Marylebone Rd FDMS	none	-	91	93	85	94	93	22	57	23	21	14
AURN	Marylebone Rd Partisol	none	-	82	81	96	98	N/A	15	34	27	*23*	*N/A*

Data in *italics* is provisional and should be treated with caution.

Figure 2:5 Trends in daily mean PM_{10} concentrations measured at all monitoring sites

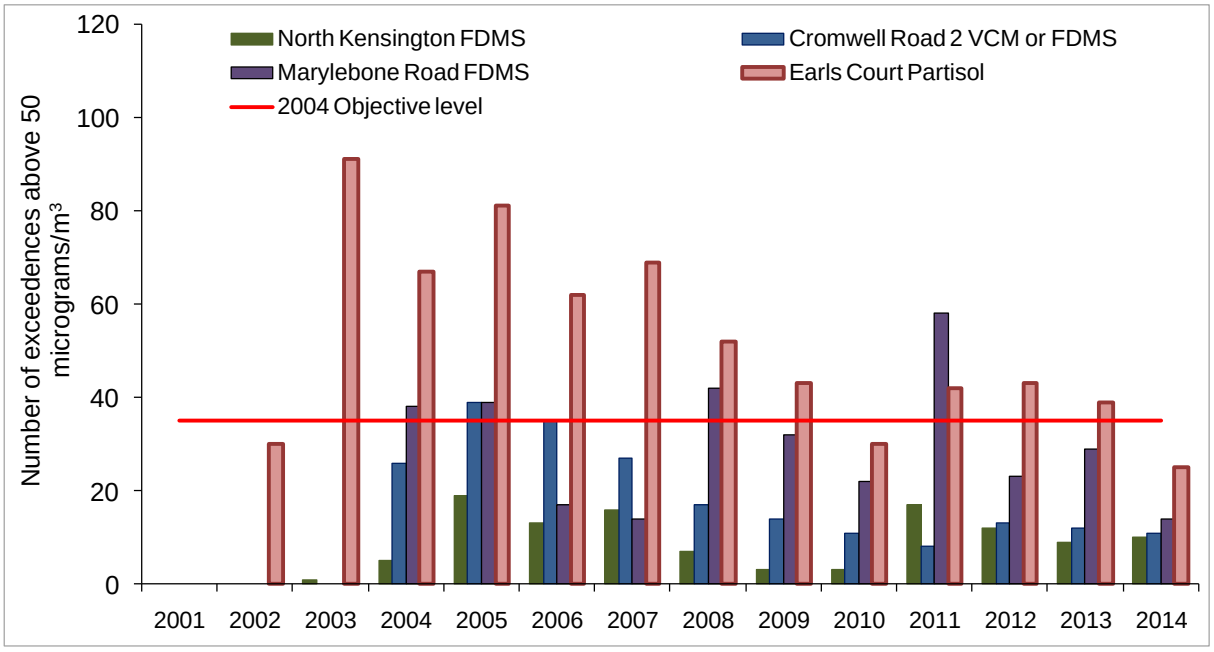


Figure 2.8 shows the longer term trend in number of 24hr periods exceeding the permitted allowance of 35. There is considerable variation in the number of exceedences from year to year but overall they have declined over the long term.

PM_{10} 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_{10} since 2008 and for the first time the daily mean objective has been met at the at the Earls Court site too since 2010. However it is important to note that there may be 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.

Particulate Matter ($PM_{2.5}$)

The Air Quality Strategy[1] set a cap of 25µg/m^3 for particulate matter ($PM_{2.5}$) and a likely target of a 15 per cent reduction in annual mean concentrations at urban background locations by 2020. However, local authorities are not required to report against these exposure reduction targets. Due to the health concerns this $PM_{2.5}$ metric will become increasingly more relevant.

Monitoring data

Monitoring of $PM_{2.5}$ is only undertaken at a relatively small number of locations in the London area. $PM_{2.5}$ 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). It has also been measured at Cromwell Road since the autumn of 2009.

Table 2.8 shows Annual mean $PM_{2.5}$ data for sites in the borough and two other central London sites for comparison purposes. These results indicate that levels at these locations are currently within the cap level. An increase in the annual mean was measured at the North Kensington site between 2013 and 2014. The annual mean at Cromwell Road cannot be reported due to the elimination of much of the data due to a suspect air drier as well as poor data capture due to site issues. There were some reductions at Marylebone Road and Bloomsbury sites.

Table 2.5 Annual mean $PM_{2.5}$ levels

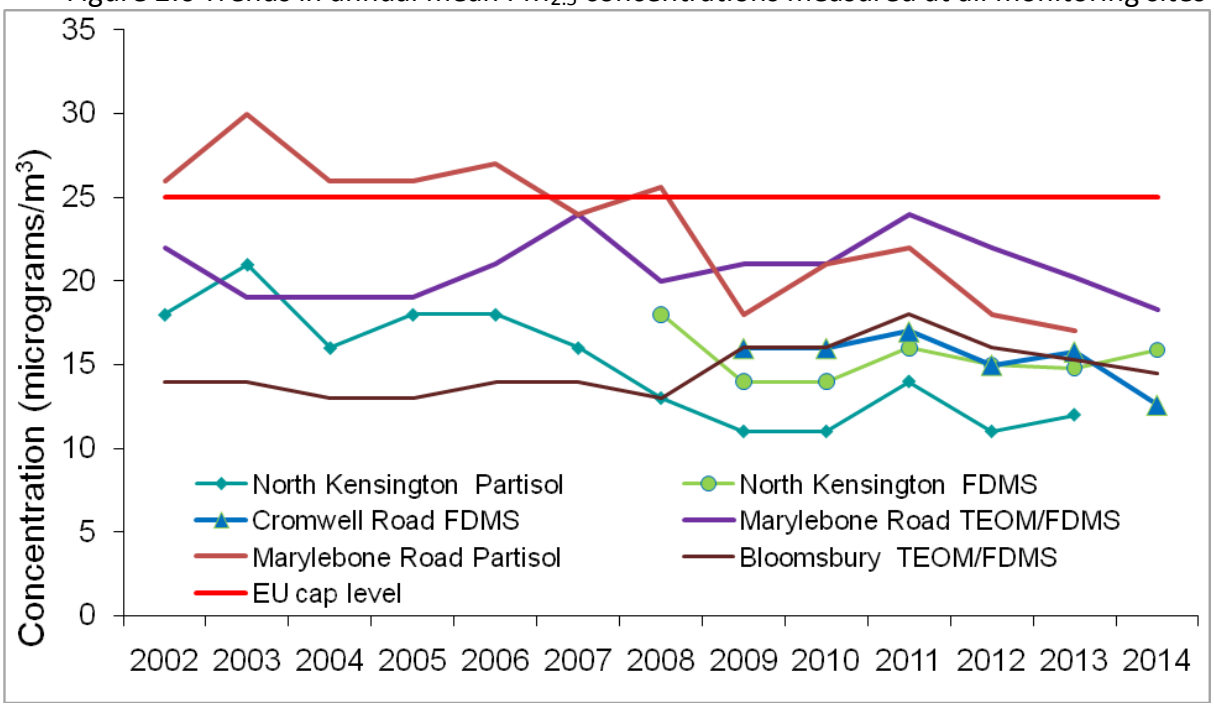
Site ID	Location	Within AQMA ?	Data Capture %					Annual mean concentrations (Cap Level 25µg/m3) (µg/m^3)				
			2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
KC1	North Kensington FDMS	Y	93	92	89	97	77	14	16.4	14.5	14.7	15.9
AURN	N Kensington Partisol	Y	88	87	94	95	95	11	14	11	12	*10*
KC2	Cromwell Rd 2 FDMS	Y	14	41	75	90	N/A	16	16.6	14.8	15.8	*N/A*
AURN	Bloomsbury TEOM/FDMS	-	89	98	98	62	94	16	17.5	16.2	11.7*	14.5
AURN	Marylebone Rd FDMS	-	58	95	92	96		21	24.5	21.6	20.1	18.3
AURN	Marylebone Rd Partisol	-	28	82	80	99	99	21	22	18	17	*16*

Data in *italics* is provisional. * Bloomsbury following ratification annual mean reduced due to low data capture
Cromwell Rd 8% data capture – annual mean 12.6 µg/m^3

1 Defra (2007) The Air Quality Strategy for England, Scotland, Wales, and Northern Ireland

The figure below shows concentrations have been below the EU cap level since 2002 for sites in the borough based on the sites where it is monitored. Overall the levels in more recent years appear to be lower compared to the period prior to 2008. This may be in part due to changes in the monitoring networks which affected the equipment and methods used, note for example, the difference in results measured by partisol and FDMS units at North Kensington.

Figure 2:6 Trends in annual mean $PM_{2.5}$ concentrations measured at all monitoring sites



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 $PM_{2.5}$ concentrations for 2009-2011. The average $PM_{2.5}$ concentration for 2009-2011 was calculated as being between 13-14 µg/m^3, based on data from Jan 2009 to Jul 2012 from 47 $PM_{2.5}$ stations; this would require the UK to comply with a 15% reduction target for 20202. The estimated reduction that would be required is an average concentration of around 2.0µg/m^3. It is therefore important that measures to reduce $PM_{2.5}$ are not deferred by an apparent meeting of PM_{10} objectives.

2 PM2.5 Average Exposure Index Report for Defra and the Devolved Administrations AEAT/ENV/R/3241 ED57002030 01/12/2011

2.2.3 Sulphur Dioxide (SO_2)

Three objectives have been set for sulphur dioxide (SO_2), a one hour mean of 350 µg/m^3 (not to be exceeded more than 24 times per year), a 24 hour mean of 125µg/m^3 (not to be exceeded more than 3 times per year) and a 15 minute mean of 266 µg/m^3 (not to be exceeded more than 35 times per year).

Monitoring data

Monitoring data is currently collected at one site 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.

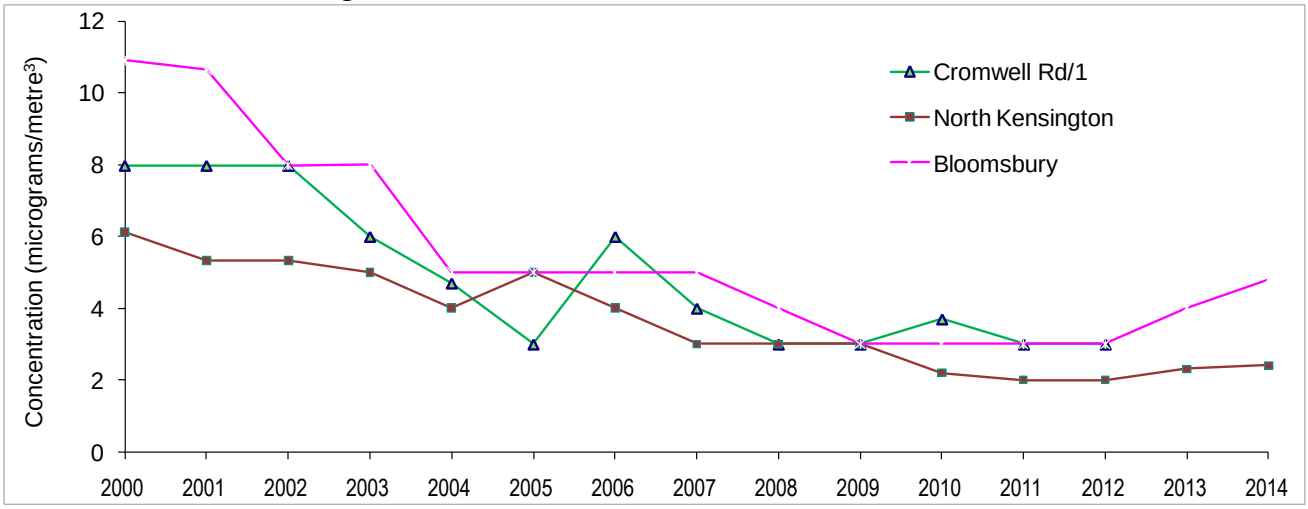
Table 2.6 Results of sulphur dioxide automatic monitoring: comparison with objectives

Site ID	Location	Within AQMA ?	Data Capture 2014 %	Annual Mean	Number of Exceedences 2014		
					15-minute Objective (266 µg/m^3)	1-hour Objective (350 µg/m^3)	24-hour Objective (125 µg/m^3)
KC1	North Kensington	Y	94	2.4	0	0	0
AURN	Bloomsbury	-	93	4.8	3	0	0

Cromwell Road ceased to operate as an AURN station in September 2012 therefore no data for SO2 was collected since then. No exceedences of any of the objectives were observed at North Kensington. Annual mean levels increased slightly compared to 2013. Elevated SO_2 does occasionally 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.

Figure 2.10 shows annual mean data since 2000 while there has been a decline in concentrations over the longer term more recently levels have increased a little. The 15 minute, one-hour, and 24 hour mean objectives for SO_2 continue to be met in the borough.

Figure 2:7 Trends in Annual Mean Sulphur Dioxide Concentration Measured at Automatic Monitoring Sites



2.2.4 Benzene

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

Monitoring Data

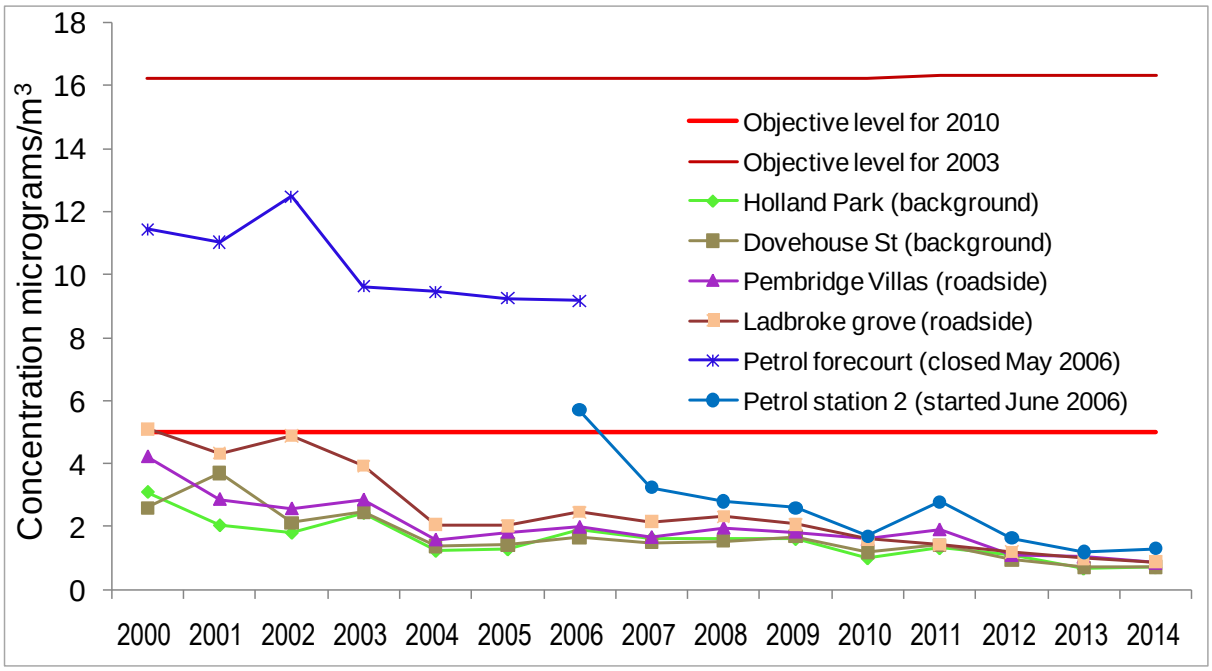
We currently undertake sampling at five locations using diffusion tubes, these include two roadside, two background, and one site in close proximity to a petrol station forecourt. The petrol station has operated stage two (in addition to stage one) vapour recovery since 2007. The highest levels of benzene 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 (16.25μg/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 2014 show almost no change apart from a small increase at the petrol station site and a small decrease at Ladbroke Grove.

Table 2.10 Annual average benzene levels using diffusion samplers (μg/m3)

Year	KC01 Ladbroke Grove/Nth Ken Library	KC02 Holland Park	KC03 Warwick Rd Petrol St. (forecourt)	KC04 Dovehouse St	KC05 Pembridge Square Library	KC0X Old Brompton Rd/Clareville Grove Petrol St
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
2012	1.2	1.1	-	1.0	1.1	1.6
2013	1.0	0.7	-	0.7	0.9	1.2
2014	0.9	0.7	-	0.7	0.8	1.3

Figure 2:8 (overleaf) shows the longer term trend. After an initial steep decline, all sites (apart from the petrol station site) have generally shown a much more gradual reduction with little change between 2013 and 2014.

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



Other pollutants monitored

Polycyclic Aromatic Hydrocarbons (PAHs)

Polycyclic Aromatic Hydrocarbons (PAHs) are a complex mixture of organic compounds some of which are carcinogens. Because it would be very difficult and expensive to monitor a selection of these pollutants the Government has selected benzo(a)pyrene (BaP) as a marker for PAHs and set an objective based on this pollutant: 0.25ng/m^3 [3] as an annual average to be achieved by the end of 2010. Whilst this objective has been set, it has not been included in regulations for local air quality management purposes.

In addition the EU Fourth Daughter Directive has set a target value for polycyclic aromatic hydrocarbons (PAH) which is also defined in terms BaP. The annual mean value may not exceed 1 ng/m3. The target value enters into force 31.12.2012. The main source of BaP is residential and commercial combustion of coal and wood; other sources include industrial combustion, metal production and road transport.

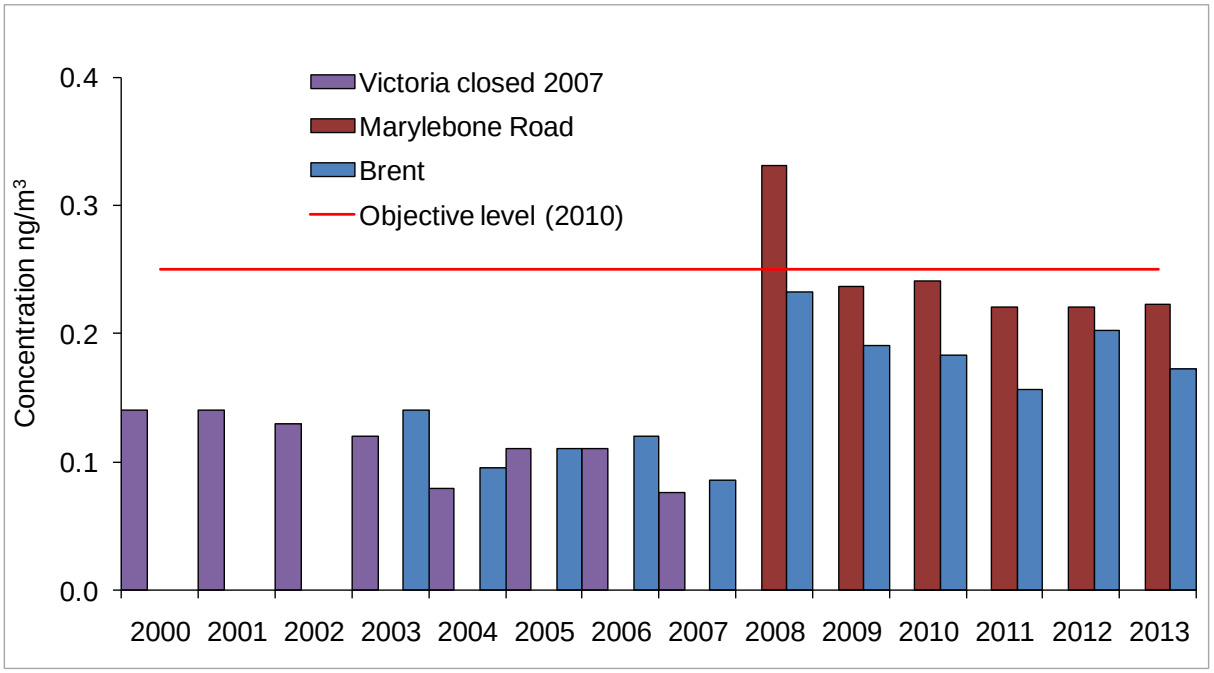
Monitoring data from the London area (Brent, Marylebone Road and historically Victoria) has been included in this report (the monitoring method at Brent changed between 2007 and 2008. Marylebone Road monitoring began in 2008).

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

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

of 2013 is available. More recent data is not available due to the non availability of the Defra AQ archive. Based on 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 are below the objective level.

Figure 2:8 Trends in Annual Mean Benzo(a)pyrene Concentration Measured at Monitoring Sites in London



As the borough has no industrial processes and relatively little coal and wood burning, concentrations of BaP 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_3)

The objective for ozone (O_3) is 100µg/m^3 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_x) 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_x emitted from vehicle exhaust and building flues will react with ozone removing it from the atmosphere.

Figure 2:9 shows levels of ozone at a background location in the borough, in comparison to the objective level (as shown by the red line). There has been no clear overall trend between 2000 to the present time. In 2014 the number of exceedences were just below the objective level.

Figure 2:9 Trends in the 8-hour ozone exceedences measured at automatic monitoring sites

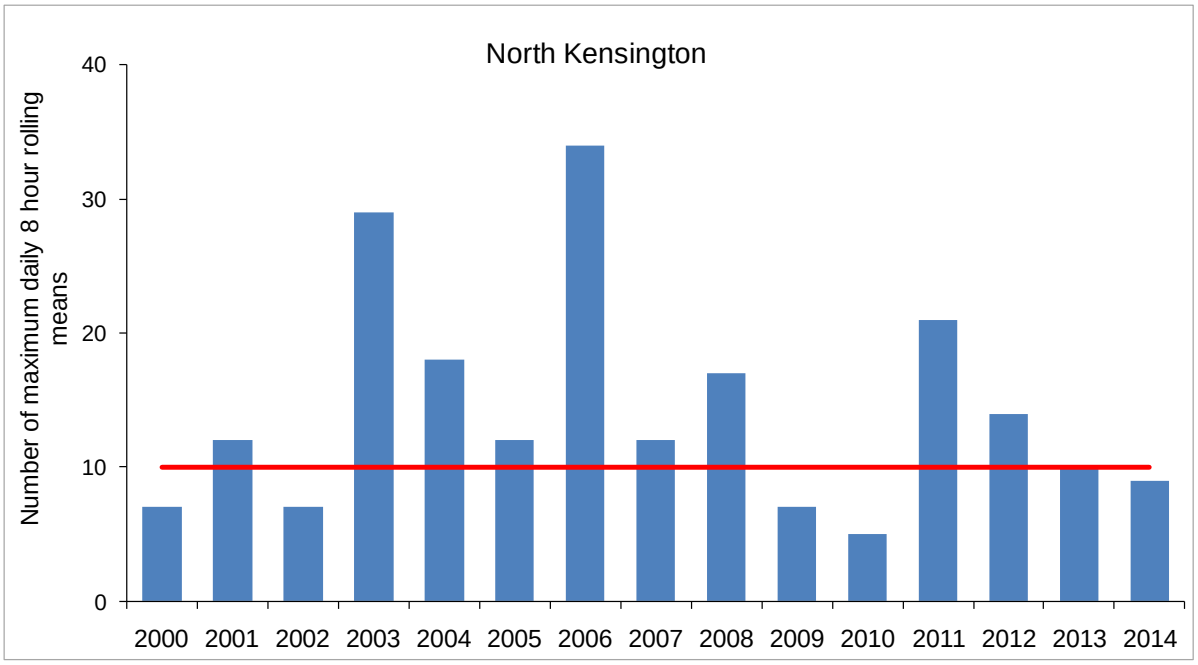
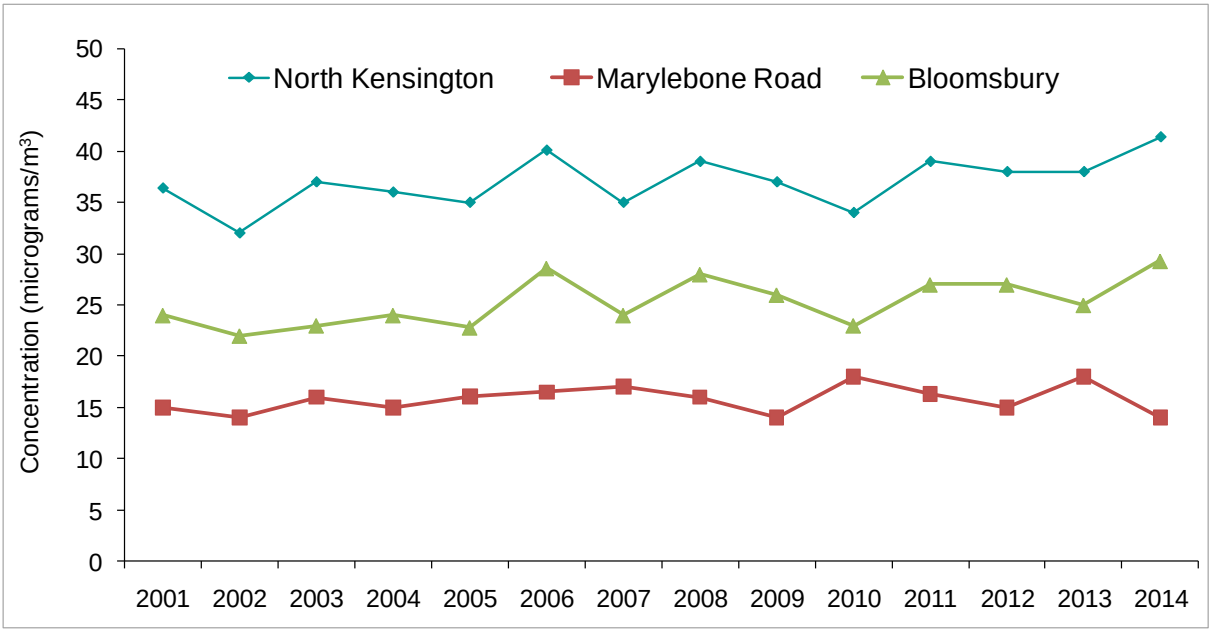


Figure 2:13 overleaf shows annual mean levels of ozone measured at North Kensington, Bloomsbury (background site) and Marylebone Road (a roadside location site) from 2001. Marylebone Road and Bloomsbury are located outside the borough but are useful in showing a range of concentrations. Concentrations 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 in the borough particularly between 2013 and 2014.

Figure 2:10 Trends in annual mean ozone concentrations measured at automatic monitoring sites in the bough and other central London sites



Lead

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

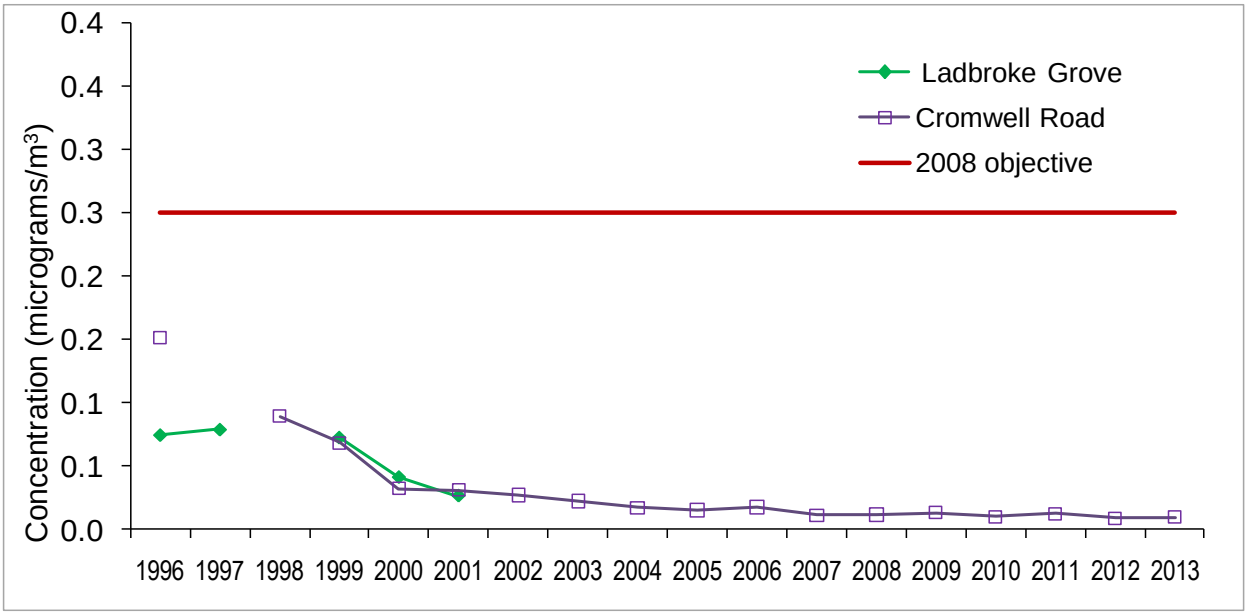
Lead monitoring in the borough is undertaken by Defra at the Cromwell Road monitoring site. Monitoring was previously also undertaken by the Council at Ladbroke Grove. When leaded petrol was phased out, monitored levels dropped significantly so the decision was taken to close the site at the end of 2001. No further update is available for 2014 as lead monitoring is no longer undertaken by Defra at this site.

Table 2.7 Annual Mean Lead levels within the Borough

Year	Ladbroke Grove (µg/m^3)	Cromwell Rd (µg/m^3)
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	-	0.012
2012	-	0.009
2013	-	0.009

However as the objectives for 2004 and 2008 have been met at the Ladbroke Grove site since 1992 and at the Cromwell Road site from 1994, no change is expected**.** The chart below showing long term monitoring data shows a downward trend between the late 1990s and 2000. However in the past few years levels have stabilised.

Figure 2:11 Trends in Annual Mean Lead Concentrations



Carbon Monoxide (CO)

The objective for carbon monoxide (CO) is 10 mg/m^3 [4] as a maximum daily 8 hour running mean. CO monitoring data recorded in the borough since 2007 (monitoring is no longer carried out at Cromwell Road following the closure of the gaseous analysers by Defra) is shown in Table 2.11 including data from one other busy kerbside location from central London (Marylebone Road). Data recorded in 2013 shows we continue to meet the objective.

Table 2.8 Concentrations of CO in the Borough and at one central London site

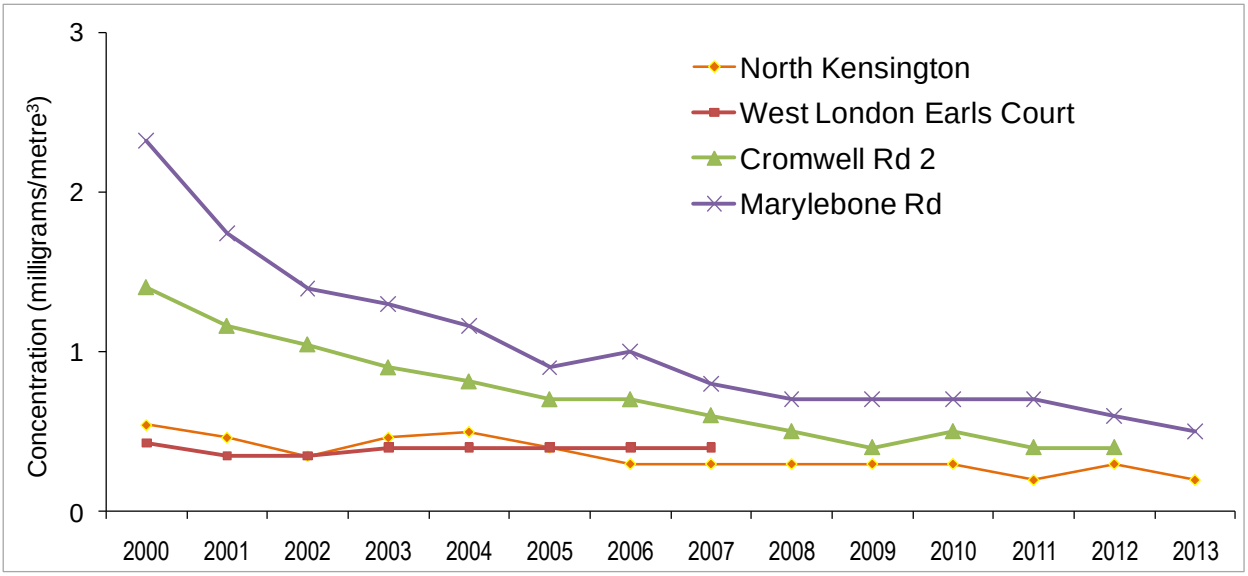
Year	Site	Annual mean (mg/m^3)	Max daily 8-hour running mean (mg/m^3)	No. of hours above 10mg/m^3	% Data capture
2009	North Kensington	0.3	1.7	0	98
	Cromwell Rd 2	0.4	2.3	0	97
	Marylebone Rd	0.7	2.5	0	98
2010	North Kensington	0.3	2.8	0	97
	Cromwell Rd 2	0.5	3.4	0	68*
	Marylebone Rd	0.7	2.7	0	96
2011	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
2012	North Kensington	0.3	1.2	0	99
	Cromwell Rd 2	0.4	1.4	0	97
	Marylebone Rd	0.6	1.6	0	95
2013	North Kensington	0.2	1.8	0	99
	Marylebone Rd	0.5	2.1	0	99

* low data capture

The maximum daily 8 hour running mean values remain well within the 10 mg/m^3 objective level. Generally, annual mean levels at roadside locations are 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 with only slight further reductions.

4 mg (milligram) = one thousand of a gram

Figure 2:12 Trends in Annual Mean Carbon Monoxide Concentrations Measured



1,3-Butadiene

Measurements should meet the 2003 objective as a running annual mean of 2.25µg/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 2.9 Levels of 1,3-butadiene (maximum annual running means) in London

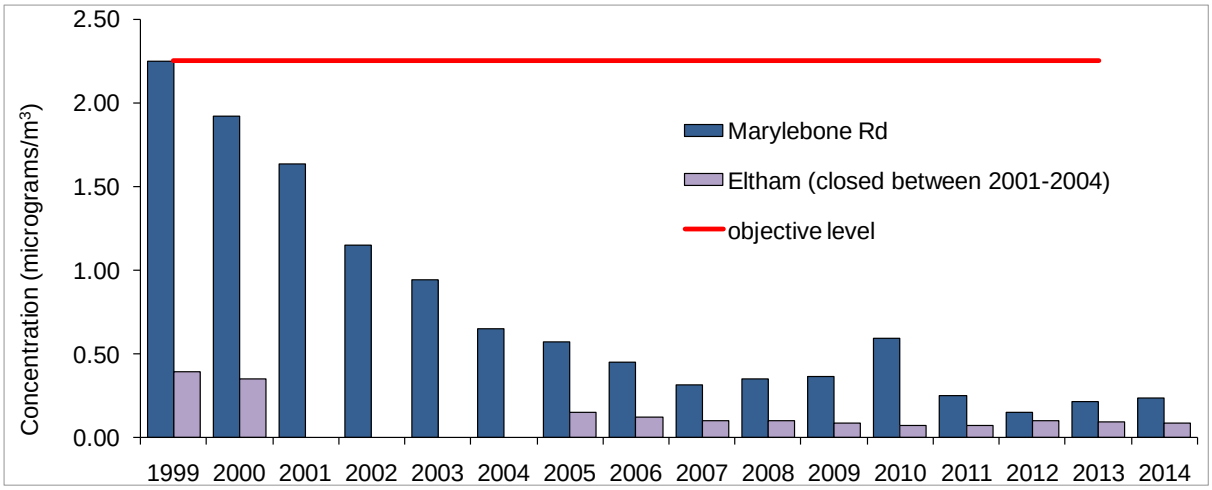
Year	Site	Annual Mean (µg/m^3)	% Data Capture
2003	Marylebone Rd	0.64	92
	Eltham	-	-
2004	Marylebone Rd	0.57	81
	Eltham	0.15	91
2005	Marylebone Rd	0.45	89
	Eltham	0.11	94
2006	Marylebone Rd	0.45*	71
	Eltham	0.09	80
2007	Marylebone Rd	0.31	78
	Eltham	0.10	83
2008	Marylebone Rd	0.35	80
	Eltham	0.10	82
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
2012	Marylebone Rd	0.15	90
	Eltham	0.10	88
2013	Marylebone Rd	0.21	94
	Eltham	0.09	79
2014	Marylebone Rd	0.23	70
	Eltham	0.09	81

*Incomplete data. Data in italics is provisional

Data for two sites with long term monitoring are shown in Table 2.12. The annual mean concentration has been met at both locations since 1999. Overall levels have declined at these sites though an increase was measured at Marylebone Road (roadside) site between

2008 and 2010. Levels in 2014 continue to be low. These results indicate that there are unlikely to be any exceedences of the 2003 objective in the borough.

Figure 2:13 Trends in the Maximum Running Annual Mean 1,3-Butadiene Measured at Automatic Monitoring Sites



Summary of Compliance with AQS Objectives

The Royal Borough of Kensington and Chelsea has examined the results from monitoring in the borough. Concentrations continue to exceed the NO2 objectives.

3. Road Traffic Sources

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

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

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 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 confirms that there are no new/proposed roads.

3.6 Roads with Significantly Changed Traffic Flows

Kensington and Chelsea Council confirm that there are no new/newly identified roads with significantly changed traffic flows.

3.7 Bus and Coach Stations

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 was estimated to contribute approximately 14 per cent (128tonnes/yr) to nitrogen oxide emissions in 2012 and to 70 per cent (10 tonnes/yr) of sulphur dioxide emissions within the borough.

Stationary Trains

Kensington and Chelsea council confirm that 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.

Moving Trains

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 approximately 33µg/m^3based on the monitoring location in North Kensington. In addition a number of residential blocks have been identified within 30m of the track.

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.

4.3 Ports (Shipping)

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

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

5. Industrial Sources

5.1 Industrial Installations

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.

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.

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.

5.2 Major Fuel (Petrol) Storage Depots

There are no major fuel (petrol) storage depots within the Local Authority area.

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^3 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. A review of our planning cases shows that few of the proposed biomass boilers have been installed.

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. Only one biomass boiler has been identified in the applicable size range (2000kw) has been installed.

Kensington and Chelsea Council confirm that there are no new biomass combustion plant in the Local Authority area that will change the declaration of the AQMA.

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.

7. Fugitive or Uncontrolled Sources

The only potential source of fugitive emissions in the borough is large construction sites. However all large sites have been required to follow the Mayor's best practice guidance on construction and demolition and more recently the Mayor's Supplementary Planning Document. Most major sites employ continuous monitoring of PM_{10} 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_2 and PM10 has been noted at a number of locations particularly between 2013 and 2014. In summary the results for nitrogen dioxide 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. Both objectives for PM10 have been met for the first time in the borough. Overall 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 NOx compared to cleaner low NOx boilers. We also apply conditions to require any plant installed meets the new emission standards contained in the Mayor's Sustainable Design and Construction Supplementary Planning Guidance.

8.3 Proposed Actions

The next progress report is due to be completed and submitted in 2016. Following the review of LAQM and proposals for a London LAQM regime some changes are anticipated in the format.

9. Action Plan Update

Table 9.1 Action Plan Progress 2014-2015

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 $PM_{2.5}$ monitoring	Review the scope of the current monitoring network to account for the increasing concerns for health effects of fine particles ($PM_{2.5}$)	LA	2009	2010	At least one road side $PM_{2.5}$ monitoring station in the borough by Dec 2010	N/a	$PM_{2.5}$ monitoring has been undertaken at Cromwell Road (roadside) monitoring station since August 2009. However data capture for 2014 was below acceptable levels due to air drier issues which lead to a chronic under-read of the concentrations resulting in much of the data being rejected at the ratification stage. The annual mean concentration reported in 2013 was 15.8µg/m^3. In the same period the annual mean at Marylebone Road 20.1µg/m^3. We will be watching with interest developments in new methods of monitoring particulate matter.	Installation was completed in August 2009. Monitoring is on-going	The monitoring of $PM_{2.5}$ indicates that levels at similar locations are below the EU cap level but could be higher in closer proximity to busy roads. Emissions reductions need to target vehicles.
2	Public Health Collaboration	Work to strengthen collaboration with local health organisations and coordinate efforts in tackling	LA	2009-2010	2009-2014	A number of joint initiatives on asthma and indoor air quality covering issues such as smoking, carbon monoxide and	N/a	Links with Breathe Easy groups were maintained. Our asthma and indoor air quality awareness raising with these groups continues. We continue to attend events to provide advice and distribute air	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
		pollution related illness and health inequalities by raising awareness of asthma and indoor air quality and the dangers of second-hand smoke.				boiler emissions.		quality and Indoor Air Quality information leaflets where opportunities arise. Promotional materials were distributed to local community groups at a Health and Well Being event organised by Age UK. Promotional materials have also been distributed to schools. A financial contribution to the AirText scheme running costs was made by the Public Health Team to assist in the maintenance of the AirText service. Smoking cessation and the smoke free service promotional activities remain the responsibility of the Public Health Team and are undertaken by a Tri borough Smoke free homes officer. The Council continues to distribute a series of posters produced by TfL to discourage idling engines. TFL posters are also used as a teaching aid in sessions held for school pupils. Posters are also displayed at promotional events. Meetings with Public Health England continue to be held to further develop air quality awareness raising opportunities and project collaboration.		

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
								Funding from Public health will be sought in 2015/16 for the introduction of greening within the school grounds and the development of an air quality awareness teaching programme using the green infrastructure as a teaching aid.		
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)	No. of airTEXT users to reach target of 300. Provide presentations and awareness workshops to schools and community groups. Establish links with all schools in the borough.	N/a	A Health and Well Being event was attended to promote the airTEXT and walk-it.com services and the London Air webpage link to daily pollution data. Officers from our Transportation Department continue to promote idling engine awareness in schools through school transport plan initiatives. Awareness is focused on the contribution idling can make to poor air quality and its impact on asthma. The Clean Air for London fund (CAF2) has successfully been used for local air quality improvement initiatives including green screens and an educational programme in two schools, and the promotion of air quality issues to the local and business community. Case studies of the CAF2 schools engagement have been	Monitoring of airTEXT subscription numbers ongoing until otherwise stated. General promotional opportunities will be ongoing (2009-2014).	N/a Early indicative monitoring of the effectiveness of the green screen installed at one of the schools is positive and shows a reduction in PM_{10} concentrations on the playground side

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
								advertised in AQ Bulletin, schools newsletter, the Council, LAQN and GLA websites. The St Cuthbert with St Matthias case study has also been subject of a research project conducted by Kings College London and has been presented as a poster at the Automation and Analytical Management Group conference Dec 2014. Work with further schools and community engagement programmes will continue to raise awareness. RBKC has continued to work in collaboration with other London Boroughs and CERC to support and develop the airTEXT service and its promotional material. During 2013/2014 the total number of alerts sent by email, SMS and voicemail was 2874.At the end of April 2013, The last recorded total number of subscribers with active accounts for these channels was 7125. For the period between March 2014 – Oct 2014 the total number of downloads of the airTEXT service iPhone app was 2022. For the same period, the total number of downloads of the airTEXT service Android app was 875. There is		of the screen in comparison to PM_{10} concentrations on the road side of the green screen.

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
								currently no way of obtaining the number of subscribers receiving SMS alerts through the Twitter delivery channel. Open access set up in 2013-14 to allows the public to sign themselves up for alerts by emails, texts or voice messages, as well as to be able to access the service via the airTEXT App, RSS feed, twitter, Facebook or website. This open access continues to allow subscription numbers to be recorded to provide a way to monitor the effectiveness of airTEXT service promotional campaigns. In the period between March 2014 – April 2015, 95 users subscribed to the airTEXT service, there were 143 text alert users, 50 voice alert users and 84 email alert users. The total number of subscribers is 277. To reflect the new changes, CERC have updated the airTEXT leaflets & website. The Council continues to advertise the AirText service via our air quality WebPages. Daily Health Bulletins with daily UV index, air pollution index, pollen and minimum and maximum temperature information continue to be distributed		

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
								at air quality promotional events. A page on the Council's intranet continues to be used to upload and distribute Daily Health Bulletins to Council staff for personal use and to be cascaded to partner organisations outside the Council. AirTEXT business cards with SMART phone QR (quick response) codes continue to be distributed to schools and the local community. Business cards provide a link to air pollution forecasts and daily health bulletins.		
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 NI194 baseline toolkit (2008/09).	8%	The Parks Police have reduced and updated their fleet of vehicles to include 4 Dacia Dusters and 1 Renault Kangoo electric van. The change in fleet is predicted to reduce carbon emissions by up to 30%. The Council's Carbon Plan for SITA continues to be implemented. The Tennant Management Organisation (TMO) has received funding to install 10 electric charging points within several car parks that the TMO manages on behalf of the Borough. The charging points will be available for any resident of the borough to use and will also be leased	2014 2014	The reduction in number of vehicles used by the service and the electric van will reduce local NOx and PM10 emissions. Installation of these additional charging points is likely to encourage the uptake of electric vehicle ownership in the borough and help reduce vehicle

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
								out to an electric mini-cab firm. The Council is continuing to keep up to date with advances in low emission vehicle technology by attending relevant events when they come up.	Ongoing	related emissions of NOx and PM10.
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: • To reduce the number of staff driving to work from 13.4% (2008) to 10% (2012) • 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)	N/a	The Council's Travel Plan (2009-2012) 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 4.3 per cent, (2014) which is a considerable achievement. At the same time the proportion of staff cycling to work as a main mode has increased from 5.1 per cent (2008) to 7.4 per cent (2014) despite some fluctuations over four years. A continuing barrier to choosing cycling may be the larger number of staff with a commuting time of more 60 minutes (and more than 90 minutes in some cases), suggesting a greater distance from work. Also in common with most London commuters, there is a justifiable perception among staff that cycling on	The Travel Plan is in place- this measure is complete. We have carried out an annual staff travel survey since 2008.	

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
								the capital's main roads is dangerous. The number of highly publicised cycling fatalities during the past two years reinforces this view, although when compared with the increase in cycling in the capital, proportionally the number of casualties is lower. The Council's staff benefit of a zone 1 and 2 travel card encourages staff to use public transport , but the cycling support schemes e.g. cycle training and cycle maintenance sessions do not seem to be inducing more staff to cycle to work. For the past seven years we have offered bike mechanic sessions for staff to have their bicycles checked for free. The sessions take place in two main sites, six times a year.		
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)	NI194 toolkit Reduction target in emissions from 2008/09 baseline level. On-site renewables in at least one Council building	N/a	The renovation of Kensington Town Hall was completed in 2014 so more staff than ever are working within our most energy efficient facility. This will have resulted in many staff moving out of older, inefficient offices. Buildings that have become vacant as a result of the revocation works will be decommissioned in the future to further reduce the Council's emissions.	2009-2014 (ongoing)	The energy efficiency improvements made within Council Offices and schools in the borough will result in reductions of air pollutant emissions as well as reductions in carbon emissions.

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
								Energy efficiency in schools was addressed through a series of projects: - low cost/no cost project with 9 schools in the borough through the Carbon Countdown Project. - better insulation of pipes for more than 6 schools - fitting LED lighting in 3 schools - RE:FIT – full retrofitting project Most of the schools reduced energy consumption since the project began in Jan 2013. One school in particular has saved £3K of savings could be made per year by making adjustments to the boiler timers and reducing the hot water temperature. This reduction in energy use will also reduce emissions of NO_x. The Council has replaced the lighting units in 604 columns on main roads throughout the borough and is piloting LED lighting for residential lighting units. This will save the Council significant amounts of energy, resulting in savings of over 73 tonnes of carbon annually. The Council have employed a new facilities management company that are working on improvements to the way the Council's buildings are run.		Although the improvements in street lighting aren't directly reducing air pollutant emissions in the borough, the reduction in energy consumption will reduce the amount of air pollution released in the location of the electricity generation.

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
								They have a plan to deliver energy efficiency measures in the major council's buildings to achieve above 1,000 tCO2 annual reduction by end of 2017. Reduction in energy usage as a result of these actions will benefit air quality. The amount of energy used by each main Council worksite and school is available for staff and public to view on our internal intranet site here: http://www.rbkc.gov.uk/environmentandtransport/climatechange/carbonmanagement.aspx		
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	The council completed this action and there is no longer a requirement for NI 194 to be reported. However all domestic boiler replacements within TMO properties are SEDBUK A rated with low NO_x and CO_2 emissions. When central boiler plant is replaced the most energy efficient and low emission boiler is sourced for the available budget. The TMO continue to improve thermal efficiency by undertaking loft and cavity wall insulation projects and communal boiler upgrades. In	December 2011	The replacement of old boilers with low NO_x A rated boilers will reduce NO_x emissions.

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
								2012/13 421 TMO properties received replacement new boilers. Data for 2013/15 is not yet available.		
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 mitigation measures in order to offset impact of the development.	LA	2009-2010	2009-2014 (ongoing)	Air Quality SPD adopted and requirements being implemented	N/a	We continue to request low emission strategies and set conditions for low NOx boilers and combustion plant assessment for all major applications. We also make observations on applications that are located in close proximity to the borough boundary. Negotiations with developers have led to a number of developments agreeing to the fitting of abatement equipment. However it is proving problematic to ensure that abatement will be installed where it has been required and can achieve the significant improvements claimed. Since the publication of the GLA Sustainable Design and Construction SPD we set conditions that require the Band B emission limits for CHP plant and require NOx test certificates to be provided for new applications.	Revised SPD was adopted in June 2009. Action complete Requests for low emission strategies are ongoing. Further revision of the SPD is likely to be required as a result of changes to the NPPF	Studies undertaken by Imperial college and AEA have shown potentially significant increases in NO_X emissions (of 4.3µg/m^3) in central London as a result of the decentralised energy strategy. Reductions in emissions from new developments could be secured if developers could use more energy efficiency measures and non combustion renewable technologies to meet carbon targets.
9.	Air Quality Action Fund	Make use of S106 obligations to require large new developments to make a one-off	LA	2009-2010	2009-2014 (ongoing)	Section 106 Planning Obligations SPD adopted and contributions	N/a	The Council's Section 106 Planning Obligations SPD sets out the approach, policies and procedures in respect of planning obligations.	The Section 106 Planning Obligations SPD was adopted in	We will use the funds to further develop action plan measures.

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
		financial contribution to an air quality action fund.				recorded.		The document outlines the standard contributions for air quality and justifies the approach. To date, contributions for air quality have been sought and we currently have approx £83K available to us. Since April 2015 the new Community Infrastructure Levy (CIL) has been operating. Although site-specific s106 monies will continue to be available for the time being, air quality funding will increasingly be derived from CIL, allocated according to a pre-determined set of Council priorities aligned with the capital programme.	August 2010 Action complete Requests for financial contributions will be ongoing.	
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 was removed as an action from this plan after the completion of the Builders Advice section (see web address in plan 11).	N/a	N/a
11.	Construction Emissions	Continue work to minimise emissions from construction sites by requiring all	LA	2009	2009-2014 (ongoing)	Planning conditions imposed on all large developments,	N/a	Construction risk assessments continue to be requested for large developments. The contractors' construction method and environmental management	2009-2014 (Ongoing)	The majority of large redevelopment sites e.g. Warwick Road and

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
		developers to follow the London Council's (2006) *Best Practice Guidance –The control of dust and emissions from construction and demolition* as a minimum standard.				requesting construction risk assessments.		statements are examined to verify that a suitable approach to dust and air quality management will be adopted. Conditions are required that mitigation proposed is in line with the Mayor of London's Supplementary Planning Guidance published in June 2014: The Control of Dust and Emissions During Construction and Demolition. The Council's web based best practice guidance tool for builders and developers, covering air quality can be referred to using the link: http://www.rbkc.gov.uk/environmentandtransport/airquality/adviceforbuilders.aspx		Wornington Green, now generate 15 minute average air quality data that provides an alert if dust level thresholds are breached to prompt site managers to take remedial action. These alerts are also available to Council officers.
12.	Energy Efficiency	Continue to promote energy-efficiency measures in homes in the borough, within the Council's HECA and Affordable Warmth work.	LA	2009	2009-2014 (ongoing)	100% RSL and TMO homes in the borough meet "decent homes" thermal efficiency standards.	N/a	This information is no longer collected by the Council; the latest figures from the Homes and Communities Agency show that 1.8 per cent of Registered Providers total housing stock in London did not achieve the Decent Homes standard. The percentage of TMO properties that reached the Decent Homes Standard in 2013/14 is not yet available. The TMO Annual Report for 2012-13 reported that the percentage	Uncertain exactly when 100% of RSLs will be achieved but will continue to work towards this. TMO continue to work towards meeting 100	The energy efficiency measures and heating upgrade work carried out with funding from the various grants available will be reducing local emissions of NO_x and PM_{10} as well as CO_2.

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
						Year on year increase in the number of qualifying households taking grants.		of homes not meeting the standard was likely to rise in 2013-14. A number of schemes are available to help people improve the energy efficiency of their living accommodation: *Kensington and Chelsea 'Keep Warm Grant'* Financial assistance is available to homeowners and private tenants on benefits or low income to upgrade or install heating and insulation. Changes are being made to the Keep Warm Grant in order to make it more accessible to residents *Green Deal* The Council is not actively promoting the Green Deal at the current time. The Green Deal pilot project went ahead in Summer 2013 which involved two local properties being retrofitted with insulation. This was carried out with 14.5K of grant funding obtained by the Council. This project allowed the Council to see what could be done to typical housing stock in the borough to reduce both air pollutant and carbon emissions from domestic properties.	per cent of stock meeting DH standard. The Keep Warm grant has been retained despite the reduction in the overall grants programme and will continue into next year. Completed	

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
								The Healthy Homes project continues to provide assistance to the elderly and vulnerable in the borough. This includes installing or updating heating systems and providing insulation and draught proofing. Public Health funding of £260k now available for 2014 to 2016. The Council has commissioned a study into the current (baseline) energy performance and the retrofit potential of the domestic properties within the borough using EPC data. The report has been completed and is being used to identify target areas and to support grant applications. The Council is involved in the European Funded Decumanus project and hopes to get high resolution heat loss maps for the borough, along with other information in order to help address energy efficiency within the Borough's buildings. The thermal imaging was completed in February 2015 and is being combined with EPC and other data to allow us to map the borough. A bid has been made to Tri-borough public health for funding to conduct in depth research on the issues	2013 Ongoing Spring 2016 Spring 2016	Improvements in the energy efficiency of the boroughs housing stock will lead to a reduction in associated NOx and PM10 emissions, particularly where older boilers are being replaced with new ones.

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
								surrounding improving the energy efficiency of flatted properties in the tri-borough area. If this proceeds it will help us to understand and overcome the barriers to insulating these properties.		
13.	Borough-wide Boiler Survey No further update	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	A survey of large boilers and CHP plant in commercial buildings in the borough has been carried out this year. The size and output of each plant has been recorded, along with make and model, use and mitigation measures. The data will be used to gain an understanding of the likely emissions from large CHP plant in the borough, which will inform future policies relating to the installation of new CHP units. The information gathered shows that CHP plant is widely installed in many of the borough's larger buildings and supports the findings of a report commissioned by the borough into CHP. The findings have implications for the dispersal of emissions from such plant where pre-existing chimneys are used and the higher emission NOx rates from such plant.	Action completed 2012/13	The findings have implications for the dispersal of emissions from such plant where pre-existing chimneys are used. Also emissions of NOx are significantly higher than for CHP compared to efficient new boilers.
14.	Integrating air quality and climate change	Aim to identify the most effective emission reduction	LA	2009-2010	2011	Produce a NI194 toolkit/ policy changes	N/a	NI194 has been withdrawn. Work commissioned undertaken in 2012 established the cost and benefits	2011	Estimates of emissions reductions of NOx, PM_{10} and CO_2 are

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
	measures	measures which provide the greatest benefits in terms of CO_2 and air quality emissions.						of individual measures that could be taken to improve air quality in central London resulted in the publication of '14 Cost Effective Actions to Cut Central London Air Pollution. Environmental Health has attended the quarterly Climate Change Programme Board meetings, which will lead to more joint working around the Council. This will result in the most effective measures for both air quality and climate change being implemented. The new Action Plan being prepared goes a step further and addresses air quality and climate issues together with measures to take advantage of the synergies. The combined Action Plan recognises that both areas largely share the same emission sources, are underpinned by statutory obligations and have significant public health impacts. Integrating the actions also makes more efficient use of resources and helps resolve apparent conflicts.		reported in the '14 Cost Effective Actions to Cut Central London Air Pollution The findings of the review highlighted increasing cycle infrastructure and promotion as having the biggest CO_2, NO_x and PM_{10} saving, (around 150,000, 249 and 18 tonnes/yr respectively) although this would be very expensive to implement. The second most significant saving of CO_2 and air pollutants could be via the expansion of car club schemes (nearly 27,000 tonnes/yr), with campaign days saving slightly less (20,000 tonnes/yr).
15.	Controlling Emissions from	Make use of planning conditions and	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	2014	Emissions reductions have been achieved

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
	Biomass, Biofuel and CHP	obligations in order to set requirements for controlling pollutant emissions from biomass and biofuel boilers and CHP.						use biomass and biofuel or Combined Heat and Power Plant. We are no longer having any success in encouraging developers to consider alternative non-combustion renewable technologies, such as ground source heat, due to the hierarchy promoted by the London plan despite the benefit to both air quality and climate change. The promotion of decentralised energy is resulting in significant number of CHP plant being installed and we remain concerned that this presents a risk to improvements in air quality (see comments in Action 8 relating to the decentralised energy strategy). Officers from Kensington and Chelsea and Hammersmith and Fulham have met with the GLA to discuss the potential negative impact of the decentralised energy strategy on air quality when CHP plant is installed.		through the implementation of conditions requiring abatement were CHP plant is proposed. Emissions of NOx without abatement can be orders of magnitudes higher.
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	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	N/a	The Council continues to implement sustainable travel initiatives in our local schools. Our travel plan data from 2013/14 shows that 67 per cent of schools (46 schools out of 69) in the borough reviewed their travel plans and received free training resources and funding from the Road Safety and Travel Plan Team. About 50 per cent of the schools are LEA and the other	Target complete, but ongoing process – each school monitors their travel plan annually.	School Travel Plans promote sustainable transport through initiatives such as free cycle, scooter and pedestrian skills training. Facilities such as scooter and cycle

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
		and Independent Schools in the borough'.				data)		half are independent. We also released school travel plan grants year on year amounting to £25,000 to an average of 28 schools to support their own road safety and sustainable travel projects. The percentage of pupils cycling, walking and scooting to school has increased from 41 per cent in 2011-12 to 53 per cent in 2013-14. Car use has been maintained at 24 per cent for the same period. In 2013-14, 28 schools were awarded Transport for London's Sustainable Travel Accreditation: 6 schools received the gold level, 6 schools the silver level and 30 schools the bronze level. A further 3 schools had an active travel plan. In total 46 schools were engaged in the school travel plan process. In 2013-14 three of our local schools received special awards from Transport for London in recognition of their excellent work in promoting road safety and sustainable travel.		storage areas are also installed in the schools. The modest but definite increase in pupils cycling and scooting to school points to the success of investing resources in school travel planning.
17.	Encouraging Cycling	Continue to encourage safe cycling in the	LA	2009-2010	2009-2014 (ongoing)	Annual increase in cycling numbers	N/a	In 2013-14 the Council delivered 343 free adult cycle training lessons and 710 children received cycle training. It	2014	Until the Mayor of London implements his radical

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
		borough by improving facilities and providing free cycle training to residents						also provided 92 free cycle maintenance sessions (Dr Bike) to the public and workplaces and delivered 20 cycle mechanic training sessions shared with LB Hammersmith and Fulham. We arranged five events with the Met. Police - 'exchanging places programme' to highlight the blind-spot dangers of large vehicles. In 2013-14 we installed an additional 456 on-street cycle parking spaces and 205 off-street. Several initiatives to encourage social activities around cycling are active e.g. All Ability Cycling Club, Recycle the Way you Travel and Bikeminded promotion campaign. In 2013/14 we delivered an outreach programme to bring cycling into the community and to involve hard-to-reach groups such as women and older people. A new 6-week cycling programme was delivered in partnership with the Westway Trust and Open Age, while new programmes are being planned in conjunction with the Muslim Centre, Imperial College and the Dalgarno		proposals to create a grid of bicycle 'super-highways' and 'quiet-ways' in the capital, and there is greater segregation of cyclists from other vehicles, there is unlikely to be a step change increase in the number of cyclists. Consequently the likelihood of a significant reduction in vehicle emissions from a mode shift to cycling remains uncertain.

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
								Trust		
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	There are now a total of 10,000 bikes available in London at 700 docking stations.	30th July 2010 Action completed in December 2013	This scheme aims to encourage bicycle use, especially for short journeys and has grown in popularity They 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	The number of car club members has levelled off. Although more than 50 per cent of the fleet is already within VED band A-B next year the Council plans to tweak the schedule of permit charges to incentivise improvements to the air quality performance of the car club vehicle fleet. Virtually all residents are within a three minutes walk of a bay.	2014	Each car club vehicle 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 continue to conduct 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	When a vehicle is waiting for longer than 30 seconds the 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.						Leaflets have been distributed to car/van/bus/coach drivers who are sitting in vehicles running idle engines. We received 32 complaints of vehicles idling from 01/04/2014 to February 2015. During 2013/2014, 28 complaints and in 2012/2013, 25 were reported. As the actual offence is failing to turn off an engine when requested to do so by an authorised officer. Drivers always do as asked and so no fixed penalties have been issued in 2014/15. The gradual increase in idling engine complaints may be due to an increase in awareness due to the implementation of London wide initiatives on idling engine issues and more generally the reporting of AQ issues on national news channels and in the press in high pollution events raising the profile TFL anti idling engine posters will continue to be distributed and displayed where opportunities arise. The issue of idling engines continues to be an integral component of the Councils Schools engagement programme where children, parents and the wider school community are informed about		

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
								the adverse impacts to local air pollution caused by idling engines.		
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. in the form of the Best Practice measures. Since the inception of this measure the Mayor of London in February 2013 announced his intention to develop an Ultra Low Emission Zone (ULEZ) in central London by 2020.	N/a	We responded positively to the ULEZ consultation - We broadly support the proposals for a ULEZ but would like you to ask TfL to explore further the implications of it covering a larger area to include the Royal Borough and other parts of London that suffer from poor air quality.	2011	
22.	Parking Charges	Review the surcharge for diesel vehicles Review the graduated parking permits system to incorporate discounts for low emission vehicles (electric vehicles)	LA	2009	2010-2011	Changes implemented to residents parking permit charges	N/a	Residents parking charges are reviewed every year. We increased the price of all seven bands from April 2015 to reflect the increase in the Retail Price Index (2.3 %). The price of Band 7 permits remains 33% higher than those in Band 6 to provide further incentive to residents to choose less polluting vehicles. We also increased visitor parking charges by two years worth of RPI –	The parking charges will continue to be reviewed on an annual basis.	The Council continues to reward residents who have chosen low emission vehicles such as electric, and place a surcharge on vehicles which are most polluting. Since the graduated tariff

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
								5.6 %. We reviewed the diesel surcharge levied on diesel vehicles that do not meet Euro 5 emissions standards, which affects most diesel cars produced before 2011. We will increase the 14/15 surcharge of £19 to £40 from April 2016 and we will remove the exemption for Euro 5 vehicles so it will apply to Euro 6 vehicles only from April 2017. Electric vehicles continue to be charged at the lowest parking permit rate. A charge of £65 is levied for second and subsequent vehicles in a household.		structure for residents' parking permits was introduced in 2008 the price differential between the lowest and highest bands has risen to over £130, providing a strong incentive to choose a change to smaller engine sizes.
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	LA	2009	2009-2014 (ongoing) updated	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	N/a	The Council continues to require ECPs with all new developments. This is enforced through the use of planning conditions. The Council is currently requesting that ECPs are installed at around 20 per cent of on-site parking spaces in new developments. However we are urging developers to install passive provision for connection later on if demand justifies it.	On target for completion of reduced Mayoral targets.	This is an ongoing commitment

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
		to local businesses.				spaces with ECPs by March 2014		We are in negotiations with the new operator of Source London, and subject to those negotiations reaching a satisfactory conclusion; we plan to install a number of charging points in the borough in 2015/16.		

10. References

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

Defra (2007) The Air Quality Strategy for England, Scotland, Wales, and Northern Ireland

Defra (2009) Local Air Quality Management Technical Guidance LAQM.TG (09)

Nitrogen Dioxide Diffusion Tube Survey Annual Report 2014

Appendices

Appendix A: QA/QC Data
Appendix B: Maps of Locations
Appendix C: Glossary

Appendix A: QA/QC Data

Factor from Local Co-location Studies

Discussion of Choice of Factor to Use

PM Monitoring Adjustment

QA/QC of Automatic Monitoring

QA/QC of Diffusion Tube Monitoring

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

NO_2 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 diffusion tubes employed in the LWEP programme are prepared and analysed by UKAS accredited Gradko International Ltd. Diffusion tubes are prepared using the 50% triethanolamine with acetone method and analysed using UV spectrometry. The diffusion tubes are labelled, and kept refrigerated in plastic bags prior to and after exposure.

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_2 diffusion tubes sampling concurrently located with continuous analysers for a number of local authorities. They employ the DIFTAB.xls spreadsheet to calculate the factor.

Bias Adjustment Factor and % Bias of LWEP Co-Location Study 2014

		Diffusion Tube	Continuous Analyser	Correction Factor (A)	% Bias based on continuous monitor (B)
Kensington	North Kensington	32	33.1	1.03	-3
LWEP	Bloomsbury	45.6	44.7	0.96	4
Croydon	George Street	50.3	45.9	0.93	7
Greenwich	Westhorne Ave	47	42.9	0.91	10
Greenwich	Blackheath	51	44.4	0.87	15
Greenwich	Trafalgar	38.3	38.2	1	0
Greenwich	Burrage	34.4	38.4	1.12	-10
Greenwich	Woolwich Flyover	77.8	75.6	0.97	3
Greenwich	Bexley Falconwood	60.6	45.9	0.77	30
Overall % Bias					**6.22**
Overall Bias Adjustment Factor				**0.95**	

Diffusion Tube Bias Adjustment Factors

NO_2 diffusion tube bias adjustment factors for 2006 to 2014 used in the reports.

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
2012	1.04	-3.00
2013	1.14	-10
2014	1.03	-3

Bias Adjustment Factor and % Bias of LWEP Co-Location Study 2014 (North Kensington)

Diffusion Tube	Continuous Analyser	Correction Factor (A)	% Bias based on continuous monitor (B)
32	33.1	1.03	-3

Source: Annual NO2 Diffusion Tube Report 2013 prepared for Royal Borough Kensington and Chelsea and the London Borough of Hammersmith and Fulham Veritas

Choice of Factor

For 2014 a local bias adjustment factor based on the North Kensington monitoring station was considered to be the most suitable as it is based on data from the borough's AURN affiliated site which has triplicate diffusion tubes co-located with it. Also comparison of the local factor and the LWEP with other co-located sites within the borough showed it gave the best fit to the continuous monitoring data.

	North Kensington	Knightsbridge	Kings road
Continuous monitoring AM data	33.0	72.0	75.0
NK Local bias adjusted DT AM data	32.9	74.5	74.4
LWEP bias adjusted DT AM data	30.3	68.7	68.6

Benzene diffusion tubes

The supply and analysis of Benzene diffusion tubes is undertaken by Gradko. The tubes are analysed using desorption scanning gas chromatography/mass spectrometry (GC/MS). 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, but 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. PM10 data is mainly collected using FDMS units and a partisol.

Data has been collected from the London Air Quality Network (LAQN) website (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

Kings college London undertake data management of the councils monitoring data. Data is collected from each instrument every hour. Data is subject to automatic and manual checks each day, 365(6) days per year (6 days per week manual checking). Measurements are scaled immediately as they are collected using the latest calibration information from the Local Site Operator (LSO) or Equipment Support Unit (ESU). This ensures that accurate measurements are disseminated to the public.

Validation and subsequent ratification of data (QA/QC) to be carried out every three months and finalised when QA/QC audit results are received. Measurements are available for download via the LondonAir website at www.londonair.org.uk

All continuous data is stored in the King's MS-SQL database in a locked server room in a secure area. The data is backed up onto physical media and stored in a safe off site. During collection, data will be screened for any faults flagged by the instruments. Complex automatic validity checks are applied as the data is parsed into the database preventing dissemination of spurious measurements. Faults are reported immediately to the LSO or ESU.

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

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

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

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

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 trail5 raised concerns over the filter media used in these instruments and showed that an over estimation in measured concentrations resulted from the 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[7]. 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

Laboratory Performance in AIR/WASP NO2 Proficiency Testing (PT) Scheme

QA/QC of diffusion tube laboratories is provided by the AIR-PT Scheme, which is operated by LGC Standards and supported by the Health and Safety Laboratory. The AIR-PT scheme combines the two long running schemes of the HSL Workplace Analysis Scheme for

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

Proficiency (WASP) and the LGC Standards STACKS scheme. The AIR-PT scheme was started in April 2014.

Gradko International Ltd participates in the AIR-PT scheme and historically participated in the WASP scheme also. Each quarter each laboratory receives tubes with known concentrations of nitrile for analysis. The tubes also include duplicates allowing for precision and accuracy to be assessed.

The results are presented as the percentage of results where the z-score was between -2 and +2, which is deemed to be satisfactory. For 2014, the results for Gradko International were as follows:

Table Laboratory Summary Performance for WASP Round 124 & and AIR NO2 PT Rounds 1, 3 and 4, 2014

WASP R124	AIR PT AR001	AIR PT AR003	AIR PT AR004
Jan-March 2014	April-May 2014	July-August 2014	October-November 2014
100%	100%	100%	100%

Network Field Inter-Comparison Exercise

Gradko International Ltd also takes part in the NO2 Network Field Inter-Comparison Exercise, operated by the National Physical Laboratory (NPL), which complements the AIR-PT scheme in assessing sampling and analytical performance of diffusion tubes under normal operating conditions.

Table X Summary of NO2 Network Field Inter-Comparison Results, 2014

Gradko

Annual Mean Bias		Precision	
Performance Target	Gradko Annual Mean Bias	Performance Target	Gradko Precision
+25%	+14.8%	10%	Good

The laboratory of Gradko International Ltd follows the Practical Guidance document "Diffusion Tubes for Ambient NO_2 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 not blank subtracted

Uncertainty of measurement: 3.82%+/- Limit of Detection: 0.06mg/m3*

Benzene diffusion tube data

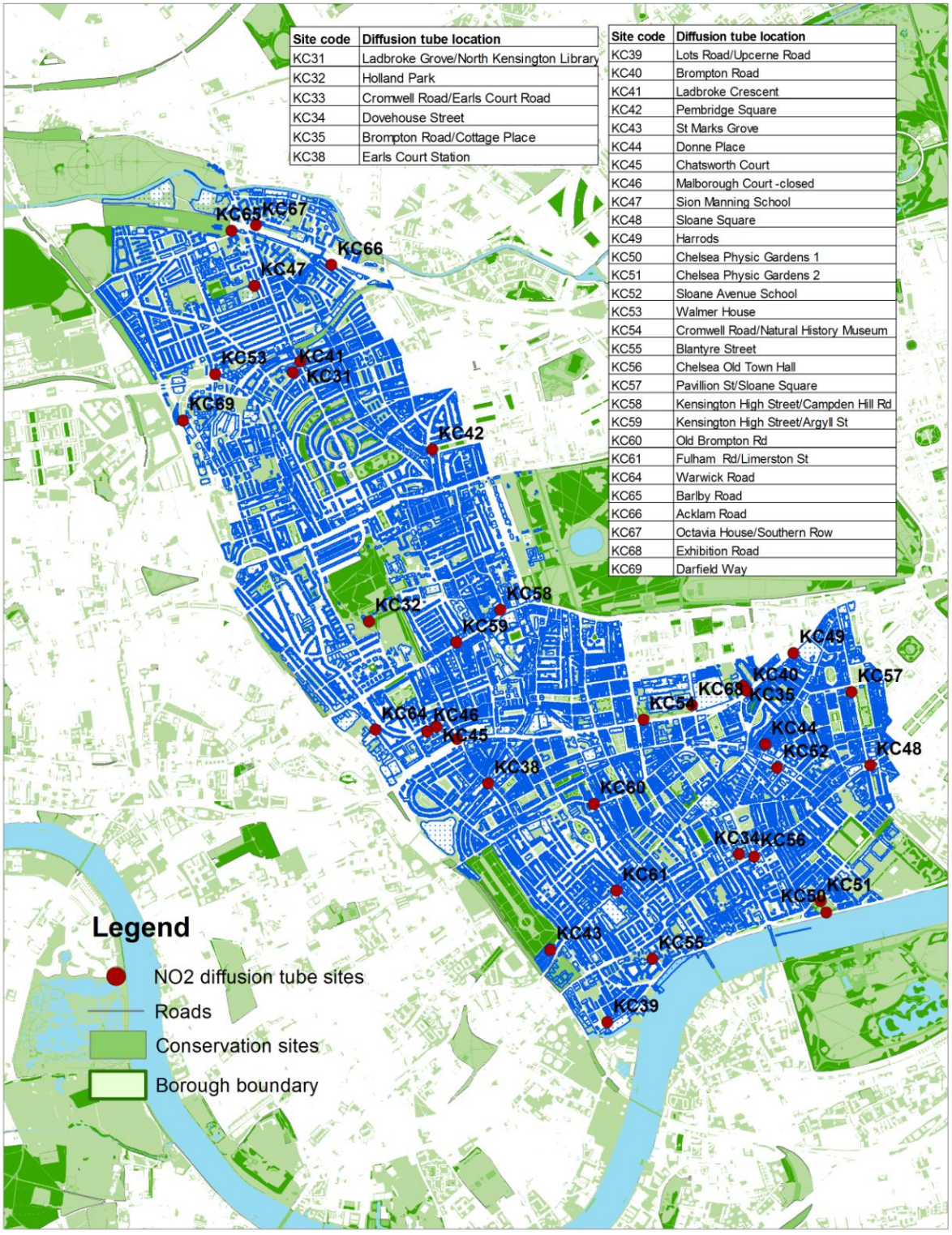
All benzene tubes were analysed by a UKAS accredited laboratory using desorption scanning gas chromatography/mass spectrometry (GC/MS). This method of analysis gives unequivocal identification of BTEX peaks. The analysis is carried out in accordance with the Gradko International Laboratory Quality Procedure GLM 4.

The accuracy of the Laboratory measurements are monitored by participation in the Laboratory Measurement Proficiency Scheme.

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.

Appendix B

Maps of Locations -Residential locations in relation to diffusion tube locations. Residential property is marked by a blue point.



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Author:Environmental Quality

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 µg) – a unit of mass equivalent to one millionth of a gram or one thousand of a milligram

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

µg/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

ng/m^3 nanogram of pollutant in a cubic metre of air

Oxides of nitrogen (NO_X)- a mixture of NO and NO_2

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

Nitrogen dioxide (NO_2)- a stable brown gas largely produced by the oxidation of NO. NO_2 is more toxic than NO

Particles- or fine particles, these are microscopic particles of varying composition, and for the purposes of this report the term 'particles' refers to a range of particle sizes from 10µ to 0.1µ

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

Objective- we have used the word objective throughout this report. This is the term used by the Government to describe standards which have a set timescale (i.e. a target date) for their achievement

PM_{10}- particulate matter less than 10µ (micrometres) in diameter

$PM_{2.5}$- particulate matter less than 2.5µ (micrometres) in diameter

Roadside site- a sampling site between 1 metre of the kerbside of a busy road and the back of the pavement, typically within 5 metres of the road

Screening models- give a preliminary level of assessment and only require simple input data

Source apportionment- the degree to which various sources of pollution contribute to air quality problems

Sulphur dioxide (SO_2) - a colourless toxic and acid forming gas, it is the main product of the combustion of sulphur contained in fuels

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_{10} by the TEOM so that they can be used to compare against the EU Limit Value in the UK.