Review And Assessment of Air Quality In The London Borough of Lewisham

Updating and Screening Assessment

July 2006

Updating and Screening Assessment conducted by Environmental Research Group, King's College London and the London Borough of Lewisham

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Executive Summary

The role of the local authority review and assessment process is to identify areas where it is considered that the government's air quality objectives will be exceeded.

The Council has previously undertaken the earlier rounds of review and assessment (R&A) of local air quality management and identified areas where the objectives are exceeded and where there is relevant public exposure. As a consequence, it designated Air Quality Management Areas (AQMAs) for the annual mean nitrogen dioxide objective and daily mean PM_{10} objective across its area.

This report concerns the third round Updating and Screening Assessment. Local authorities are required to review and assess air quality against the objectives in the Air Quality Regulations 2000 and the amendment regulations as part of a rolling three-year cycle ending in 2010.

The air quality objectives to be assessed are for the following seven pollutants:-

- carbon monoxide
- benzene
- 1,3-butadiene
- lead
- nitrogen dioxide
- sulphur dioxide
- particles (PM_{10}).

This report provides a new assessment to identify those matters that have changed since the last review and assessment in 2004 and which might lead to a risk of the objective being exceeded.

The report follows the prescribed guidance given in technical guidance LAQM. TG (03) and the additional advice provided by DEFRA for the purposes of this round of R&A. This includes guidance on the use of background pollutant concentrations, monitoring results, industrial sources and road traffic. The guidance requires a phased approach and that local authorities should only undertake a level of assessment that is commensurate with the risk of an air quality objective being exceeded.

The conclusions of the third round Updating and Screening Assessment are as follows:

- For carbon monoxide, benzene, 1,3-butadiene, lead and sulphur dioxide there is:-

  not a significant risk of exceeding the objectives in the Council's area.

- For nitrogen dioxide there is:-

  A significant risk of the annual mean objective being exceeded where there is relevant exposure. The Council has previously designated AQMAs in its area. Recent monitoring results from roadsides in the Borough confirm that concentrations continue to exceed the annual mean objective where there is relevant exposure.

- For PM_{10} (for 2004) there is:-

  A significant risk of the objectives being exceeded where there is relevant public exposure. The Council has previously designated AQMAs in its area. Recent monitoring results from roadsides and an analysis of rolling trends based on monitoring in the Borough indicates that concentrations are not reducing from those monitored in 2001.

- For PM_{10} (for 2010 only) there is:-

  A significant risk of the objective being exceeded across the Borough where there is relevant public exposure, despite the expected reductions in emissions .The Council however is not required to undertake actions at this time in respect of this finding, other than to note it for longer term planning purposes.

As a result of the findings in this report the Council has decided to take the following action:-

Nitrogen dioxide

A Detailed Assessment will not be required to amend or revoke AQMAs since there are no changes to the current exceedences across the Borough.

Particulates

A Detailed Assessment will not be required to amend or revoke AQMAs since there are no changes to the current exceedences across the Borough.

For all pollutants not requiring a Detailed Assessment, the LAQM guidance requires no further action to be taken, other than for the Council to produce its next annual air quality progress reports by the end of April 2007, prior to undertaking the next Updating and Screening Assessment by the end of April 2009.

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1. Local Air Quality Management

1.1 Introduction

Part IV of the Environment Act 1995 introduced new responsibilities to both national and local government throughout the UK.

These responsibilities include the requirement upon the national government and devolved administrations to develop an Air Quality Strategy (AQS) for England, Wales, Scotland and Northern Ireland (DEFRA, 2000). The overall purpose of the AQS is to seek improvements in air quality for the benefit of public health. The first AQS was produced in 1997, it was amended in 2000 and is currently undergoing a further revision. A consultation on the latest review has recently closed.

The Environment Act 1995 also provides the framework for local air quality management (LAQM) across England and Wales. It requires local authorities to periodically review and assess air quality across their areas.

The purpose of the review and assessment, which forms part of the overall process, is to:

- **Periodically review and assess air quality against the standards and objectives of the Air Quality Regulations 1997, the Air Quality Regulations (England) (Wales) 2000 and the Air Quality (Amendment) Regulations 2002, within the local authority's geographical area for both 1995 and 2005;**

- **Assess the current air quality in Lewisham against the AQS objectives;**

- **Predict the future air quality in Lewisham (a timescale is set by Government in regulations) against the AQS objectives and**

- **Designate Air Quality Management Areas (AQMAs) where the Air Quality Strategy (AQS) objectives are unlikely to be met by 2005 and prepare a written action plan for such areas.**

Air quality objectives have been set for those air pollutants deemed to be of most concern and relevance.

Seven pollutants are included under the LAQM regime in Regulations. The air quality objectives for the relevant pollutants are given in Tables 1 and 2 .

Table One - Air quality objectives (from Air Quality Regulations 2000 and Amendment Regulations 2002)

Pollutant	Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu g\ m^{-3}$	Running Annual Mean	31 Dec 2003
	5 $\mu g\ m^{-3}$	Annual Mean	31 Dec 2010
1, 3 Butadiene	2.25 $\mu g\ m^{-3}$	Running Annual Mean	31 Dec 2003
Carbon Monoxide	10 mg m^{-3}	Daily Maximum Running 8 hour mean	31 Dec 2003
Lead	0.5 $\mu g\ m^{-3}$	Annual Mean	31 Dec 2003
	0.25 $\mu g\ m^{-3}$	Annual Mean	31 Dec 2008
Nitrogen Dioxide (provisional)	200 $\mu g\ m^{-3}$ not to be exceeded more than 18 times a year	1 hour mean	31 Dec 2005
	40 $\mu g\ m^{-3}$	Annual Mean	31 Dec 2005
Particles (PM_{10})	50 $\mu g\ m^{-3}$ not to be exceeded more than 35 times a year	24 hour mean	31 Dec 2004
	40 $\mu g\ m^{-3}$	Annual Mean	31 Dec 2004
Sulphur Dioxide	350 $\mu g\ m^{-3}$ not to be exceeded more than 24 times a year	1 hour mean	31 Dec 2004
	125 $\mu g\ m^{-3}$ not to be exceeded more than3 times a year	24 hour mean	31 Dec 2004
	266 $\mu g\ m^{-3}$ not to be exceeded more than 35 times a year	15 minute mean	31 Dec 2005

Table 2 - Proposed new particle objectives (from Air Quality Strategy Addendum (2003))

Pollutant	Objective		Date to be achieved by
	Concentration	Measured as	
Particles (PM_{10}) (NB the objective for London is given in brackets)	50 $\mu g\ m^{-3}$ not to be exceeded more than 7 (10) times a year	24 hour mean	31 Dec 2010
	20 (23) $\mu g\ m^{-3}$	Annual Mean	31 Dec 2010

Additional objectives have been set for ozone and polyaromatic hydrocarbons (PAHs), although these have been deemed the responsibility of national government and therefore not applicable to the LAQM process.

The objectives are all based on health-based standards using current scientific advice taking into account the likely cost and benefits, as well as feasibility and practicality in meeting the objectives. The objectives are mostly in line with limit values prescribed by EU Directive, although additional objectives (including bringing forward the date for compliance) have been included for some pollutants.

1.2 Review and Assessment (1997 to present)

The 'review and assessment' of air quality is the first step in the LAQM process. Part IV of the Environment Act requires each local authority to review air quality 'from time to time'. The Borough of Lewisham carried out the previous or 'first' round of reviews and assessments from 1999 to 2003 to determine the need for designation of AQMAs in the Borough.

The Council followed the phased approach required by the Government and undertook the first, second, third and fourth stages of the review and assessment process.

The seven air quality pollutants detailed above were assessed and screened within the Council's area.

Benzene, 1,3 butadiene, carbon monoxide, lead and sulphur dioxide (SO_2) were considered and found not likely to lead to the air quality objectives being exceeded. As a result no further action was required for these pollutants.

The whole of the Council's area was assessed for the annual mean nitrogen dioxide (NO_2) and daily mean PM_{10} objectives and areas across the Borough were found to exceed the objectives, mainly as a result of roads vehicles. As a consequence Air Quality Management Areas (AQMAs) were designated.

Following on, the Stage 4 report subsequently remodelled the whole Borough using revised vehicle emission factors. The modelling predictions confirmed the Stage 3 findings that the annual mean NO_2 and 24 hour mean PM10 AQS objectives would be exceeded.

The Council produced it's Action Plan in December 2003 in an effort to bring about change across a number of areas to ensure that emissions were reduced from the main sources of pollution in a cost effective and proportionate way.

The Council has since undertaken the second round of review and assessment, whereby the Council completed its Updating and Screening Assessment (USA) in February 2004.

The USA examined air quality across the whole of the Borough in accordance with Defra guidance.

The report identified that the risk of the objectives being exceeded:

- For carbon monoxide, benzene, 1,3-butadiene, lead and sulphur dioxide was:-

  Not significant in the Council's area. Therefore, the Council did not progress beyond the Updating and Screening Assessment for these pollutants.

These pollutants were therefore reported on in the Council's subsequent Air Quality Progress report 2005.

- For nitrogen dioxide: -

  There is a risk of the annual mean objective being exceeded across many parts of the Borough. This is consistent with the Council's existing AQMAs.

- For particles PM_{10} (for 2004 only): -

  There is a risk of the annual mean objective being exceeded across parts of the Borough close to busy roads.

- For PM_{10} (for 2010 only): -

  There is a risk of the objectives being exceeded across parts of the Borough. The Council however is not required to undertake actions at this time in respect of this finding, other than to note it for longer term planning purposes.

The Council was required to undertake a Detailed Assessment of PM_{10} to determine whether or not the Council's AQMAs should be revoked, amended or maintained. Primarily the Council was concerned that PM_{10} emissions from local fugitive sources were leading to higher concentrations in some locations.

The Detailed Assessment concluded that the Council should maintain the designated AQMAs and continue the programme of monitoring and consider an expansion of the current monitoring stations to locations where fugitive sources are known to be an issue.

Subsequently, the Council's Air Quality Progress report was produced in 2005 giving updated monitoring results.

2. Updating and Screening Assessment

2.1 Introduction

The government's Air Quality Strategy (AQS) establishes the framework for air quality improvements, including international and national improvements. However, it is recognised that despite these improvements, areas of poor air quality will still remain and are best dealt with using local measures implemented through the LAQM regime. The role of the local authority review and assessment process is to identify the areas where it is considered that the objectives will be exceeded.

This report concerns the third round of LAQM review and assessment (R&A), which is part of a three yearly cycle for review and assessment ending in 2010. It follows the prescribed guidance given in Technical Guidance LAQM. TG (03) (DEFRA, 2003a) and specific amendments released by DEFRA as "Frequently Asked Questions" in January 2006, supported where necessary by new LAQM Tools. The guidance is designed to help local authorities undertake their duties under the Environment Act 1995 to review and assess air quality in their area from time to time.

It is recognised that whilst most of the original TG03 guidance is still relevant, some parts required revision to reflect the most up-to-date understanding, and to draw upon experience gained during the second round of Review and Assessment.

Updated guidance has been prepared to cover the following issues:

- Background pollution maps and future year calculation tools
- Emissions of sulphur dioxide from steam locomotives
- Emissions of sulphur dioxide from shipping
- Emissions of PM_{10} from poultry farms
- Data ratification procedures
- NO_x: NO_2 relationships

In addition, the Updating and Screening Assessment (USA) checklists provided in TG03 have been revised and re-issued to take account of all necessary changes.

The findings from the USA determine whether or not the Council needs to carry out a Detailed Assessment and then potentially progressing to the declaration, revocation or amendment of an AQMA(s).

2.2 Monitoring Data

The Council's monitoring of air quality in its area provides an important source of information for understanding air quality. This benefit can be further enhanced if the monitoring is undertaken as part of a wider e.g. national or regional network.

It is, however, important to ensure that there is confidence in the data being produced and used. Hence QA/QC issues need to have been considered and the data produced also need to be properly validated and ratified.

2.3 Background Pollutant Concentration

These are produced nationally for all local authorities in the UK and provide the estimated background annual mean air pollutant concentrations at a 1 km x 1 km grid resolution for 2004 for NO_x, NO_2, PM_{10}, PM_{10} secondary concentrations, with projected concentrations also available for NO_x (2005, 2010), NO_2 (2005, 2010), PM_{10} (2005, 2010).

The data is available at
www.airquality.co.uk/archive/laqm/tools.php?tool=background04

The methods to estimate concentrations in other years use Year Adjustment Factors, which are designed to represent typical trends.

2.4 Industrial Sources

Both the Environment Agency and the Council regulate industrial sources under the Pollution Prevention and Control Act 1999 and Environmental Protection Act 1990. The Environment Agency is responsible for the largest industrial processes (IPPC/ Part A1 processes), whilst the Council is mainly responsible for smaller Part B and A2 processes. There are also some small industrial processes that fall outside of Part B/A2 control that can be of interest to LAQM.

Details of the Part A and B processes and installations are available from the Council's Public Register and are also contained in Appendix 1 and 2 at the back of this report. There is one a Part A1 process in the Borough; the incineration process operated by South East London Combined Heat and Power Ltd (SELCHP) in the north of the Borough. This has not changed from the previous USA. The Council also permits 5 Part B installations and 17 petrol stations in the Borough. One additional vehicle respraying installation has been permitted since the previous USA although this is of little significance for the purposes of this USA.

2.5 Road Traffic

Updated details of road traffic movements across the Borough have been obtained from the London Atmospheric Emissions Inventory 2003, which has recently been produced by the GLA.

2.6 Relevant Exposure

The objectives relate to public exposure to the pollutants. More specifically any areas that may exceed the objectives should relate to the quality of air at locations which are situated outside of buildings or other man made structures above or below ground and where members of the public are regularly present (from the Air Quality regulations). TG03 further advises that the assessment should focus on those locations where members of the public are likely to be regularly present and are likely to be exposed over the period of the objective.

3. Updating and Screening Assessment – Results

3.1 Carbon Monoxide

3.1.1 Objective

The current air quality objective for Carbon Monoxide is a daily maximum running 8 hour mean of 10 mg/m$^{3.}$

The objectives is to be achieved by the end of 2003.

3.1.2 Pollutant Overview

Carbon monoxide (CO) is a colourless and odourless gas produced by the burning of fuels. Exposure to carbon monoxide leads to a decreased uptake of oxygen by the lungs and can lead to a range of symptoms as the concentration increases. Early symptoms of exposure include tiredness, drowsiness, headache, pains in the chest and sometimes stomach upsets. Some people, for example those with heart disease, are at an increased risk. Exposure to very high concentrations will lead to death. However such conditions, where there are very high concentrations, are most likely to arise in confined spaces, rather than outdoors where the public are exposed and the air quality strategy (AQS) applies.

3.1.3 National Overview

The dominant source of carbon monoxide in the UK remains road transport (49% of UK emissions in 2003) (DEFRA, 2005), although annual emissions are declining mainly as a result of uptake of abatement technologies (catalytic converters) following the introduction of the Euro standards for road vehicles (since 1993). Significant emission reductions have occurred over the last decade from Euro standards, with reductions of 42% for carbon monoxide relative to the "no abatement" scenario (DEFRA, 2004).

Monitoring results from the UK national network sites confirm that there was no exceedence of the objective at any site during the period between 2001 and 2005.

Current projections are that emissions will reduce by 78% between 2000 and 2010. National modelling has further indicated that by the end of 2003, major roads will not exceed the objective.

No AQMAs were declared in the first and second rounds of R & A (although the first round was based on the previous objective of 11.6mg m^{-3}).

Based on TG03 guidance, it is considered highly unlikely that any authority will be required to proceed beyond the updating and screening assessment.

3.1.4 Assessment Methodology

A checklist approach was used, based on:-

- **Monitoring data.** For this pollutant, ratified monitoring data is required at locations where there is a potential for public exposure. If the data indicated that the maximum daily running 8-hour concentration exceeded the objective then the Council would need to proceed to the Detailed Assessment stage.

- **Traffic data relating to very busy roads**. This relates to roads not previously considered and to annual average daily traffic flows exceeding stated flows (which are dependent on the type of road) for areas where the annual mean background is expected to be greater than 1mg m^{-3}. If there is relevant exposure within 10m of the kerb then it will be necessary to obtain additional traffic information relating to average speeds and the HGV/LGV split. The DMRB screening model can be used to predict concentrations. (Note; if junctions occur along any of the roads then the flows from the roads should be added together). If the predicted annual mean concentration is greater than 2mg m^{-3} then it is necessary to proceed to the Detailed Assessment stage.

3.1.5 Assessment Results

For the purposes of this review and assessment the following data was considered:-

Monitoring

The Council does not undertake carbon monoxide monitoring in the Borough.

Monitoring is undertaken at the nearby Crystal Palace and Southwark 2 sites, which are both located at the roadside. The Crystal Palace site opened in 1999 and the Southwark 2 site (on the Old Kent Road) opened in 1994. Details of recent monitoring and data capture are given in Table 3 based on scaled and ratified data (apart from 2005 which are still provisional).

There were no periods of exceedence for the carbon monoxide objective at the site over the period 2000 to 2005. Details of annual mean and maximum one-hour concentrations are also provided for information purposes. The annual mean concentrations are low in comparison with the objective.

Table 3- Carbon monoxide statistics from the Crystal Palace and Southwark 2 site (mg m^{-3})

	2000	2001	2002	2003	2004	2005
Crystal Palace						
Max 8 Hour	5.9	6.5	4.2	4.1	*2.9*	*3.5*
Annual mean	1.5	1.2	1.0	0.7	*0.7*	*0.7*
Data capture %	97.0	96.0	96.0	97.0	85.0	88.0
Max 1 Hour	10.0	7.3	7.1	6.8	*5.2*	*4.9*
Southwark 2						
Max 8 Hour	6.4	6.4	4.4	4.1	3.7	3.9
Annual mean	1.3	1.5	0.9	0.9	0.9	0.8
Data capture %	98.0	92.0	84.0	38.0	98.0	90.0
Max 1 Hour	8.0	8.2	5.3	5.9	5.7	5.0

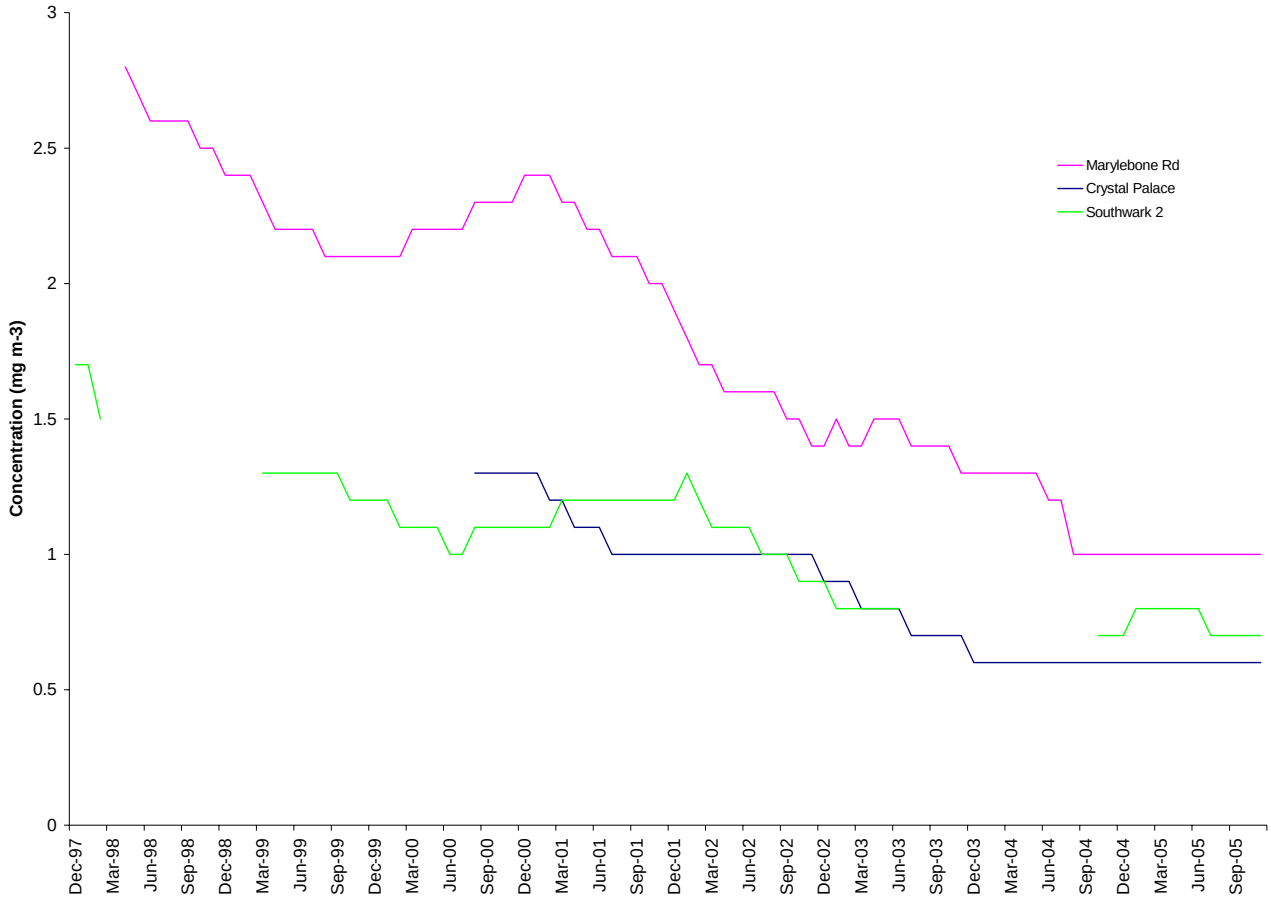
(Note – italics indicates < 90% data capture)

An analysis of rolling annual mean concentrations is provided. The analysis is for the period from 1997 and includes the busy central London site at Marylebone Road.

Figure 1 illustrates changing concentrations over time, based on changing annual averaged hourly mean concentrations. The use of rolling annual mean concentrations in this way largely removes seasonal influences and provides a guide to changing trends over time.

The rolling annual mean carbon monoxide concentrations for the sites largely indicate a downward trend over time, in line with reductions in emissions over time. This is most noticeable for the Marylebone Road kerbside site. All sites indicate low concentrations for the period shown, with the most notable reduction arising prior to 2000. This is to be expected with older more polluting vehicles being replaced by Euro vehicles incorporating catalytic converters. The reduction in concentration for an average of sites in the London Air Quality Network was 56% (based over the period from 1996 to 2004) (ERG, 2006).

Figure 1 - Rolling annual mean trends for Crystal Palace and Marylebone Road sites (1997 to 2004)



The results of the monitoring undertaken at these sites are considered representative of the busiest roadsides in the Council's area. These results indicate that the objective is being met and therefore a Detailed Assessment of carbon monoxide based on monitoring is not required.

Very busy road/ junctions in built up areas

All roads and junctions were considered in the previous USA and none were found to exceed the criteria for the carbon monoxide objective. This assessment indicated that no road or junction had flows >80,000 vehicles per day for single carriageways, >120,000 vehicles per day for dual carriageways and >140,000 vehicles per day for motorways and the estimated background concentrations were below the annual mean threshold of 1mg m^{-3} for carbon monoxide. Based on these findings it is considered that the objective is not likely to be exceeded in the Borough as a result of road traffic emissions.

3.1.6 Conclusions

The Updating and Screening Assessment for carbon monoxide has not identified a risk of the objective being exceeded by the end of 2003 in the Borough.

The findings of the Updating and Screening Assessment have shown that there have not been any significant changes to carbon monoxide concentrations or emissions in the Borough since the second round USA.

As a result, a Detailed Assessment for carbon monoxide will not be required for this round of review and assessment.

3.2 Benzene

3.2.1 Objective

The current air quality objectives for Benzene is 16µg/m ¯3 as a running annual mean to be achieved by the end of 2003 and a additional objective of 5µg/m ¯3 as an annual mean concentration to be achieved by 2010.

3.2.2 Pollutant Overview

Benzene at normal ambient temperatures occurs as a liquid but it readily evaporates and small amounts are detectable in the air. It is known from workplace studies that benzene is potentially carcinogenic, that is, exposure to it may lead to the development of cancer.

EPAQS (1994) considered risks associated with the levels found in the air in the UK to be small and not accurately measurable. Nevertheless, it considered that efforts continue to be made to reduce the levels even further as a precautionary measure.

3.2.3 National Overview

Benzene emissions arise from the evaporation and combustion of petroleum products, as benzene is a constituent of petrol. It is estimated that 11% of the total emissions from 2003 arose from fuel combustion. Benzene is also exhausted in stack emissions and as fugitive emissions from its manufacture and use in the chemical industry.

In total benzene emissions are estimated to have decreased by 71% between 1990 and 2003, to 18.3 kt in 2003 (DEFRA, 2005).

Monitoring results from national sites using pumped tubes indicated that the stricter 2010 objective was not exceeded. This network started in 2002 and the results include the period from 2002 to 2005.

Emissions from vehicles are predicted to reduce by over 90% from 1990 levels by 2010 (DEFRA, 2004).

One AQMA was declared for benzene in the UK during the second round of R & A. This was at a school, which is sited close to a busy petrol station and the decision was based on the 2010 objective.

No AQMAs were declared during the first round of review and assessment.

3.2.4 Assessment Methodology

A checklist approach was used, based on:-

- **Monitoring data.** Monitoring results should be prioritised based on locations near busy roads, where the highest exposure is likely to be at building facades. Where monitoring relating to industrial and other sources is undertaken then monitoring down wind from the site is recommended. If monitoring is undertaken by diffusion tube, suitable QA/QC procedures should be used and the tubes validated and bias corrected. The results will need to be corrected to 2010. If the data indicates that the objective is exceeded then the Council will be required to proceed to the Detailed Assessment stage.

- **Data relating to very busy roads**. This relates to roads not previously considered and to 2010 only, where the 2010 annual mean background exceeds 2μg m^{-3} and the annual average daily traffic flows exceed the stated flows (which are dependent on the type of road). If there is relevant exposure within 10m of the kerb then it will be necessary to obtain additional traffic information relating to average speeds and the HGV/LGV split. The DMRB screening model can be used to predict 2010 concentrations. (Note; if junctions occur along any of the roads then the flows from the roads should be added together). If the predicted concentration is greater than 5μg m^{-3} then it is necessary to proceed to the Detailed Assessment stage.

- **Industrial sources**. For new industrial and other sources listed in TG03 it is likely that an air quality assessment will have been undertaken as part of planning or permit process. The results from this should be cited. Authorities are also asked to check information from previous rounds of R&A and note if there are substantially increased emissions (>30% per annum). Where it is necessary to check industrial sources then the annual emission of benzene is needed along with the height of discharge to calculate whether the relevant threshold in the guidance has been exceeded.

- **Petrol stations/ major fuel storage depots**. For petrol stations it is necessary to identify those stations not covered by previous reports with a throughput of more than 2000m^3 and with nearby roads with more than 30,000 vehicles per day. If there is relevant exposure within 10m of the pumps it is necessary to proceed to a Detailed Assessment.

  For major petrol storage depots not covered by previous reports it is necessary to identify relevant exposure and annual emissions to calculate whether the relevant threshold in the guidance has been exceeded.

3.2.5 Assessment Results

For the purposes of this review and assessment the following data was considered:-

Monitoring

The Council does not undertake benzene monitoring in its area.

Monitoring of benzene is undertaken at other sites in London as part of the government's non-automated hydrocarbon network. This network uses pumped tubes that are replaced fortnightly. There is 91.2% data availability for the period from April 2002 to the present. These measurements, from a central London site and a London roadside site, are presented in Table 4.

Table 4 - Results of benzene monitoring (µg m^{-3}) from the government's sites in London (2002-2005)

	2002	2003	2004	2005
Haringey Roadside	2.7	2.91	2.78	2.32
London Bloomsbury	1.49	1.91	1.69	1.47

All the results are below the 2003 and the stricter 2010 objectives. The monitoring results are considered representative of the Council's area and they indicate that the concentrations will not exceed the benzene objectives and therefore a Detailed Assessment based on monitoring is not required.

Very busy road/ junctions in built up areas

All roads and junctions were considered in the previous USA and none were found to exceed the criteria for the benzene objective. This assessment indicated that no road and junction had flows >80,000 vehicles per day for single carriageways, >120,000 vehicles per day for dual carriageways and >140,000 vehicles per day for motorways. Estimated 2010 background concentrations were also below the annual mean threshold of 2µg m^{-3} for benzene. Based on these findings it is considered that the objective is not likely to be exceeded in the Borough as a result of road traffic emissions.

Industrial Sources

There are no new industrial processes or significant increased emissions of benzene from existing industrial processes of relevance in the Borough or neighbouring areas.

Petrol stations/ major fuel storage depots

The previous USA did not identify any petrol stations where the TG03 criteria applied and there has been no change to this position. (See Appendix 2 for list of permitted petrol stations in the Borough).

3.2.6 Conclusions

The Updating and Screening Assessment for benzene has not identified a risk of the 2003 and 2010 objectives being exceeded in the Council's area.

The findings of the Updating and Screening Assessment have shown that there have not been any significant changes to benzene concentrations or emissions in the Borough since the second round USA.

As a result, a Detailed Assessment for benzene will not be required for this round of review and assessment.

3.3 1,3 Butadiene

3.3.1 Objective

The current air quality objective for 1,3 butadiene remains at 2.25 µg /m ¯3 as a running annual mean to be achieved by the end of 2003.

3.3.2 Pollutant Overview

1,3 Butadiene arises from the combustion of petroleum products and its manufacture and use in the chemical industry. It is not present in petrol but is formed as a by-product of combustion.

3.3.3 National Overview

Road transport and other machinery are the dominant sources of UK emissions (83% of the total in 2003) (DEFRA, 2005). As with other predominantly vehicle related pollutants annual emissions are declining mainly as a result of uptake of abatement technologies (i.e. catalytic converters) following the introduction of the Euro standards for road vehicles (since 1993). This has led to a reduction in emissions of 55% relative to a "no abatement" scenario (DEFRA, 2004). Current projections are that emissions will continue to reduce by 81% in 2010.

Current monitoring indicates that all of the UK national network sites were significantly below the 2003 objective during the period between 1999 and 2004 (from TG03) apart from the Marylebone Road site in London in 1999. This site is a very busy kerbside site and concentrations have greatly reduced. Reductions in emissions from road vehicles are continuing to decrease and hence only locations close to industrial sites were expected to proceed beyond the second round updating and screening assessment for this objective.

National mapping also indicated that for all areas the 2003 objective would not be exceeded. No AQMAs were declared in the first round of R&A.

3.3.4 Assessment Methodology

A checklist approach was used, based on:-

- **Monitoring of data.** For monitoring, the data should be prioritised and for locations near industrial sites monitoring down wind from the site is recommended. If the data indicates that the objective is exceeded then the Council will be required to proceed to the Detailed Assessment stage.

- **Industrial sources.** For new industrial processes listed in the guidance it is likely that an air quality assessment will have been undertaken as part of the planning or permit process. The results from this should be cited. Authorities are also asked to check information from previous rounds of R&A and note if there are substantially increased emissions (>30% per annum). Where it is necessary to check an industrial source then the annual emission of 1,3 butadiene is needed, along with the height of discharge, to calculate whether the relevant threshold emissions rate in the guidance has been exceeded.

3.3.5 Assessment Results

For the purposes of this review and assessment the following data was considered:-

Monitoring

The Council does not undertake monitoring of 1,3-butadiene.

Continuous monitoring however is undertaken at the busy central kerbside London site at Marylebone Road, which is part of the government's automated network. The maximum running annual mean results at this site for the period 2002 to 2005 are between 1.14 µg m^{-3} (in 2002) and 0.57 µg m^{-3} (in 2005). These results indicate that concentrations are decreasing over time. The results are also less than the 2003 objective and can be considered representative of the likely maximum in the Council's area; hence they indicate that the concentrations will not exceed the 1,3-butadiene objective. In view of this a Detailed Assessment is not required.

Industrial Sources

There are no new industrial processes or changes relating to existing industrial processes of relevance for 1,3 butadiene in the Borough, or neighbouring areas.

3.3.6 Conclusions

The Updating and Screening Assessment for 1,3 butadiene has not identified a risk of the new objective being exceeded by the end of 2003 in the Borough.

The findings of the Updating and Screening Assessment have shown that there have not been any significant changes to 1,3 butadiene concentrations or emissions in the Borough since the second round USA.

As a result, a Detailed Assessment for 1,3 butadiene will not be required for this round of review and assessment.

3.4 Lead

3.4.1 Objective

The current air quality objective for lead remains at 0.5 µg /m ˉ3 as an annual mean concentration to be achieved by the end of 2004, with a lower air quality objective of 0.25 µg /m ˉ3 as an annual mean concentration to be achieved by the end of 2008.

3.4.2 Pollutant Overview

Lead in particulate form in air can be inhaled directly and ingested indirectly following its deposition on soil and crops. Exposure to lead has been known to be harmful to people for many years, with severe adverse effects on blood, the nervous system and the kidneys (although these effects only occur with high exposures). More subtle effects caused by lower exposure to lead can also arise, such as may occur from the presence of lead in drinking water, paint and dust, and in the ambient air. These effects include the impaired intellectual development of children. EPAQS concluded that the available evidence suggests that the risks associated with the levels found in the air in the UK are very small and cannot be measured with any accuracy (EPAQS, 1998). However, efforts to reduce the levels even further continue as a precautionary measure.

3.4.3 National Overview

Lead emissions have declined greatly in recent decades, principally as a result of the lead content in fuel (where it was used as an anti-knock additive) being reduced and subsequently phased out at the end of 1999.

Other sources include industrial processes, such as iron and steel production and waste incineration. Emissions from these sources have also decreased as a result of improved abatement measures.

Emissions in 2003 are estimated to be 0.13 kt, a decrease of 95% on the 1990 estimates, with road transport contributing only 1% to UK emissions total (DEFRA, 2005).

Current monitoring indicates that none of the UK national network sites exceeded the 2004 objective during the period between 2000 and 2004, with industrial sites having higher concentrations than urban background sites. Similarly, no network sites exceeded the stricter 2008 objective during the period since 2002 (one industrial site in the Midlands exceeded this objective in 2001).

No AQMAs were declared in the first and second rounds of R&A.

Based on TG03, it is considered that only relevant locations in the vicinity of major industrial processes emitting lead will be required to proceed beyond to a Detailed Assessment.

3.4.4 Assessment Methodology

- **Monitoring of data.** For monitoring the data should be prioritised and for locations near industrial sites monitoring down wind from the site at the nearest residential property is recommended. If the data indicates that the objective is exceeded then the Council will be required to proceed to the Detailed Assessment stage.

- **Industrial sources.** For new industrial processes listed in the guidance it is likely that an air quality assessment will have been undertaken as part of planning or permit process. The results from this should be cited. Authorities are also asked to check information from previous rounds of R&A and note if there are substantially increased emissions (>30% per annum). Where it is necessary to check industrial sources then the annual emission of lead is needed along with the height of discharge to calculate whether the relevant threshold in the guidance has been exceeded.

3.4.5 Assessment Results

For the purposes of this review and assessment the following data was considered:-

Monitoring

The Council does not monitor lead in its area.

Monitoring is however undertaken at a number of sites elsewhere in London as part of the government's national network. The results from these sites (between 2000 and 2005) show that concentrations do not exceed the 2003 and 2008 objectives. The highest annual mean concentration was 0.038 $\mu g\ m^{-3}$ at the kerbside site at Marylebone Road site in central London in 2000. Concentrations at the London sites have since further reduced at all sites.

Table 5 - Lead monitoring results from London ($\mu g\ m^{-3}$)

	2000	2001	2002	2003	2004
Cromwell Rd London	0.032	0.031	0.027	0.022	0.017
Central London			0.022	0.021	0.015
London Brent	0.024	0.030	0.022	0.025	0.020
London Marylebone Road	0.038	0.036	0.028	0.028	0.0183

These monitoring results are considered representative of the likely highest concentrations in the Council's area. The results indicate that the concentrations will not exceed the 2004 and 2008 lead objectives and therefore a Detailed Assessment is not required.

Industrial Sources

There are no new industrial processes or changes relating to existing industrial processes of relevance for lead in the Borough, or neighbouring areas.

3.4.6 Conclusions

The Updating and Screening Assessment for lead has not identified a risk of the new objective being exceeded by the end of 2003 in the Borough.

The findings of the Updating and Screening Assessment have shown that there have not been any significant changes to lead concentrations or emissions in the Borough since the second round USA.

As a result, a Detailed Assessment for lead will not be required for this round of review and assessment.

3.5 Nitrogen Dioxide

3.5.1 Objective

The current air quality objectives for nitrogen dioxide are 40 μg/m^3 as an annual mean concentration to be achieved by the end of 2005, and a one hour mean concentration of 200 μg/m^3 not be exceeded more than 18 times per year. The objectives are to be achieved by the end of 2005

3.5.2 Pollutant Overview

Nitrogen dioxide (NO_2) and nitric oxide (NO) are both oxides of nitrogen, and are collectively referred to as nitrogen oxides (NO_x). All combustion processes produce NO_x emissions, largely in the form of nitric oxide which is then converted to nitrogen dioxide, mainly as a result of reaction with ozone in the atmosphere. It is nitrogen dioxide that is associated with adverse effects upon human health.

The principal source of nitrogen oxides emissions is road transport, which accounted for about 49% of total UK emissions in 2000 (from TG (03)). Major roads carrying large volumes of high-speed traffic are a predominant source, as are conurbations and city centres with congested traffic. The contribution of road transport to nitrogen oxides emissions has declined significantly in recent years as a result of various policy measures. At a national level, urban traffic emissions of nitrogen oxide are estimated to fall by about 20% between 2000 and 2005 and by 46% between 2000 and 2010 (Stedman et al, 2001).

Other significant sources of nitrogen oxides include emissions from the electricity supply industry and other industrial and commercial sectors. Emissions from both sources have also declined dramatically, due to the fitting of low nitrogen oxides burners and the increased use of natural gas. Industrial sources make only a very small contribution to annual mean nitrogen dioxide levels.

More than a hundred AQMAs were declared in the first round of review and assessment across the country, the vast majority of which related specifically to road transport emissions where the attainment of the annual mean objective is considered unlikely.

The annual mean objective is more demanding than the one-hour mean objective and areas predicted to exceed the objective include parts of major conurbations, town centres with congested traffic, dual carriageways and motorways.

3.5.3 National Overview

The dominant source of NO_x in the UK remains road transport (around 40% of UK emissions in 2003) (DEFRA, 2005). Although in urban areas this proportion is higher, up to 70%. Combustion sources also emit significant amounts of NO_x, however such sources only make a small contribution to NO_2 levels. Significant emissions reductions have occurred over time primarily as a consequence of abatement measures in road transport and power stations and the increased use of other fuels for power generation. Since 1989, total NO_x emissions are estimated to have declined by 45%

Despite the above reductions, monitoring results from across the UK continue to indicate that sites, particularly at roadside, exceed the annual mean objective. Although it is only the busiest urban roadside sites that have recorded periods where the hourly standard has been exceeded.

Further improvements are projected to 2010 (with emissions reductions of 69% for NO_x, relative to the "no abatement" scenario). These reductions arise as tougher Euro standards enter into force for new vehicles, and as the older vehicle fleet is retired. Further emission reductions are also projected to occur post 2010.

As a result of high concentrations arising post 2005 more than 150 AQMAs were declared across the UK during the first and second rounds of R & A for the annual mean objective.

3.5.4 Assessment Methodology

A checklist approach was used, based on:-

- **Monitoring of data.** Ratified monitoring data should be considered and if the data indicate that the concentration exceeds either objective then the Council will be required to proceed to the Detailed Assessment stage.

- **Roads including narrow congested streets and junctions.** This section focuses on specific road traffic locations not fully considered during previous rounds of R&A. For these situations, annual average daily traffic flows exceeding stated flows (which are dependent on the type of road) for different locations are required. If the results arising from these assessments are greater than 40 $\mu g\ m^{-3}$ then a Detailed Assessment is necessary. For any new roads a specific assessment is required based on the DMRB screening model. Similarly roads close to the objective at the last review and assessment or roads with significantly changed flows (> 25% increase) should be re-assessed.

- **Bus stations.** Bus stations not previously considered should be assessed, based on the numbers of bus movements and the proximity of relevant exposure (in this instance it should be judged against the 1 hour criteria). If the bus station meets these requirements then DMRB is to be used to obtain a predicted annual mean. If the predicted concentration is greater than 40 μg m^{-3} then it is necessary to proceed to the Detailed Assessment stage.

- **New industrial sources and existing ones with significantly increased emissions.** For new industrial sources (as listed in TG03) it is likely that an air quality assessment will have been undertaken as part of planning or permit process. The results from this should be cited. If no assessment was undertaken then TG03 provides nomograms for an assessment. The same approach is required where there has been a substantial increase in emissions (i.e. one greater than 30%).

- **Aircraft.** Aircraft emissions not previously considered are important if there is relevant exposure within 1000m of the airport boundary and the equivalent passenger numbers is predicted to exceed 5 million passengers per annum.

3.5.5 Assessment Results

The main sources examined in the previous round of review and assessment were road transport. The Council undertook a Stage 3 report in the previous round of review and assessment and identified the sections of road in the Borough with relevant exposure and where the annual mean objective would be exceeded. Consequently the Council declared 5 AQMAs.

A further review was also undertaken and incorporated new emission factors. The results showed that future vehicles emissions would not reduce as much as previously estimated and as a result the Council maintained its AQMAs.

For the purposes of this review and assessment the following data was considered:-

Monitoring

The Council undertakes monitoring of NO_2 using automatic high quality continuous monitoring analysers. The sites in the area and nearby are as follows:

- Catford Town Hall (Lewisham 1) – an urban background site in Catford, in the middle of the Borough (this site has been operating since 1996).

- New Cross Road (Lewisham 2) - a roadside site in New Cross that started operating in late 2002.

A further site just outside of the Borough :-

- Crystal Palace – a jointly operated roadside site located on Crystal Palace Parade just outside the south west corner of the Borough.

All the sites are part of the London Air Quality Network and therefore the standards of QA/QC are similar to those of the government's AURN sites. Regular calibrations are carried out, with subsequent data ratification undertaken by the ERG at King's College London. In all cases the data are fully ratified, apart from the 2005, which are still provisional. The results of the monitoring at the sites are given in Table 6.

Table 6 - NO_2 continuous monitoring in Lewisham (2001 – 2005)

LAQN site		2001	2002	2003	2004	2005
Lewisham 1	Annual mean	***52***	**50**	**55**	**49**	**51**
(Urban background)	No of hours >200 µg m^{-3}	*0*	0	1	1	3
	Data capture %	*45*	93	99	97	97
Lewisham 2	Annual mean	-	***46***	**64**	**68**	**55**
(Roadside)	No of hours >200 µg m^{-3}	-	*0*	5	4	4
	Data capture %	-	*75*	99	100	90
Crystal Palace	Annual mean	**51**	***47***	**49**	***48***	***51***
(Roadside)	No of hours >200 µg m^{-3}	0	*0*	*2*	*0*	*0*
	Data capture %	96	*82*	96	*85*	*87*

(Note – **bold** means exceeds objective: italics indicates < 90% data capture)

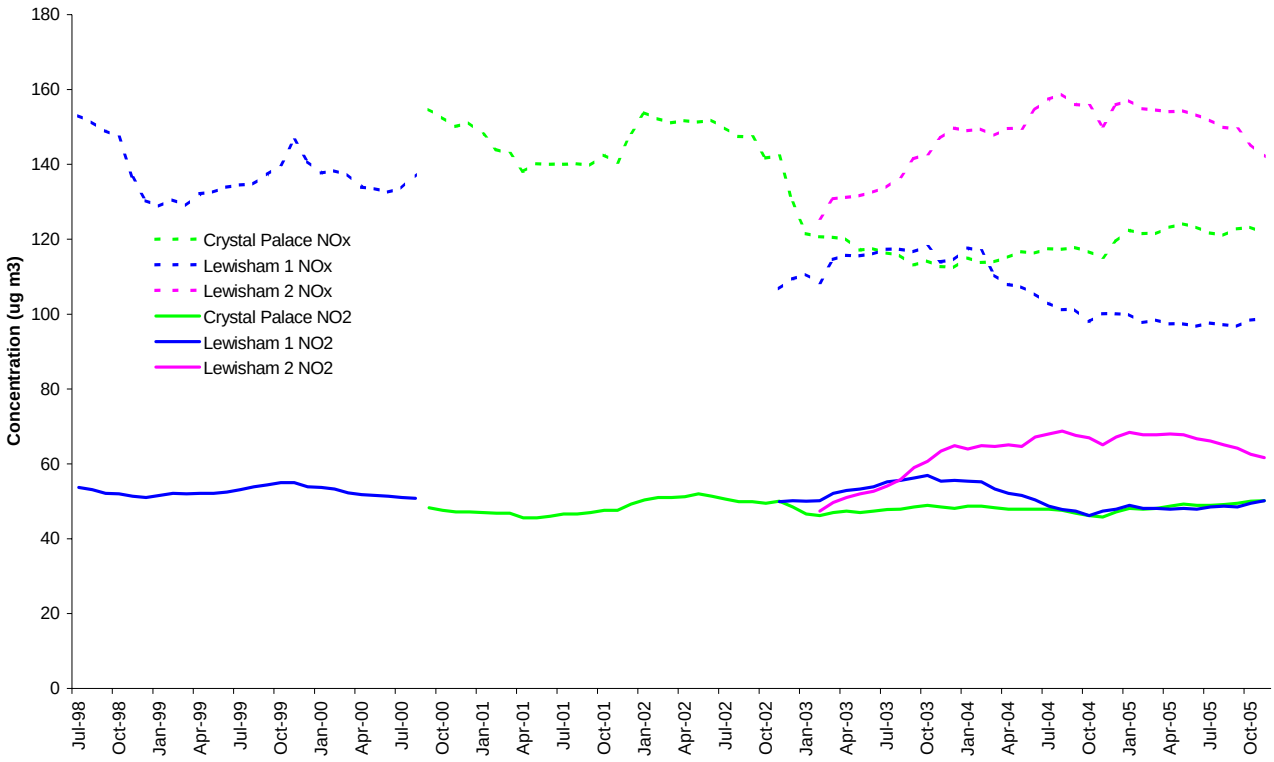
The results indicate that the annual mean objective was exceeded at the Lewisham 1 and 2 sites for all years monitored. High concentrations of NO_2 arose across London in 2003 due to poor dispersion conditions during the wintertime, plus during the hot summer there were highly oxidising conditions leading to some summertime incidents. The annual mean objective was also exceeded at the roadside site at Crystal Palace for all years reported.

The hourly objective was however not exceeded at any of the sites, although some hours did exceed the hourly standard of 200 µg m^{-3}during most years. These results suggest that emissions of NO_2 directly emitted from road vehicles may be increasing (see recent research by Carslaw D.C and Beevers, S. D, 2005).

An analysis of rolling annual mean NO_x and NO_2 concentrations is provided for the Lewisham monitoring sites to indicate any trend over time. The Crystal Palace roadside site is also included. The analysis is for the period from 1998 through to 2005.

Figure 2 illustrates changing concentrations over time for the sites, based on changing annual averaged hourly mean concentrations. The use of rolling annual concentrations in this way largely removes seasonal influences and provides a guide to changing trends over time.

Figure 2 - Rolling annual mean NO_X/ NO_2 trends for Lewisham and nearby sites (1998 to 2005)



The rolling annual mean concentrations of NO_x indicate a downward trend at the Lewisham 1 and Crystal Palace roadsides site over time in line with the expected reductions in emissions over time. An equivalent trend for NO_2 is less clear for the sites, with both remaining almost constant over the period of monitoring. The downward trend for NO_x (approximately 60 $\mu g\ m^{-3}$) as the primary emission is more pronounced than that for NO_2 (approximately 10 $\mu g\ m^{-3}$) at Lewisham 1. At the Crystal Palace site, NO_2 has remained almost constant and appears in 2005 to be increasing marginally. This illustrates the difference between pollutants and the difficulty in reducing NO_2, which is mostly a secondary pollutant that is largely determined by the oxidising capacity of the atmosphere. In addition it again highlights the recent research which indicates that direct NO_2 emissions may also be increasing.

The Lewisham 2 roadside site does not show any similar reductions; instead both NO_x and NO_2 are increasing slightly, this may be a reflection of the short period of monitoring and the direct NO2 contribution referred to above.

The TG03 guidance also includes correction factors for future years at roadside and background locations and using this, estimated concentrations for the sites have been derived. The results are given below in Table 7.

Table 7 - Predicted NO_2 using corrected results for the Council's monitoring sites (µg m^{-3})

SITE	LW1	LW2
2010 (based on 2005)	**44.6**	**46.3**

The estimations for the above sites indicate that both sites will exceed the 2010 annual mean objective, despite the predicted reductions in emissions.

Roads including narrow congested streets and junctions

Busy streets where people may spend an hour or more close to traffic were examined in the second round USA. There has been no change to the previous findings since then and no new roads have been constructed with traffic flows greater than 10,000vpd in the Council's area since the first round of R&A where there is relevant exposure arising.

The new 2003 London Atmospheric Emissions Inventory (LAEI) has been used to identify changed flows and an examination of this has confirmed that there are no roads in the area with significant changes.

New Industrial Sources and existing with significantly increased emissions

There are no new industrial processes or changes relating to existing SELCHP incineration Part A1 installation and other industrial processes of relevance for NO_2 in the Borough, or neighbouring areas.

Bus stations

Lewisham bus station was examined in the previous USA and there has been no change to this position in this USA.

Aircraft

There is no relevant airport in or close to the Borough and as a result further assessment is not required.

3.5.6 Conclusions

Recent monitoring in the Borough confirms that the NO_2 objectives continue to be exceeded.

There have been no other significant changes to NO_2 concentrations or emissions in the Borough since the second round USA.

As a result of these findings a Detailed Assessment for NO_2 will not be required for this round of review and assessment.

3.6 Sulphur Dioxide

3.6.1 Objective

The current air quality objectives for sulphur dioxide are a 15 min mean concentration of 266µg /m ¯3 not to be exceeded more than 35 times per year, to be achieved by the end of 2005.

Additional objectives include a one hour mean concentration of 350µg /m ¯3 not to be exceeded more than 24 times per year and a 24 hour mean concentration of 125µg /m ¯3 not to be exceeded more than 3 times per year.

These latter objectives, equivalent to the EU limit values, are all to be achieved by the end of 2004.

3.6.2 Pollutant Overview

Sulphur dioxide (SO_2) is a colourless gas, produced from burning fossil fuels like coal and oil. Power stations and oil refineries are the main sources in the UK, with small releases from other industries. SO_2 is also found naturally in the air at low concentrations from natural releases such as volcanoes and forest fires. SO_2 also has a role in the formation of secondary particles.

SO_2 can cause breathing difficulties at high concentrations over short periods of time, particularly to those with asthma and chronic lung disease.

3.6.3 National Overview

UK emissions have decreased to approximately 1Mt in 2003, representing a decrease of 74% from 1990 (DEFRA, 2005). This is mostly as a result of reduced emissions from the industrial and particularly the electricity supply sector, arising from the decreasing use of coal and increasing use of abatement equipment. However, coal combustion still accounts for 76% of the 2003 UK SO_2 emissions.

Emissions from petroleum use also have reduced due to a decline in fuel oil use and the reduction in the sulphur content in the fuel. These led by 2001 to a 96% reduction in SO_2 from the transport sector.

Monitoring results from sites across most of the UK indicate that the AQS objectives are met and that concentrations have reduced in over time. Unlike other LAQM pollutants, further large reductions in emissions are not expected in the coming years.

Despite most locations meeting the objectives, there are some areas where high concentrations do arise from specific local sources. As a result 11 local authorities across the UK declared AQMAs during the previous rounds of R & A.

3.6.4 Assessment Methodology

A checklist approach was used, based on:-

- **Monitoring data**. Ratified monitoring data should be considered and if the data indicate that the concentration exceeds any of the objectives then the Council will be required to proceed to the Detailed Assessment stage.

- **New industrial sources and existing ones with significantly increased emissions.** For new industrial sources listed in TG03 it is likely that an air quality assessment will have been undertaken as part of the planning or permit process. The results from this should be cited. If no assessment was undertaken then TG03 provides nomograms for an assessment. The same approach is required where there has been a substantial increase in emissions (i.e. one greater than 30%).

- **Areas of domestic coal burning**. For domestic sources not previously considered there is the need to identify small areas (500 x 500m) where significant coal burning still takes place. If the density of coal burning premises exceeds 100 per 500 x 500m then a Detailed Assessment is required.

- **Boilers burning coal or oil**. For boiler plant it is necessary to identify all plant >5MW(thermal) that burns coal or fuel oil and establish whether there is relevant exposure within 500m. If such boilers are found then TG03 provides nomograms for an assessment to be made.

- **Shipping.** For shipping not previously considered or where there is new relevant exposure, it is necessary to identify if there is relevant exposure close to the berths and main area of manoeuvring. Should this be established then the number of ship movements (relating to large ships only) should be collated and if the number exceeds more than 5000 movements per year then a Detailed Assessment is required.

- **Railway locomotives**. Both diesel and coal fired locomotives emit sulphur dioxide and this is most relevant where the locomotives are stationary for periods of 15 minutes or more. It is also necessary to establish whether or not there is relevant exposure within 15m of the source. If there are more than two occasions when locomotives are stationary with engines running then it is necessary to go to a Detailed Assessment.

3.6.5 Assessment Results

For the purposes of this review and assessment the following data was considered:-

Monitoring

The Council monitors SO_2 at both of its sites;

Lewisham 1 - an urban background site in Catford which opened in 1996 (sited in the middle of the Borough)

Lewisham 2 - a roadside site in New Cross towards the north of the Borough and which opened in 2002.

Both sites are part of the LAQN and the Lewisham 1 site is also part of the AURN.

The maximum 15-minute concentrations for each year at each site (plus the nearby Crystal Palace site, which is just outside the south east corner of the Borough) are given in Table 8, along with details of data capture. In all cases the data are fully ratified, apart from the 2005, which is still provisional.

Table 8 - SO_2 monitoring in Lewisham (2000 to 2005)

Site	Data reported	2001	2002	2003	2004	2005
Lewisham 1	Maximum 15 minute µg m^{-3}	*56.4*	259	285.7	194.9	109.5
	Data capture %	*45*	96	99	97	94
Lewisham 2	Maximum 15 minute µg m^{-3}	-	*190.5*	267.8	169.7	129.2
	Data capture %	-	*75*	96	100	99
Crystal Palace	Maximum 15 minute µg m^{-3}	257.1	*165.1*	*266.2*	*130.6*	*108*
	Data capture %	92	*89*	*77*	*85*	*74*

(Note – **bold** means exceeds objective: italics indicates < 90% data capture)

These results indicate that the 15-minute standard of 266 µg m^{-3} was exceeded at all three sites during 2003 only, although the standard was approached at Lewisham 1 in 2002 and Crystal Palace in 2001. In 2003 at the Lewisham 1 site there were 2 periods that exceeded, whilst at the other sites there was one 15-minute period only that exceeded per year. These episodes may be due to emissions from large point sources (possibly elsewhere in London). Despite these periods where the standard was exceeded, the 15-minute objective of more than 35 such periods was not exceeded.

The stricter hourly and daily standards were also not exceeded in any year. These results indicate that the hourly and daily SO_2 objectives also were not exceeded over this period of monitoring. These results are considered representative of all the Council's area.

Industrial Sources

Emissions to air from the SELCHP incineration Part A1 installation were examined (as reported by the Environment Agency). These indicate that SO_2 emissions have not changed significantly since the last USA. This source and other Part B sources in the Borough and close to the Borough boundary were assessed previously and found not to be relevant. This position has not changed and no new sources have been introduced.

Boilers

There have been no new small boilers installed within the Borough since the last USA.

Railway Locomotives

Diesel trains were considered in the previous USA and found not to idle at locations close to relevant receptors. This position has not changed.

Shipping

A very small part of the Borough at its northern end fronts the river Thames and although there are small ship movements in this area they are not sufficient to require further investigation based on the TG3 guidance.

Domestic Sources

This was considered in the previous USA and no areas of domestic coal burning were identified. There has been no change to this position.

3.6.6 Conclusions

The Updating and Screening Assessment for sulphur dioxide has not identified a risk of the new objective being exceeded by the end of 2003 in the Borough.

The findings of the Updating and Screening Assessment have shown that there have not been any significant changes to sulphur dioxide concentrations or emissions in the Borough since the second round USA.

As a result, a Detailed Assessment for sulphur dioxide will not be required for this round of review and assessment.

3.7 Particulates

3.7.1 Objective

The current air quality objectives for PM_{10} are an annual mean concentration of 40 $\mu g/m^3$ and a 24 hour mean concentration of 50 $\mu g/m^3$ not to be exceeded more than 35 times per year. Both objectives are to be achieved by the end of 2004 and are based upon measurements by the European gravimetric transfer reference sampler or equivalent.

The EU has also set indicative limits (Stage 2 limit values) to be achieved by the beginning of 2010. These limit values are more stringent than the existing objectives. The government has adopted these as provisional objectives for England, Wales and Northern Ireland (excluding London), although it has not brought them into regulation for the purposes of LAQM.

Specific objectives have been included for London; these are an annual mean concentration of 23 $\mu g/m^3$ and a 24 hour mean concentration of 50 $\mu g/m^3$ not to be exceeded more than 10 times per year. The TG (03) guidance suggests that local authorities consider them as part of this second round of review and assessment as the findings will provide valuable information, particularly when assessing future local development proposals

3.7.2 Pollutant Overview

There are a wide range of emission sources that contribute to PM_{10} concentrations in the UK. The PM_{10} (particles measuring 10µm or less aerodynamic diameter) standard was agreed to represent those particles likely to be inhaled by humans, accepting that the chemical and physical composition varies widely. In view of this there are a wide range of emission sources that contribute to PM_{10} concentrations in the UK

Research studies have confirmed that these sources can be divided into three main categories:-

- Primary particle emissions are derived directly from combustion sources, including road traffic, power generation and industrial processes.

- Secondary particles are formed by chemical reactions in the atmosphere and comprise principally of sulphates and nitrates.

- Coarse particles comprise emissions from a wide range of sources, including re-suspended dusts from road traffic, construction works, mineral extraction processes, wind-blown dusts and soils, sea salt and biological particles.

The expected reduction in national particle emissions in future years is different for each source type.

For example, emissions from road transport will be governed by new legislation on vehicle emission standards; emissions of secondary particles will be largely governed by controls on power generation, industrial and transport SO_2 and NO_x emissions, both in the UK and in Europe. Emissions of coarse particles are largely uncontrolled and, in general, are not expected to decline in future years.

Approximately half of the AQMAs declared during the first round of review and assessment were for the 24-hour mean PM_{10} objective. The majority of these are in combination with NO_2 and are associated with road transport sources. Other AQMAs have been declared in relation to industrial activities and fugitive sources around a quarry and from port handling activities.

Particles are associated with a range of health effects, including effects on respiratory and cardiovascular systems, asthma and mortality. As a result, EPAQS recommended a daily standard based on the evidence reviewed with an annual mean standard to assist with policy formation.

A subgroup of the Committee on the Medical Effects of Air Pollutants (COMEAP) is currently preparing a report which will, as far as possible, quantify the benefits to health of reducing air pollution in the UK. This group has previously advised that there is strengthening evidence base that links long-term exposure to particles and mortality and are of the view that the associations reported are likely to represent causal relationships with air pollution. They are also investigating the effects on morbidity and aim to publish a detailed report later in 2006.

3.7.3 National Overview

The main sources of primary PM_{10} are road transport (with diesel vehicles emitting a greater mass per vehicle kilometre driven than other vehicles), stationary combustion (with domestic coal combustion traditionally being a major source of emissions) and industrial processes (including bulk handling, construction, mining and quarrying). Current UK emissions are estimated to be 0.14 Mt in 2003 (DEFRA, 2005) and emissions have declined by 51% between 1990 and 2003, partly reflecting a trend away from coal use particularly by domestic users.

PM_{10} emissions from road transport have also shown a steady decline across recent years. Coal combustion and road transport together contributed 57% of UK emissions of PM_{10} in 2003.

Monitoring results from across the UK continue to indicate that sites, including busy roadside sites, exceed the current 2004 daily mean objective during some years. Concentrations of annual mean PM_{10} are generally well below the 2004 objective.

Further emission reductions of 69% for PM_{10} improvements are projected over the period to 2010, arising as tougher Euro standards come into force for new vehicles, and the older vehicle fleet is replaced. Additional post 2010 emissions reductions are also projected to occur (DEFRA, 2004).

As a result of high concentrations arising post 2004 more than 50 AQMAs were declared across the UK during the first and second rounds of R & A for the daily mean objective.

3.7.4 Assessment Methodology

A checklist approach was used, based on:-

- **Monitoring data**. Ratified monitoring data is to be considered and if the data indicate that the concentration exceeds the 2004 objectives then the Council will be required to proceed to the Detailed Assessment stage.

- **Roads including junctions and new roads.** These sections focus on specific road traffic examples not considered in the previous rounds of R&A. For busy roads with annual average daily traffic flows exceeding 10,000vpd any relevant exposure within 10m of the kerb needs to be determined. It is then possible to use the DMRB screening model to predict the number of 24-hour periods exceeding 50 $\mu g\ m^{-3}$. If the number is greater than 35 then a Detailed Assessment is necessary. Similar assessments are required for roads with high numbers of HGVs and/or buses, i.e. where the proportion of this type of vehicle exceeds 20% and the HGV/ bus flow exceeds 2000vpd. For any new roads a specific assessment is required based on the DMRB screening model. Similarly roads close to the objective at the last review and assessment or roads with significantly changed flows (>25% increase) should be re-assessed.

- **New industrial sources and existing ones with significantly increased emissions.** For new industrial sources listed in the guidance it is likely that an air quality assessment will have been undertaken as part of the planning or permit process. The results from this should be cited. If no assessment was undertaken then TG03 provides nomograms for an assessment. The same approach is required where there has been a substantial increase in emissions (i.e. one greater than 30%).

- **Areas of domestic coal burning.** For domestic sources, not previously considered, there is the need to identify small areas (500m x 500m) where significant solid fuel burning still takes place. If the density of such premises exceeds 50 houses then the nomogram in TG03 is used to determine whether or not a Detailed Assessment is required.

- **Quarries, landfill sites, opencast coal, handling of dusty cargoes at ports.** For quarries, landfill and other waste sites, and ports where dusty cargoes are handled not previously considered then it is necessary to identify whether there is relevant exposure near to any unpaved haul road, processing plant and materials handling facility. Poultry farms with known dust problems are also introduced by the new DEFRA advice. The proximity to each relates to distance, which is dependant on the annual mean background. For sites identified there is a need to use professional judgement based on complaints received and concerns related to the premises.

- **Aircraft.** Aircraft emissions are important if there is relevant exposure within 500m of the airport boundary. If the source has not been previously considered and the equivalent passenger numbers is predicted to exceed 10 million passengers per annum (mppa), then a Detailed Assessment is required.

3.7.5 Assessment Results

For the purposes of this review and assessment the following data was considered:-

Monitoring

The Council currently operate a continuous analyser at its Lewisham 2 monitoring site. The site opened in 2002 and is located at the roadside in New Cross. The site is part of the London Air Quality Network and therefore the standards of QA/QC are similar to those of the government's AURN sites, with subsequent data ratification undertaken by ERG at King's College London. In all cases the data is fully ratified, apart from the 2005, which is still provisional.

The Lewisham site uses a TEOM instrument and the results have been factored to a gravimetric equivalent (x 1.3). Monitoring is also undertaken in neighbouring LAQN sites at Crystal Palace, Blackheath (Greenwich 7) and Old Kent Road (Southwark 2). All these sites use TEOM instruments too. The following table provides the results or the monitoring sites.

Table 9 - Monitoring at Lewisham and nearby sites (2001 to 2005)

Site		2001	2002	2003	2004	2005
Lewisham 2	Annual mean	-	*31*	37	31	30
	No of days > 50 µg m^{-3}	-	*17*	**47**	19	24
	Data capture	-	*45*	82	99	99
Crystal Palace	Annual mean	31	28	27	26	28
	No of days > 50 µg m^{-3}	24	6	17	4	7
	Data capture	98	99	93	91	91
Greenwich 7	Annual mean	-	35	35	31	30
	No of days > 50 µg m^{-3}	**-**	**43**	**55**	25	22
	Data capture	-	96	99	92	90
Southwark 2	Annual mean	-	-	-	32	32
	No of days > 50 µg m^{-3}	**-**	**-**	**-**	29	26
	Data capture	-	-	-	99	98

(Note – **bold** means exceeds objective: italics indicates < 90% data capture)

The results indicate that the 2004 daily mean objective of more than 50 µg m^{-3} was exceeded in the Borough at the Lewisham 2 site in 2003, and also at the Greenwich 7 site in nearby Blackheath in 2003.

The annual mean objective however was not exceeded at any of the sites during the period reported, although the annual mean objective was approached at the Lewisham 2 site in 2003. It should be noted that 2003 was a year with high pollutant concentrations in many areas of the UK, due to the long periods of high pressure that arose during the hot summer months. Such periods are conducive to secondary particle formation over wide areas.

Based on the above 2004 results, an estimate of 2010 concentrations and number of days greater than 50 µg m^{-3} can be made using the TG03 updated guidance. These estimates are given in table 10.

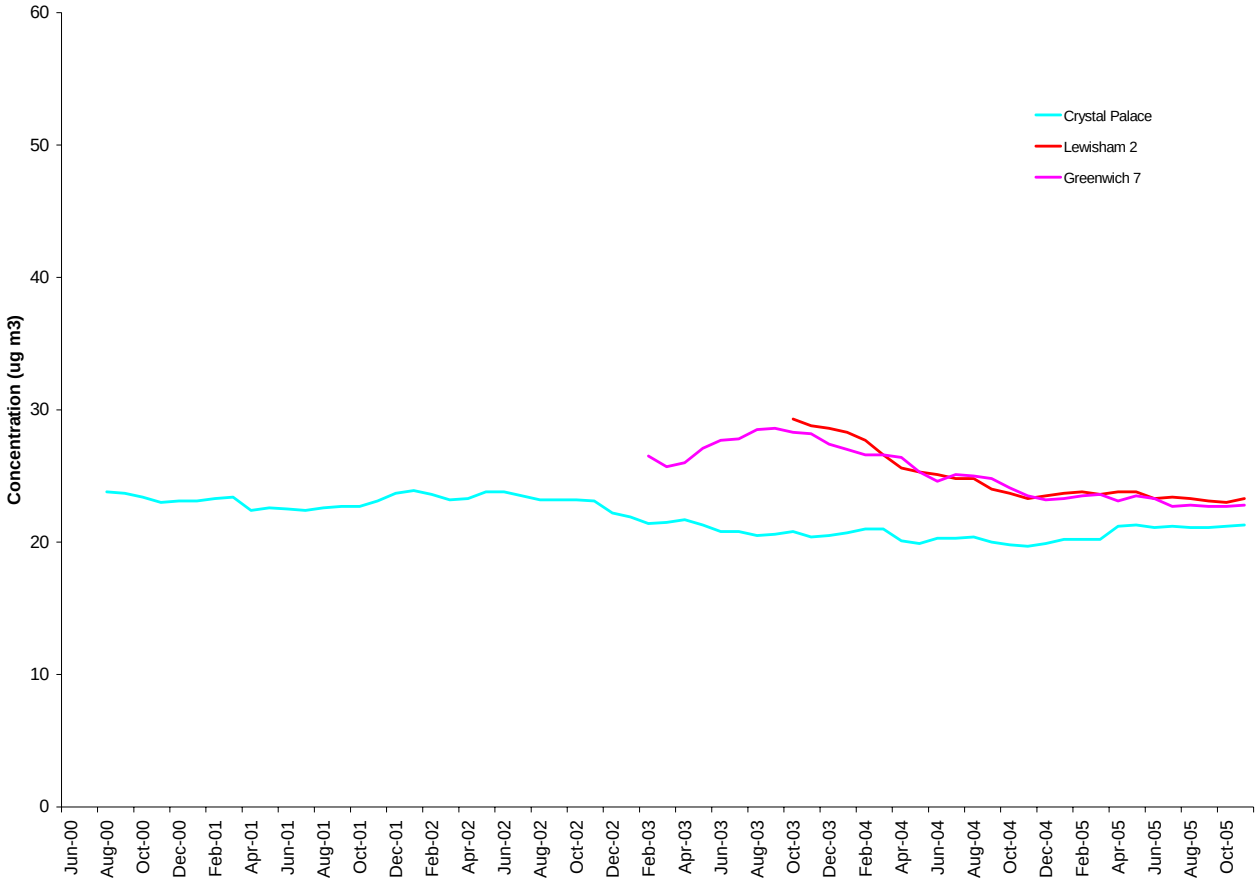
Table 10 - Estimated 2010 PM_{10} results at Lewisham and nearby sites (using updated TG03 guidance)

Site	Annual mean (µg m^{-3})	No. of days> 50 µg m^{-3}
Lewisham 2	28.2	21.4
Greenwich 7	28.2	21.4
Crystal Palace	23.6	9.3

Despite the predicted reduction resulting from future emission changes, the estimates for the Lewisham 2 and other nearby sites are predicted to exceed the provisional London 2010 objectives. These predictions suggest that other busy roadside sites within Lewisham may also exceed these provisional future objectives.

An analysis of rolling annual mean PM_{10} concentrations and daily mean PM_{10} exceedences is provided for the Lewisham monitoring site to indicate any trend over time. The analysis is for the period from 2000 through to 2005. The Crystal Palace and Greenwich 7 roadside sites are also included for comparison purposes. Figure 3 illustrates changing concentrations over time, based on changing rolling annual mean PM_{10} concentrations and Figure 4 the rolling daily mean PM_{10} exceedences. The use of rolling data in this way largely removes seasonal influences and thus provides a guide to changing trends over time.

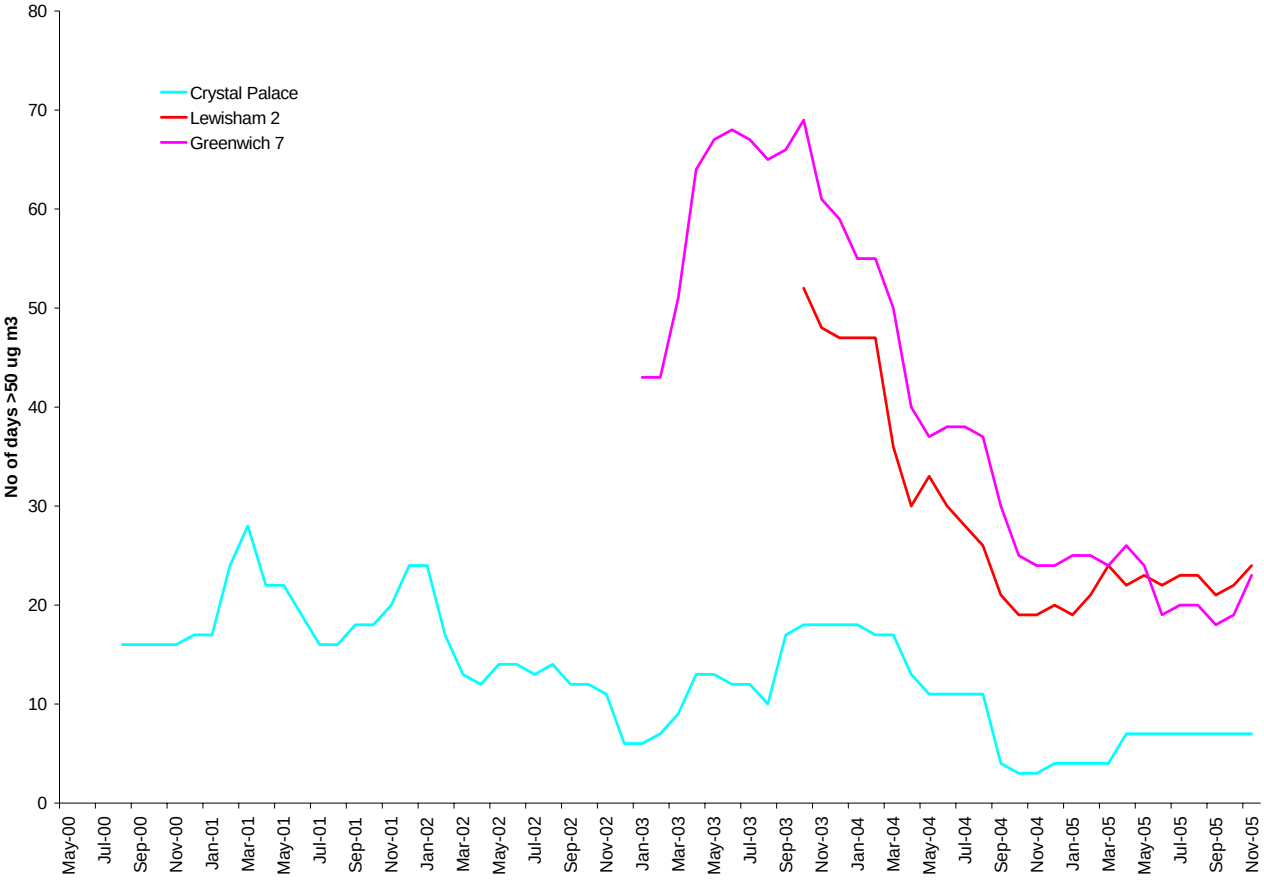
Figure 3 - Rolling annual mean PM_{10} trends for Lewisham and nearby sites (2000 to 2005)



The rolling annual mean trend for the Crystal Palace site provides the longest dataset. The site shows a slight downward trend from 2000 to 2005, less than 3 µg m^{-3} over this period. The data for the Lewisham 2 and Greenwich 7 sites show a similar pattern for the period that the graphs overlap. These indicate for the Greenwich 7 site that concentrations increased during 2003 before tailing off in 2004 to a lower concentration than at the start of the graph.

The use of trends in this way highlights that, although concentrations dropped in 2004, this was mainly as a result of the pollution incidents in 2003 not being repeated in 2004. Levels have dropped just below pre 2003 levels and do not appear to be further reducing; indeed for some sites there may be a slight increase, possibly as a result of increasing primary PM_{10} emissions (ERG, 2006) rather than the predicted decrease in emissions.

Figure 4 - Rolling number of days PM_{10} > 50 µg m^{-3} for Lewisham and nearby sites (2000 to 2005)



The rolling trend of PM_{10} exceedences similarly shows the effect of the pollution episodes in 2003 for the Lewisham 2 and Greenwich 7 sites. The Crystal Palace site has been operating for longer and this shows that, despite fluctuations, levels do not appear to have decreased markedly over the period of time since 2001 for these sites.

Averages based on London sites for the period from 1995 to 2000 show a downward trend from around 50 days above 50 µg m^{-3} to 10 days in 2002. By the end of 2004 the number of days exceeding the standard at background sites was comparable to that measured at the start of 2001, whereas inner London roadside sites had a higher number of days exceeding in 2004 than 2001 (ERG, 2006).

Roads

The second round USA considered major roads in the area and noted that the Stage 3 and 4 reports for the previous round of R&A provided modelling of the main roads in the Council's area and addressed the following issues: junctions and high flows of HGVs and buses.

The TG03 guidance also required an assessment of roads close to the objective during the first round of R&A and this was undertaken in the Stage 4 further assessment. Hence no further examination of these issues was undertaken. There is no change in this position.

Additionally no roads with unusually high proportions of heavy goods vehicles (>20%) were identified from the new 2003 London Atmospheric Emissions Inventory (LAEI) and there have been no significant increases in traffic flows. There is no change in this position since then and no new roads have been constructed or proposed since the last review.

There are also no new roads with traffic flows greater than 10,000vpd that have been built in the Council's area since the first round of R&A where there is relevant exposure arising.

Quarries, mines etc

There are no quarries or landfill sites within the Lewisham. No further dust complaints have arisen from fugitive sources in the Borough and on this basis further investigation is not considered necessary.

The revisions to the TG03 guidance include a reference to potential problems from poultry farms. This guidance is not applicable to Council as there are no poultry farms within the Borough.

Industrial Sources

There are no new industrial processes or changes relating to existing industrial processes of relevance for PM_{10} in the Borough, or neighbouring areas.

Aircraft

As mentioned previously, there is no airport in the Borough. Therefore, a further assessment is not required.

Solid fuel burning

This was examined in the previous USA and no areas of domestic coal burning were identified. There has been no change to this position.

3.7.6 Conclusions

Recent monitoring in the Borough confirms that the PM_{10} objectives have been exceeded.

There have been no other significant changes to PM_{10} concentrations or emissions in the Borough since the second round USA.

As a result of these findings a Detailed Assessment for PM_{10} will not be required for this round of review and assessment

4. Conclusions and Recommendations

This report follows the technical guidance (TG03 and Frequently Asked Questions) produced for this part of the third round of review and assessment. It therefore fulfils this part of the continuing LAQM process.

The results, from following this methodology, are that the Council has not identified an additional risk of the air quality objectives for carbon monoxide, benzene, 1,3-butadiene, lead and sulphur dioxide being exceeded by the relevant years anywhere in the Council's area. Thus the Council need not proceed beyond the updating and screening assessment for these pollutants.

The Council however has previously identified a risk that the air quality objectives for NO_2 and particles will be exceeded at locations with relevant public exposure. As a result it designated AQMAs across the Borough. Further monitoring in the area confirms that the annual mean NO_2 and daily mean PM_{10} objectives have been exceeded.

The Council has also identified a risk that the air quality objectives for PM_{10} (for 2010 only) will be exceeded at locations with relevant public exposure. The Council is not required to undertake a Detailed Assessment for PM_{10} at this stage. The findings for PM_{10} however will be noted for longer term planning.

For this pollutant (and the other pollutants not requiring a Detailed Assessment) the LAQM guidance requires that the Council produce its next air quality progress reports by the end of April 2007, prior to undertaking the next updating and screening assessment by the end of April 2009.

As a result of the findings in this report the Council has decided to take the following action:-

- Maintain the designation of AQMAs, based on the findings in this report and the previous assessment of public exposure.

- To continue and where necessary expand, the Council's monitoring programme as part of its LAQM actions and to monitor potential air quality improvements.

- In line with the above findings, undertake consultation with statutory and other consultees as required.

- To consider the findings of the report with regards to the proposed 2010 objectives for PM_{10} especially with regard to land planning issues.

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6. Glossary of Terms

AADT	Annual Average Daily Traffic (vehicles per day)
APEG	Airborne Particles Expert Group
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
AURN	Automatic Urban and Rural Network
CO	Carbon monoxide
COMEAP	Committee on the Medical Effects of Air Pollutants
DA	Detailed Assessment
Defra	Department for Environment Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges Screening Model
ERG	Environmental Research Group, King's College London
HGV	Heavy Goods Vehicles
LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LAQN	London Air Quality Network
mg/m^3	Milligrams of the pollutant per cubic metre of air
NO	Nitric oxide
NO_2	Nitrogen dioxide
PM_{10}	Particles with diameter less than 10µm
ppb	Parts per billion
ppm	Parts per million
QA/QC	Quality Assurance / Quality Control
SO_2	Sulphur dioxide
TEOM	Tapered Element Oscillating Microbalance
$µg/m^3$	Micrograms of the pollutant per cubic metre of air

7. Appendices

Appendix 1

Table 11 - List of Part B processes in the Council's area

Ref.	Name	Type of Process
HL/236	Holts Accident Repair Centre	Vehicle respraying
EPA/CS/2	Penfold Motors Limited	Vehicle respraying
EPA/I/1	Lewisham Crematorium	Crematorium
PPC/PG6/34/001	Ascott Cab & Co Sales Ltd	Vehicle respraying
10	Volkespares Limited	Waste oil burner

Appendix 2

Table 12 - List of permitted petrol stations in the Council's area

Ref.	Name
EPA/PG1/14/82495/CE	Shell Deptford
EPA/PG1/14/82486/CE	Shell Forest Hill
EPA/PG1/14/82507/CE	Star (Crown Auto Point)
EPA/PG1/14/82488/CE	Lee Self-Service Station
EPA/PG1/14/82181/CE	Sainsbury's New Cross Road
EPA/PG1/14/82489/CE	Foxberry Service Station
EPA/PG1/14/82496/CE	Sydenham Service Centre
EPA/PG1/14/812885/CE	Tesco Lewisham Road
EPA/PG1/14/82490/CE	Star Service Station Southend Lane
EPA/PG1/14/82505/CE	Tesco Grove Park Express
EPA/PG1/14/80028/CE	Shell Lewisham
EPA/PG1/14/82501/CE	BP/Safeway Bromley Road
EPA/PG1/14/82503/CE	Forest Hill Express
EPA/PG1/14/82506/CE	Shell Hillbrow
EPA/PG1/14/82279/CE	Tesco Loampit Vale
EPA/PG1/14/81933/CE	Star Service Station Carford
EPA/PG1/14/82185/CE	Sainsbury's Sydenham
EPA/PG1/14/82253/CE	Total Whitfoot Lane