BEDFORD BOROUGH COUNCIL

Update and Screening Assessment of Air Quality in the Bedford Borough

October 2006

- Technical Services Group
- Environmental Health Service
- Pollution Control Section

PRIDE IN BEDFORD

Third Round Updating and Screening Assessment for Bedford Borough Council

October 2006

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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 Bedford 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 has designated Air Quality Management Areas (AQMAs) for the annual mean nitrogen dioxide objective and sulphur dioxide objectives in the Borough.

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 and particles (PM_{10}). This report provides a new assessment to identify those matters that have changed since the last review and assessment, 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 (as Frequently Asked Questions) 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 also requires both a phased approach and that local authorities 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 PM_{10} (for 2004) there is not a significant risk of exceeding the objectives in the Council's area.

For nitrogen dioxide, the Council has previously designated three AQMAs in its area: Prebend Street and High Street, Bedford and in Great Barford. Recent bias corrected diffusion tubes monitoring results in the Borough confirm that concentrations continue to exceed the annual mean objective where there is relevant exposure in the AQMAs. Additional monitoring has confirmed that other sites close to the Bedford town centre AQMAs also exceeded the objective. As a result the Council as part of its Further Assessment will incorporate these findings and consider amending its AQMA. In addition two new sites away from the AQMA have exceeded the objective. Relevant exposure close to these sites will be assessed and if confirmed the Council will undertake a Detailed Assessment of these sites.

For sulphur dioxide, recent monitoring in the AQMA located in the southwest of the Borough confirms that 15 minute mean concentrations are exceeding the government's objective. Thus there is no need to consider changing its AQMA and the Council will now complete its Further Assessment.

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 is therefore recommended to undertake the following action:

1. Undertake consultation on the findings arising from this report with the statutory and other consultees as required.
2. Confirm that there is relevant exposure close to its NO_2 diffusion tube monitoring sites in Ampthill Road and Goldington Road in Bedford and upon confirmation undertake a Detailed Assessment of these areas.
3. Complete the Further Assessment of its existing AQMAs.

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1. Introduction

This report is the 2006 Updating and Screening Assessment of air quality for the Bedford Borough Council. The purpose of the report is to fulfil the Council's initial obligation under the third round review and assessment of air quality. In so doing it will determine whether or not there is a risk that an air quality objective will be exceeded in the Borough and therefore whether or not the Council needs to undertake a Detailed Assessment of air quality. In addition the report provides an indication as to the need for amending or revoking existing air quality management areas (AQMAs).

1.1 Background

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 just been released.

Local air quality management (LAQM) was also introduced by the Environment Act 1995. It requires local authorities to periodically review and assess air quality across their areas. The AQS confirms that LAQM provides a major component of the government's plan for air quality improvement across the UK.

Air quality objectives have been set for those air pollutants deemed to be of most concern and relevance by the AQS. Seven of these pollutants are included under the LAQM regime and regulations for these were introduced. The air quality objectives for the relevant pollutants are given in Table 1. 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 Third Round Review and Assessment

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 guidance requires a phased approach, as with the previous guidance. This requires local authorities to undertake a level of assessment that is commensurate with the risk of an air quality objective being exceeded. It is considered that not every authority will need to proceed beyond the first step of the third round of review and assessment.

The findings from the USA determine the need for the Council to undertake the next step i.e. a Detailed Assessment and then potentially progressing to the declaration/ revocation/ amendment of an AQMA.

1.3 Progress with Local Air Quality Management – Bedford Borough Council

The first Review and Assessment (R&A) concluded that emissions from road traffic on the A1 and other major roads in the area were the main causes for concern. Following screening of the sources, it was considered that levels of pollution within the Borough would comply with the air quality objectives, although the Council were concerned that high concentrations of sulphur dioxide (SO_2) were occurring in the Borough and as a consequence it set up a continuous monitoring site in the village of Stewartby, which is the site of a large brickworks.

The 2003 Updating and Screening Assessment followed up the work carried out for the first round of R&A and considered changes to emissions of air pollution in the Borough using new information and guidance. It was found that there was a risk of the air quality objective for nitrogen dioxide (NO_2) being exceeded in the town centre of Bedford and along the A421 in Great Barford. It also found that the air quality objectives were being exceeded in the south west of the Borough around Stewartby.

As a result, a Detailed Assessment was carried out for these specific locations. Following consideration of this report the Council designated AQMAs in each of these areas (Bedford, 2004).

The 2005 Progress Report (Bedford, 2005) showed that measured levels of NO_2 and SO_2 confirmed the findings of the Detailed Assessment.

1.4 Updating Screening and Assessment – important considerations

As with the second round USA, relevant considerations and sources of data include the following:

Monitoring Data

The Council's monitoring of air quality in its area provides an important source of information for understanding air quality in its area. 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.

Background Pollutant Concentrations

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 are available from http://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.

Industrial Sources

Both the Environment Agency and the Council regulate industrial sources under the Pollution Prevention and Control Act 1999. 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. Those small industrial processes that fall outside of Part B/A2 Process control can also be of interest to LAQM. Details of the processes and installations are available from the Council's Public Register (see tables in the Appendix). Since the last USA, one new process (mobile crusher) and three petrol stations have been permitted. In addition three Part Bs (including one petrol station) have closed. These changes are not considered significant for the purposes of this air quality assessment.

1.5 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 advises further 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.

Table 1 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 μg m^{-3}	Running Annual Mean	31 Dec 2003
	5 μg m^{-3}	Annual Mean	31 Dec 2010
1, 3 Butadiene	2.25 μg 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 μg m^{-3}	Annual Mean	31 Dec 2003
	0.25 μg m^{-3}	Annual Mean	31 Dec 2008
Nitrogen Dioxide (provisional)	200 μg m^{-3} not to be exceeded more than 18 times a year	1 hour mean	31 Dec 2005
	40 μg m^{-3}	Annual Mean	31 Dec 2005
Particles (PM_{10})	50 μg m^{-3} not to be exceeded more than 35 times a year	24 hour mean	31 Dec 2004
	40 μg m^{-3}	Annual Mean	31 Dec 2004
Sulphur Dioxide	350 μg m^{-3} not to be exceeded more than 24 times a year	1 hour mean	31 Dec 2004
	125 μg m^{-3} not to be exceeded more than3 times a year	24 hour mean	31 Dec 2004
	266 μg 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 μg m^{-3} not to be exceeded more than 7 (10) times a year	24 hour mean	31 Dec 2010
	20 (23) μg m^{-3}	Annual Mean	31 Dec 2010

2. Carbon Monoxide

2.1 Introduction

Carbon monoxide (CO) is a colourless and odourless gas produced by the burning of fuels. Exposure to CO 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.

The AQS objective for CO, based on advice from the Expert Panel of Air Quality Standards (EPAQS), is as follows:

Objective		Date to be achieved by
Concentration	Measured as	
10 mg m^{-3}	Daily Maximum Running 8 hour mean	31 Dec 2003

2.2 National Perspective

The dominant source of CO 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 emissions reductions have occurred over the last decade from Euro standards, with reductions of 42% for CO relative to the no abatement scenario (DEFRA, 2004).

Monitoring results from the UK national network sites confirm that no site exceeded the objective 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 at 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.

2.3 Third round assessment of CO

A checklist approach is used, based on 1) monitoring data and 2) data relating to very busy roads.

1. For this pollutant, ratified monitoring data are required at locations where there is a potential for public exposure. If the data indicate that the maximum daily running 8-hour concentration exceeds the objective then the Council will be required to proceed to the Detailed Assessment stage.

2. 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.

2.4 Monitoring

The Council does not undertake CO continuous monitoring in its area, however monitoring is undertaken in three other nearby local authorities that are part of the Herts and Beds Air Pollution Monitoring Network (HBAPMN). The sites are all located at background and the nearest of these to Bedford is Luton. Details of the monitoring and data capture are given in Table 3 and are based on scaled and ratified data (apart from 2005 which are still provisional).

There were no periods exceeding the CO objective at these sites over the period 2000 to 2005 and the data capture exceeded 84% for all years other than 2005 for the Hertsmere site (it closed in 2005).

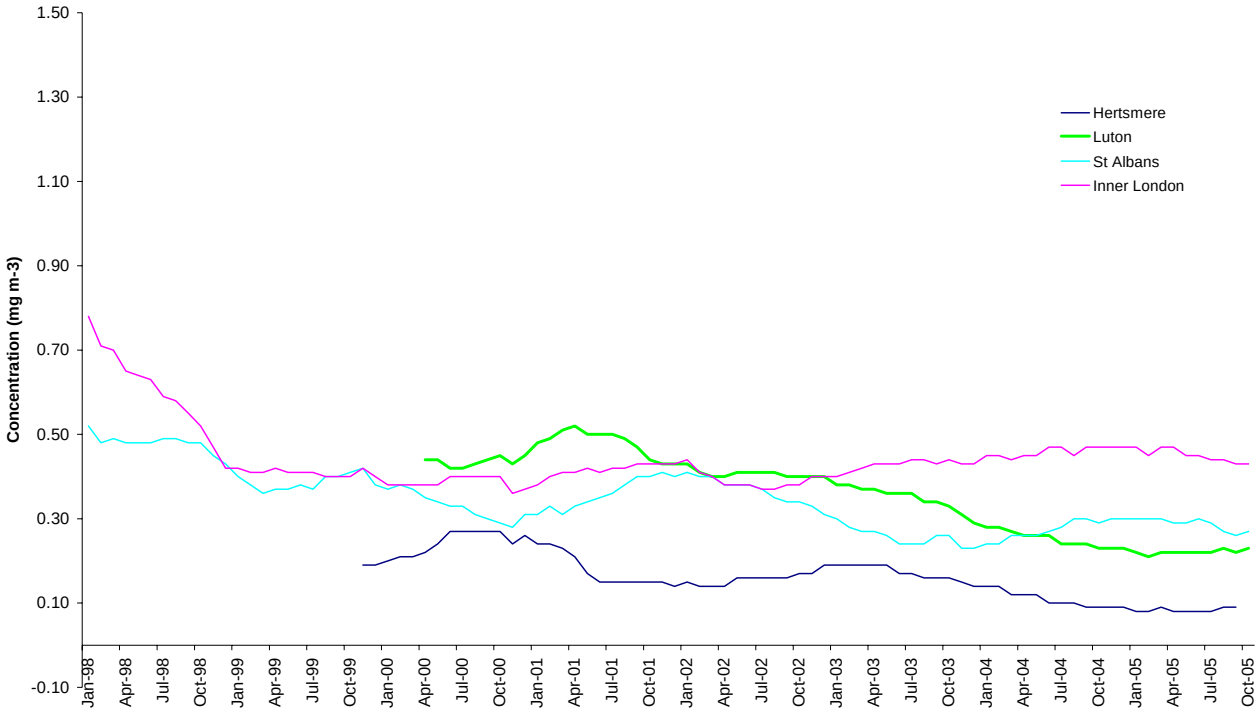
Table 3 CO statistics from nearby sites (mg m^{-3})

Luton	2000	2001	2002	2003	2004	2005
Max 8 Hour	5.2	3.4	2.6	2.0	2.1	3.4
Data capture %	85	94	91	94	86	91
St. Albans	2000	2001	2002	2003	2004	2005
Max 8 Hour	4.1	2.7	3.2	3.2	2.2	2.1
Data capture %	96	84	94	85	95	91
Hertsmere	2000	2001	2002	2003	2004	2005
Max 8 Hour	3.7	2.7	2.6	2.3	2.0	2.4
Data capture %	85	85	98	98	98	48

(Note – italics indicates < 90% data capture)

An analysis of rolling annual mean concentrations is provided for these sites (plus a background site in inner London for comparison purposes). The analysis is for the period from 1998. 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.

Figure 1 Rolling annual mean trends for nearby sites and an inner London site (1996 to 2005)



The rolling annual mean CO concentrations for all sites largely indicate a downward trend over time in line with reductions in emissions over time. This is most noticeable for the inner London background site. All sites indicate low concentrations for the period shown, with the most notable reduction arising prior to 2000. This is as would 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).

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

2.5 Very busy roads or 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 CO 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 and the estimated background concentrations were below the annual mean threshold of 1mg m^{-3} for CO. Based on these findings it is considered that the objective is very unlikely to be exceeded in the Borough as a result of road traffic emissions.

2.6 Conclusion of third round assessment of CO

There have been no significant changes to CO concentrations or emissions in the Borough since the second round USA and as a result a Detailed Assessment for CO will not be required.

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3. Benzene

3.1 Introduction

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

The AQS objectives for benzene, based on advice from EPAQS, are as follows:

Objective		Date to be achieved by
Concentration	Measured as	
16.25 $\mu g\ m^{-3}$	Running Annual Mean	31 Dec 2003
5 $\mu g\ m^{-3}$	Annual Mean	31 Dec 2010

3.2 National Perspective

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. It was based on the 2010 objective. No AQMAs were declared during the first round.

3.3 Third round assessment of Benzene

A checklist approach is used, based on 1) monitoring data 2) data relating to very busy roads 3) industrial sources/ petrol stations/ major fuel storage depots.

1. For monitoring the data should be prioritised, based on locations near busy roads the results 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.

2. This relates to roads not previously considered and to 2010 only, where the 2010 annual mean background exceeds 2$\mu g\ m^{-3}$ 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.

3. 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 authorisation/permit process. The results from this should be cited. Authorities are also asked to check information from previous rounds of R&A and 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.

   For petrol stations it is necessary to identify those stations not covered by previous reports and 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.

3.4 Monitoring

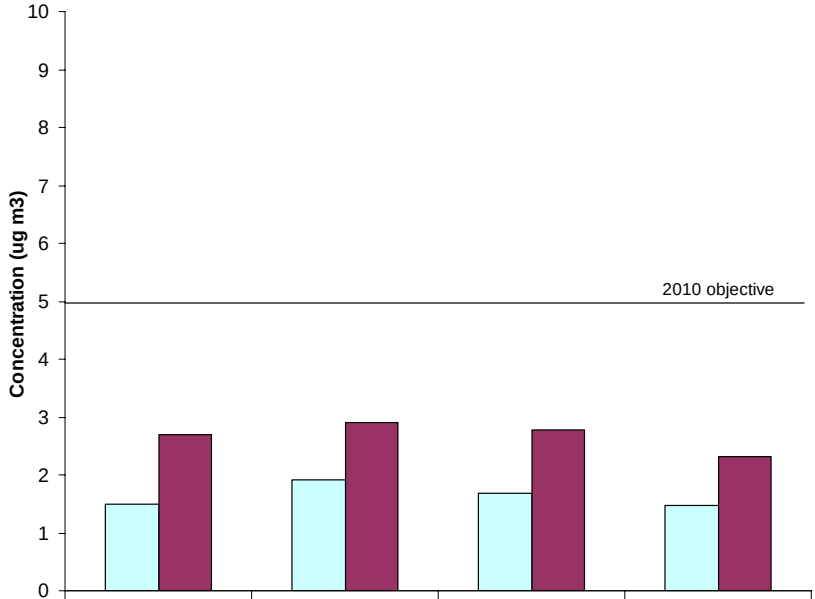
The Council does not undertake benzene monitoring in its area.

Monitoring of benzene is however undertaken at the urban background site 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 and a London roadside site, are presented in Figure 2.

All the results are below the 2003 and 2010 objectives, with the concentrations measured at roadside higher than those measured at background. Nevertheless even at busy roadsides in London the 2010 objective is not exceeded. The results also indicate only very slight changes over the limited period of monitoring. Due to the measurement uncertainty and inter annual variability it is not possible to confirm that concentrations are decreasing, although as outlined above further emission reductions are expected.

These monitoring results are considered representative of the Council's area. They indicate that the concentrations will not exceed the benzene objectives for 2003 and 2010 and therefore a Detailed Assessment based on monitoring is not required.

Figure 2 Results of benzene monitoring (µg m^{-3}) from the government's sites in London (2000-2005)



	2002	2003	2004	2005
Central London	1.49	1.91	1.69	1.47
London roadside	2.7	2.91	2.78	2.32

3.5 Very busy roads or 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 very unlikely to be exceeded in the Borough as a result of road traffic emissions.

3.6 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.

3.7 Petrol stations

The previous USA did not identify any petrol stations where the TG03 criteria applied in the Borough and there has been no change to this position. (See Appendix 1 for list of permitted petrol stations in the Borough).

3.8 Conclusion of third round assessment of benzene

There have been no significant changes to benzene concentrations or emissions in the Borough since the second round USA and as a result a Detailed Assessment for benzene will not be required.

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4. 1,3 Butadiene

4.1 Introduction

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.

The AQS objective for 1,3 butadiene, based on advice from EPAQS, is as follows:

Objective		Date to be achieved by
Concentration	Measured as	
2.25 μg m^{-3}	Running Annual Mean	31 Dec 2003

4.2 National Perspective

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 since. Reductions in emissions from road vehicles are continuing 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.

4.3 Third round assessment of 1,3 butadiene

A checklist approach is used, based on 1) monitoring data 2) new industrial sources and existing industrial sources with significantly increased emissions.

1. 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.

2. 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 authorisation/permit process. The results from this should be cited. Authorities are also asked to check information from previous rounds of R&A and if there substantial increases in emissions (>30% per annum). Where it is necessary to check an industrial sources 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.

4.4 Monitoring

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

Continuous monitoring however is undertaken at the busy central roadside 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 approximately 1.14 µg m^{-3} (in 2002) and 0.57 µg m^{-3} (in 2005). These results indicate that concentrations are dropping over time. The results are also less than the 2003 objective and can 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.

4.5 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.

4.6 Conclusion of third round assessment of 1,3 butadiene

There have been no significant changes to 1,3 butadiene concentrations or emissions in the Borough since the second round USA and as a result a Detailed Assessment for 1,3 butadiene will not be required.

5. Lead

5.1 Introduction

Lead in particulate form in air can be inhaled directly by people, 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 the 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.

The AQS objective for lead, based on advice from EPAQS, is as follows:

Objective		Date to be achieved by
Concentration	Measured as	
0.5 $\mu g\ m^{-3}$	Annual Mean	31 Dec 2003
0.25 $\mu g\ m^{-3}$	Annual Mean	31 Dec 2008

5.2 National Perspective

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.

5.3 Third round assessment of lead

A checklist approach is used, based on 1) monitoring data 2) new industrial sources and existing industrial sources with significantly increased emissions.

1. 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.

2. 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 authorisation/permit process. The results from this should be cited. Authorities are also asked to check information from previous rounds of R&A if there are substantial increases in 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.

5.4 Monitoring

The Council does not monitor lead in its area.

Monitoring is undertaken at a number of sites in London as part of the government's national network. The results from these sites (between 1999 and 2005) show that concentrations do not exceed the objectives for 2003 and 2008. 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, although concentrations at the London sites have since reduced. The results are all less than the 2008 objective.

Table 4 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.

5.5 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.

5.6 Conclusion of third round assessment of lead

There have been no significant changes to lead concentrations or emissions in the Borough since the second round USA and as a result a Detailed Assessment for lead will not be required.

6. Nitrogen Dioxide

6.1 Introduction

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. At high concentrations NO_2 causes inflammation of the lung. Long-term exposure is also considered to affect lung function and exposure to NO_2 is particularly important for people with asthma and related diseases. NO_x is also important in the formation of ozone and secondary particle formation.

The AQS objectives for NO_2 are as follows:

Objective		Date to be achieved by
Concentration	**Measured as**	
200 μg m^{-3} not to be exceeded more than 18 times a year	1 hour mean	31 Dec 2005
40 μg m^{-3}	Annual Mean	31 Dec 2005

6.2 National Perspective

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 emissions 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.

6.3 Third round assessment of NO_2

A checklist approach is used for the updating and screening assessment, based on 1) monitoring data 2) roads including narrow congested streets and junctions 3) bus stations 4) new industrial sources and existing ones with significantly increased emissions 5) aircraft.

1. 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.

2. 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 indications arising from these assessments are greater than 40 μg 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.

3. 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 $\mu g\ m^{-3}$ then it is necessary to proceed to the Detailed Assessment stage.

4. 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 authorisation/permit process. The results from this should be cited. If no assessment were 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%).

5. 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.

6.4 Monitoring

The Council undertakes monitoring of NO_2 using diffusion tubes across its area. The diffusion tubes are currently exposed at 43 locations in the Borough, although 20 of these sites only commenced late in 2004. The sites include roadside, background and intermediate sites. The locations include sites within the AQMAs, as well outside of the AQMAs. The 20 new monitoring sites are sited close to the façade of existing properties representing relevant exposure.

The diffusion tubes used are supplied by analysed by Gradko using a preparation method of 50% TEA in acetone. Details of the sites monitored are given in Appendix 2.

The Council is looking to install two continuous analysers in the Bedford town centre AQMAs and will undertake a local co-location study once the sites have been established. In the meantime appropriate correction factors for 2002 to 2005 (to allow for bias) have been derived from the latest default factor spreadsheet (March 2006) from DEFRA's helpdesk. These factors are derived from series of co-location studies undertaken elsewhere and are as follows:

Year	Bias factor
2002	1.27
2003	1.11
2004	1.10
2005	1.18

The factors indicate the diffusion tube measurements are under reading for all years, compared to continuous measurements. The results presented in Table 5 are the bias adjusted results. It should be noted that results are those sites with less than 75% data capture are marked using italics and those in bold exceed the AQS objective. The locations in italics are those that are sited within the AQMAs.

Table 5 Diffusion tube monitoring in Bedford (2002 to 2005) (µg m^{-3})

Address	Code	Type	2002	2003	2004	2005	Estimated 2010
20 High St Bedford	BF06	K	**41.6**	**46.0**	**44.6**	**45.5**	38.2
135 George St Bedford	BF07	R	26.7	26.9	25.0	30.1	25.3
Arrowleys Bedford	BF08	B	23.2	21.8	23.1	23.3	20.4
61 The Links Kempston	BF09	B	22.2	24.5	23.1	25.0	21.8
Bromham Road Bedford	BF10	K	31.5	33.5	35.5	33.4	28.1
Goldington Road Bedford	BF11	K	33.2	35.8	34.7	**40.2**	33.8
Bunyan Road Kempston	BF12	R	31.9	33.7	31.3	37.6	31.6
Riverfield Drive Bedford	BF14	K	22.1	28.8	26.9	31.1	26.2
Great Barford	BF16	K	26.7	28.7	27.9	31.0	26.1
The Lane Wyboston	BF17	R	29.5	32.9	29.9	31.6	26.5
Great North Road Wyboston A1	BF18	R	**45.3**	**50.9**	**48.1**	**50.5**	42.5
St Johns Street car park Kempston	BF20	K	24.0	30.8	27.0	31.2	26.2
Kempston Road Bedford	BF21	K	28.0	33.0	29.4	31.7	26.7
Ampthill Road Bedford	BF22	K	*37.9*	**42.1**	36.2	36.8	31.0
Castle Road Bedford	BF23	R	29.1	37.8	30.5	35.7	30.0
Kimbolton Road Bedford	BF24	R	*36.8*	**42.7**	31.9	35.0	29.5
Prebend Street Bedford	BF25	K	34.6	**46.8**	**41.5**	39.8	33.5
Churchville Road Bedford	BF28	R	32.9	36.0	32.2	33.1	27.8
Kirkstall Close Bedford	BF29	B	31.7	34.3	34.5	36.4	31.9
River Street Bedford	BF30	K	**43.1**	**59.9**	**50.4**	**60.5**	50.9
Great North Road Wyboston A1 North 1	BF31	K	34.6	**48.0**	**44.7**	**50.1**	42.2
Great North Road Wyboston A1 North 2	BF32	K	37.7	**50.5**	**44.1**	**49.6**	41.7
Great North Road Wyboston A1 South	BF33	K	36.8	**48.1**	39.7	**50.0**	42.1
Great Barford o/s no. 11 Bedford Rd	BF34	K			*49.4*	**52.0**	43.8
London Rd Bedford o/s no. 5	BF35	R			*50.4*	**51.5**	43.3
Great Barford o/s 5 Bedford Rd	BF36	R			*44.1*	**51.6**	43.4
High Street Bedford o/s Ladbrokes	BF37	R			*54.1*	**61.1**	51.4
Prebend St nr 24 Commercial Rd	BF38	R			*43.4*	**52.2**	43.9
Goldington Rd Bedford Opp. University	BF39	R			*42.0*	**51.0**	42.9
The Broadway Bedford o/s Collins jewellers	BF40	K			*59.9*	**57.7**	48.5
High Street Bedford o/s Luddingtons	BF41	R			*51.5*	**56.2**	47.2
Prebend Street Bedford Opposite no. 8	BF42	R			*49.9*	**63.6**	53.5
Shakespeare Rd Bedford o/s no. 4	BF43	R			*50.4*	**53.5**	45.0
St Mary's St Bedford o/s Kings Arms PH	BF44	R			*48.8*	**56.0**	47.1
Prebend Street Bedford nr Crown Quay	BF45	R			*48.8*	**52.2**	43.9
Ashburnham Rd Bedford o/s no. 35	BF46	R			*36.4*	**46.4**	39.0
Ampthill Rd Bedford o/s no. 38	BF47	R			*39.9*	**47.3**	39.8
Prebend Street Bedford o/s no. 44	BF48	R			*54.1*	**62.9**	52.9
Great Barford near 37 Bedford Road	BF49	K			*46.2*	**49.4**	41.5
Tavistock Street Bedford o/s YMCA	BF50	R			*33.1*	35.3	29.7
Great Barford outside 610 Roxton Rd	BF51	R			*29.9*	33.8	28.4
St Johns St Bedford o/s old BT building	BF52	R			*32.6*	**46.4**	39.0
Dame Alice St Bedford o/s no. 45	BF53	R			*49.0*	**52.3**	44.0

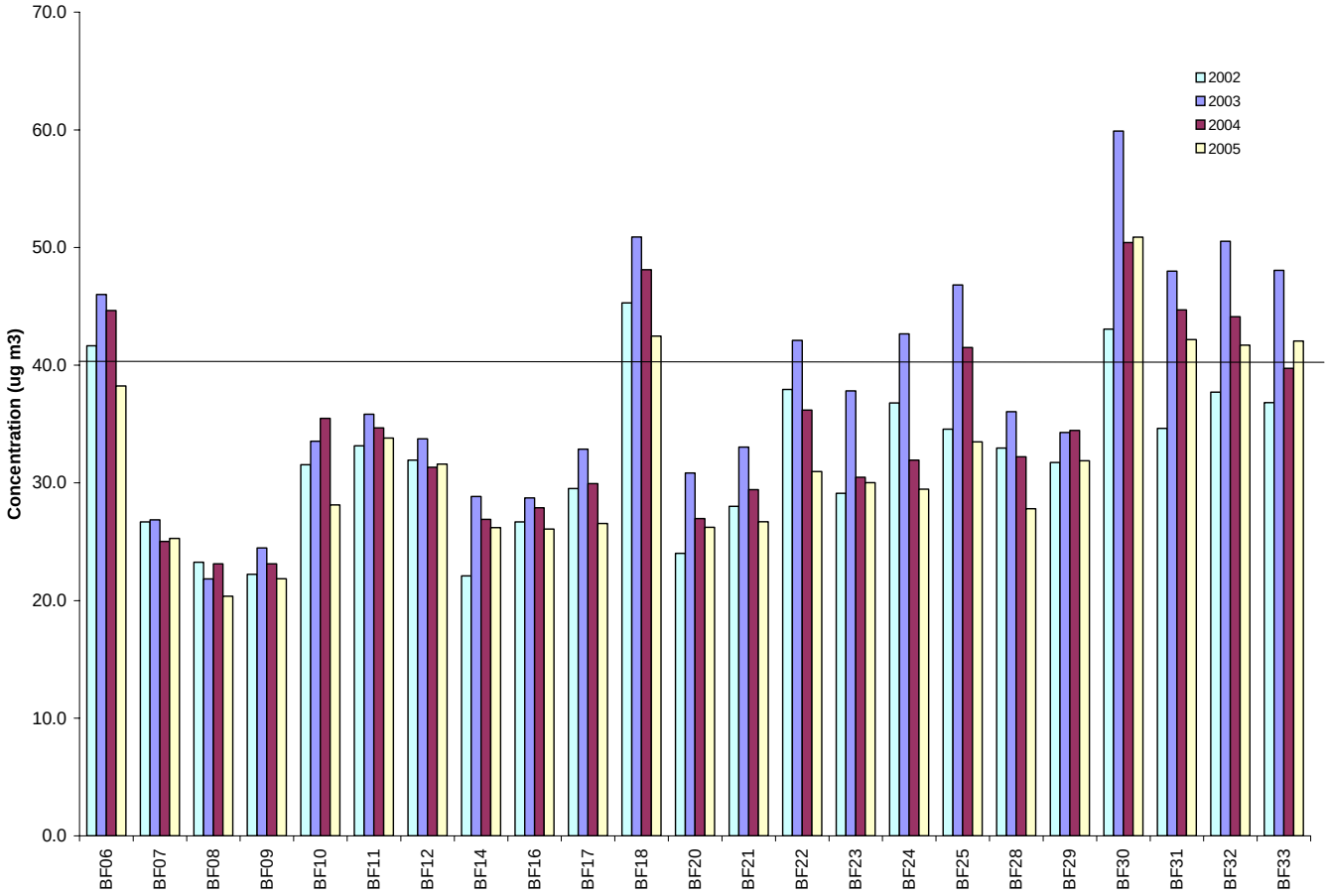
The results for the sites that monitored from 2001 to 2005 are also presented in Figure 3. Additional sites have supplemented the original sites monitored, with some of these in the AQMAs (also indicated). Of the sites that were in existence prior to 2004 and exceeded the annual mean objective in 2005, both BF06 and 25 are in the AQMAs. The other sites that exceeded (BF 18, 31, 32 and 33) were close to the A1 (M) and do not represent relevant exposure, although there is relevant exposure nearby. Mid Beds D.C however completed a Detailed Assessment in 2004 of an area further along

the road and indicated that NO_2 concentrations were just below the AQS objective, where there was a similar area with relevant exposure. To assess concentrations in the Bedford District, the Council is recommended to install a new diffusion tube monitoring site to confirm whether or not the AQS objective is exceeded.

The monitoring in 2005 also revealed that the new sites in the AQMAs exceeded the objective (BF 34,36, 37, 38, 40, 41, 42, 44, 45, 48, 49, 52 and 53). These include sites in Bedford town centre and also Great Barford (BF34 and 49).

In addition, as reported in the 2005 Progress Report, some locations near the AQMAs also exceeded the objective, including sites in London Road (BF35), Shakespeare Road (BF43), Ashburnham Road (BF46) and Dame Alice Street (BF53). These sites will be investigated in the Council's Further Assessment of its AQMAs with a view to amending the AQMA. Two other new sites exceeded the objective; these were Goldington Road (BF39) and Ampthill Road (BF47) in Bedford.

Figure 3 Bias corrected diffusion tube monitoring results in Bedford (2002 to 2005)



6.5 Roads

Busy streets where people may spend an hour or more close to traffic were examined in the second round USA and there has been no change to the previous findings.

New roads in the area include the Great Barford Bypass. This will be a new 7.7kms long dual carriageway. It commences at the eastern end of the Bedford Southern Bypass. The route runs to the north of Great Barford and Roxton, connecting into a new enlarged Black Cat Roundabout on the A1. The new route should lead to a reduction in traffic through Great Barford and as a result improved air quality in the AQMA. Construction work is now well underway. The anticipated completion date for the

project is Autumn 2006. Diffusion tube monitoring will continue in this area to confirm this improvement.

Other new roads proposed in the area include the A5134 Bedford Western Bypass to bypass Bedford to the west between the A421 (Trunk Road) Woburn Road, Kempston and the Denham Village Roundabout, south of the A428 Bromham Bypass. Compulsory Purchase Orders for land in the area were submitted in late 2005.

An improvement of the existing A421 between the M1 and Bedford Southern is also proposed. The route suffers considerable congestion, particularly during peak hours, and a poor accident record. Proposals include construction of a new dual carriageway alongside the existing A421 between the M1 and the Bedford Southern Bypass. Construction work could start as early as 2008 with the road open to traffic in 2010. The Council will continue to seek to ensure that where new roads are proposed with predicted traffic flows greater than 10,000vpd there is no relevant exposure arising.

There are no other roads in the area with significant changes in traffic flows.

A revised DMRB assessment has been made of those roads in the Bedford town centre where measurements have indicated high concentrations. To do this the latest version of DMRB has been used, with the revised background predicted concentrations. The 2005 predicted background for the town centre is 19.9 µg m^{-3} for annual mean NO_2 and 30.2 µg m^{-3} for NO_x. Traffic data for the links have been obtained from the NAEI warehouse and 2005 estimates have been based on two traffic growth scenarios: a low scenario of 1% per annum and a high scenario of 3% per annum. Traffic speeds have been assumed to be 10kph reflecting that traffic is congested in the town centre. The DMRB predictions are considered as typical urban roads and also street canyons. The TG03 guidance allows for this by doubling the NO_2 road component predicted by DMRB (paragraph 6.30 of TG03). The predictions are given at two distances from the road centre line, as follows:

Table 6 Predicted 2005 NO_2 concentrations (µg m^{-3}) for selected town centre roads

Road name	Non canyon	Canyon	Traffic growth	Distance
Ampthill Road	30.4	**40.8**	low	2.5
Ampthill Road	30.3	**40.7**	low	5
Ampthill Road	30.7	**41.5**	high	2.5
Ampthill Road	30.6	**41.4**	high	5
London Road	26.7	33.5	low	2.5
London Road	26.6	33.4	low	5
London Road	27.3	34.7	high	2.5
London Road	27.2	34.6	high	5
Shakespeare Road	26.5	33.1	low	2.5
Shakespeare Road	26.5	33.0	low	5
Shakespeare Road	27.1	34.3	high	2.5
Shakespeare Road	27.0	34.2	high	5
Ashburnham Road	27.2	34.6	low	2.5
Ashburnham Road	27.2	34.5	low	5
Ashburnham Road	27.8	35.7	high	2.5
Ashburnham Road	27.7	35.6	high	5
Dame Alice Street	29.4	38.9	low	2.5
Dame Alice Street	29.3	38.7	low	5
Dame Alice Street	30.0	**40.0**	high	2.5
Dame Alice Street	29.9	39.9	high	5
Goldington Road	30.0	**40.0**	low	2.5
Goldington Road	29.9	39.9	low	5
Goldington Road	30.3	**40.7**	high	2.5
Goldington Road	30.2	**40.5**	high	5

High Street	26.7	33.5	low	2.5
High Street	26.7	33.4	low	5
High Street	27.3	34.7	high	2.5
High Street	27.3	34.6	high	5
Prebend Street	29.7	39.5	high	2.5
Prebend Street	29.6	39.3	high	5

(Note: bold indicates > annual mean objective)

The DMRB predictions indicate that the annual mean objective is exceeded close to the busiest roads when they are considered as street canyons. However in the instance of both the High Street and Prebend Street, even these predictions are below those of the biased adjusted measured results, indicating that the model under predicts in these congested roads.

The roads where there are DMRB predictions that the annual mean objective is exceeded include Ampthill Road, Dame Alice Street and Goldington Road. This screening suggests that there is a risk of the annual mean being exceeded and in view of this finding these roads should be assessed further in a Detailed Assessment.

6.6 Bus stations

One bus station was identified in the previous assessment where there is relevant exposure. This bus station at Greyfriars was found not to need further investigation as there were less than 1000 buses flowing through it per day. There has been no change to this position. The current bus station is also subject to a redevelopment proposal that will reduce its size, amend the nearby road layout and provide a superstore.

6.7 Industrial sources

There are no new industrial processes of relevance for NO_2 in the Borough, or neighbouring areas, however there has been one change relating to an existing industrial process. This concerned the installation of a new combustion chamber at the Goosey Lodge Power Plant at Wymington and this was the subject of an IPPC application in 2005. This concerns a Part A1 waste incineration installation permitted by the Environment Agency. The process burns animal by products, fuels and wastes by a high temperature combustion process. A dispersion modelling assessment was carried out of the plant as part of the Environmental Impact Statement (CERC, 2004). This indicated that the AQS objectives would not be exceeded in the vicinity of the plant; this was based on modelling emissions data with 5 years of sequential data from a local site. The emissions data used were based on actual daily averaged and half hourly averaged emission rates and these represented worst-case scenarios. A permit under the terms of a PPC permit was issued in December 2005.

A follow up monitoring assessment was also undertaken to assess measured concentrations near the site. The monitoring reported (MSE, 2006) was for the period from June to December 2005 at a site of relevant exposure, 1km southeast of the Goosey Lodge Power plant. The QA/QC of the monitoring met the requirements of the TG03. The results indicated that there were no periods when the hourly standard of 200 µg m^{-3} was exceeded. The maximum hourly mean concentration monitored was 79 µg m^{-3} with a 99.79th percentile of 59 µg m^{-3}. These results albeit over a limited 6-month period indicate that the hourly objective was not exceeded. The annualised annual mean for the site was 13 µg m^{-3}, again below the annual mean objective for NO_2. Based on these results a Detailed Assessment is not required.

6.8 Aircraft

There is not a large relevant airport in the Borough or immediate neighbouring areas.

6.9 Conclusion of third round assessment of NO_2

The monitoring undertaken by the Council in 2005 showed that sites within the Council's existing AQMAs exceeded the annual mean objective. The Council is undertaking a Further Assessment of these areas.

In addition, supplementary monitoring at additional sites in Bedford has indicated new locations where the annual mean objective was exceeded. These sites should be checked to confirm that there is relevant exposure and upon confirmation a Detailed Assessment of these sites should be undertaken. The new sites requiring a Detailed Assessment are Ampthill Road, Dame Alice Street and Goldington Road.

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7. Sulphur Dioxide

7.1 Introduction

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 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. As a result the AQS objectives are all incident based as follows:

Objective		Date to be achieved by
Concentration	Measured as	
350 μg m^{-3} not to be exceeded more than 24 times a year	1 hour mean	31 Dec 2004
125 μg m^{-3} not to be exceeded more than3 times a year	24 hour mean	31 Dec 2004
266 μg m^{-3} not to be exceeded more than 35 times a year	15 minute mean	31 Dec 2005

7.2 National Perspective

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, 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 have 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 and locations 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.

7.3 Third round assessment of SO_2

A checklist approach is used, based on 1) monitoring data 2) new industrial sources and existing ones with significantly increased emissions 3) areas of domestic coal burning 4) boilers burning coal or oil 5) shipping and 6) railway locomotives.

1. Ratified monitoring data are to 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.

2. For new industrial sources listed in TG03 it is likely that an air quality assessment will have been undertaken as part of planning or authorisation/permit process. The results from this should be cited. If no assessment were 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%).

3. 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.

4. 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.

5. For shipping not previously considered or where there is new relevant exposure, it is necessary to identify whether there is relevant exposure close to the berths and main area of manoeuvring. If this is 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.

6. 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 2 occasions when locomotives are stationary with engines running then it is necessary to go to a Detailed Assessment.

7.4 Monitoring

The Council monitors SO_2 at its Bedford 1 rural background site in Stewartby. The site is located within the Council's AQMA for SO_2, that surrounds the Stewartby brickworks. The site has been in operation since 2000 and is part of the HBAPMN and therefore the standards of QA/QC used are similar to the government's AURN.

The numbers of periods that the AQS standards are exceeded each year at the site are given in Table 7, along with details of data capture at the site. In all cases the data are fully ratified, apart from the 2005, which are still provisional.

Table 7 SO_2 monitoring in Bedford (2001 to 2005)

Objective	2001	2002	2003	2004	2005
15min mean	25	26	**118**	**135**	**44**
Hourly mean	1	2	4	8	3
24hr mean	0	0	0	0	0
Data capture %	85	99	98	96	76

(Note – bold indicates AQS objective exceeded)

These results indicate that the 15-minute objective has been exceeded at the monitoring site for the past three years; the hourly standard has also been exceeded over the period of monitoring, but not the hourly objective (of more than 24 such periods). The 24-hour objective also has not been exceeded at the monitoring site.

The Council is in the process of setting up another SO_2 monitoring station near the northern end of the AQMA in Kempston to confirm pollution levels in this area. The Council does not monitor SO_2 elsewhere in the Borough outside of its AQMA.

The operator of the Stewartby Brickworks, Hanson Building Products Limited also undertakes monitoring in the area at two sites. These are at Kempston Hardwick and at Broadmead. The latter site was set in 2005 to assess maximum concentrations from the brickworks.

The results for 2005 from these sites are given in Table 8.

Table 8 SO_2 monitoring at Kempston Hardwick and Broadmead for 2005 (µg m^{-3})

	15 minute	1 hour	24 hour
Kempston Hardwick	215	147	38
Broadmead	530	345	117

The results are reported as equivalent percentiles rather than the number of periods exceeding the standards. These are: 99.9th percentile for the 15-minute objective, 99.7Th ile for the 1-hour objective and 99.2th ile for the 24-hour objective. Details of data capture and QA/QC were not available.

The results indicate that at the objectives were not exceeded at the Kempston Hardwick site. There were 11 periods when the 15-minute mean standard was exceeded and no periods when the 1 hour and 24 hour standards were exceeded. However at the Broadmead site with 348 periods exceeding the 266 µg m^{-3} standard, which easily exceeded the 15-minute objective. In addition both the 1-hour and 24-hour objectives were closely approached.

7.5 Industrial sources

Part A and B sources in the Borough and close to the Borough boundary were assessed previously and found not to be relevant, apart from the brickworks at Stewartby. This position has not changed and no new sources have been introduced.

Emissions of SO_x (including SO_2) were obtained from the Environment Agency's Pollution Inventory for the installation at the Stewartby brickworks. These are given in the following table:

Year	SO_x (tonnes)
2001	4668
2002	5963
2003	8564
2004	8738

This table of emissions shows that emissions increased slightly in the last year reported. There was also a significant increase in emissions (+40%) from 2002 to 2003. Part of the increase in emissions relates to operational changes at the brickworks as discussed previously in the Council's Detailed Assessment for SO_2 (Bedford, 2004).

The Council's is currently in the process of completing its Further Assessment of air quality in the AQMA and its Action Plan.

In addition there has been one major change relating to an existing industrial process. This concerned a new combustion chamber at the Goosey Lodge Power Plant at Wymington (see also chapter 6 for additional comments on NO_2 from this installation). The process burns animal by products, fuels and wastes by a high temperature combustion process. An Environmental Impact Assessment, which included an air quality dispersion modelling assessment (CERC, 2004), was produced and this indicated that the SO_2 objectives would not be exceeded. To model short concentrations the maximum half hourly emission limit value was modelled, which is more than ten times the typical emission rate as a precautionary approach. The maximum predicted environmental concentration for this worst-case scenario was 265 µg m^{-3} at a point on land controlled by the operator very close to the source, and therefore where there is no relevant exposure.

As mentioned earlier a follow up monitoring assessment including SO_2 was also undertaken to assess measured concentrations near the site. The monitoring reported (MSE, 2006) was for the period from June to December 2005 at a site 1km southeast of the Goosey Lodge Power plant. The QA/QC for the monitoring met the requirements of the TG03.

The results indicated that there were no periods when the 15-minute standard of 266 µg m^{-3} was exceeded. The maximum 15 minute mean concentration monitored during this period was 201 µg m^{-3}, which arose when the wind was from the southeast and therefore not from the direction of the plant.

The wind rose assessment of the monitoring also indicated that there were no raised levels from the direction of the plant. The 99.7th percentile of the monitored data was 59 µg m^{-3}. These results albeit over a limited six-month period indicate that the SO_2 objectives were not exceeded. Based on these findings to date a Detailed Assessment is not required. The monitoring has continued beyond December 2005 however the results were unavailable for this report and these will be reported in the Council's 2007 Air Quality Progress report.

7.6 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.

7.7 Boilers

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

7.8 Shipping

There are no local sources of shipping emissions.

7.9 Railway locomotives

Diesel trains were considered in the previous USA and found not to idle at locations within 15m of relevant receptors on more than two occasions a day. This position has not changed.

7.10 Conclusion of third round assessment of SO_2

The Council has previously designated an AQMA around the Stewartby brickworks. Monitoring from its continuous site nearby confirms that the 15-minute objective continues to be exceeded and as a result the Council is continuing with its Further Assessment of air quality in the area and the production of its Action Plan.

8. Particles (PM_{10})

8.1 Introduction

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 is 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 3 main categories (APEG): (i) Primary particle emissions derived directly from combustion sources, including road traffic, power generation, industrial processes etc. (ii) Secondary particles formed by chemical reactions in the atmosphere, comprising principally of sulphates and nitrates. (iii) Coarse particles comprising 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.

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 have 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.

The AQS objectives for PM_{10} are as follows:

Objective		Date to be achieved by
Concentration	Measured as	
50 μg m^{-3} not to be exceeded more than 35 times a year	24 hour mean	31 Dec 2004
40 μg m^{-3}	Annual Mean	31 Dec 2004

Proposed new particle objectives were introduced by the 2003 Air Quality Strategy Addendum (DEFRA, 2003b) based on the Stage 2 limit values set in the first EU Air Quality Daughter Directive. These objectives were included as provisional pending further EU reviews. TG03 guidance confirmed that local authorities are not statutorily required to assess air quality against these, but advised that they may find it helpful to do so, to assist with longer term development planning.

Objective		Date to be achieved by
Concentration	Measured as	
50 μg m^{-3} not to be exceeded more than 7 times a year	24 hour mean	31 Dec 2010
20 μg m^{-3}	Annual Mean	31 Dec 2010

8.2 National Perspective

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 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 emissions reductions of 69% for PM_{10} improvements are projected over the period to 2010, arising as tougher Euro standards enter into force for new vehicles, and as 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.

8.3 Third round assessment of PM_{10}

A checklist approach is used, based on 1) monitoring data 2) roads including junctions and new roads 3) new industrial sources and existing ones with significantly increased emissions 4) areas of domestic coal burning 5) quarries, landfill sites, opencast coal, handling of dusty cargoes at ports, etc and 6) aircraft.

1. Ratified monitoring data are to be considered and if the data indicates that the concentration exceeds the 2004 objectives then the Council will be required to proceed to the Detailed Assessment stage.

2. 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. Then using 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.

3. For new industrial sources listed in the guidance it is likely that an air quality assessment will have been undertaken as part of planning or authorisation/permit process. The results from this should be cited. If no assessment were 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%).

4. 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.

5. 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 with the facility.

6. 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.

8.4 Monitoring

The Council does not monitor PM_{10} in the Borough.

The following table provides the results for monitoring sites in nearby local authorities that are part of the HBAPMN. Each site uses a TEOM instrument to monitor PM_{10} and therefore the results have been converted to gravimetric equivalent (x 1.3) in accordance with the requirements of the TG03 guidance.

Table 9 PM_{10} monitoring in selected Herts and Beds sites (2001 to 2005)

		2001	2002	2003	2004	2005
South Beds	Annual mean	*25*	24	23	18	22
(Background)	Data capture %	*83*	96	94	97	95
	Days > 50 µg m^{-3}	*8*	15	20	1	0
Luton	Annual mean	25	25	27	23	24
(Background)	Data capture %	95	95	94	90	90
	Days > 50 µg m^{-3}	6	5	24	1	2
Stevenage	Annual mean		*25*	28	24	25
(Roadside)	Data capture %		*85*	94	97	96
	Days > 50 µg m^{-3}		*8*	24	5	4

(Note – bold indicates objective exceeded; italics < 90% data capture)

The results for the sites indicate that the 2004 annual mean objective was not exceeded during any of the years reported. The 24-hour standard was exceeded for all years (other than South Beds in 2005), although the objective was not exceeded.

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 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 based on 2004 results are given in Table 10.

Table 10 Estimated PM_{10} results at the Bedford sites for 2010 (using updated TG03 guidance)

	Annual mean (µg m^{-3})	No. of days> 50 µg m^{-3}
South Beds	16.3	0.4
Luton	20.9	4.5
Stevenage	21.8	5.9

Despite the predicted reduction resulting from future emission changes the estimates for the Luton and Stevenage sites indicate that the provisional 2010 annual mean objective may be exceeded. This suggests that busy roadside sites within Bedford may also exceed these provisional future objectives.

8.5 Roads

The second round USA considered major roads in the area and concluded that the 2004 PM_{10} objectives are unlikely to be exceeded within the Borough as a result of road traffic emissions from busy roads and junctions. As a result a Detailed Assessment was not required. This position has not changed.

Additionally no roads with unusually high proportions of heavy goods vehicles (>20%) were identified during the previous USA and there have been no significant increases in traffic flows. There is no change in this position since then.

New roads in the area include the A421 Great Barford by pass, which is under construction, and the A5134 Bedford Western Bypass and proposed dual carriageway on the A421 between the M1 and the Bedford Southern Bypass has been proposed since the last review. These were discussed earlier in the nitrogen dioxide chapter.

In view of the revised background predictions, a DMRB assessment has been undertaken of those roads identified as exceeding the NO_2 objective in chapter 6. In line with TG03 no allowance has been made for street canyons, this is because DMRB is considered to provide conservative estimates and not underestimate PM_{10} concentrations (unlike both CO and NO_2, see paragraph 8.32). Traffic data for the links have been obtained from the NAEI warehouse and 2004 estimates have been based on two traffic growth scenarios: a low scenario of 1% per annum and a high scenario of 3% per annum. Traffic speeds have been assumed to be 10kph reflecting that traffic is congested in the town centre. The predictions are given at two distances from the road centre line, as follows:

Table 11 Predicted 2005 PM_{10} concentrations for selected town centre roads

Road name	Annual mean (µg m^{-3})	Days > 50(µg m^{-3})	Traffic growth	Distance (m)
Ampthill Road	30.2	28.4	low	2.5
Ampthill Road	30.2	28.2	low	5
Ampthill Road	30.5	29.4	high	2.5
Ampthill Road	30.4	29.2	high	5
London Road	27.5	19.1	low	2.5
London Road	27.4	19.0	low	5
London Road	27.9	20.4	high	2.5
London Road	27.9	20.2	high	5
Shakespeare Road	27.6	19.6	low	2.5
Shakespeare Road	27.6	19.5	low	5
Shakespeare Road	28.1	21.0	high	2.5
Shakespeare Road	28.0	20.8	high	5
Ashburnham Road	28.0	20.8	low	2.5
Ashburnham Road	28.0	20.7	low	5
Ashburnham Road	28.5	22.2	high	2.5
Ashburnham Road	28.4	22.0	high	5
Dame Alice Street	29.3	24.9	low	2.5
Dame Alice Street	29.2	24.7	low	5
Dame Alice Street	29.7	26.4	high	2.5
Dame Alice Street	29.6	26.2	high	5
Goldington Road	29.7	26.6	low	2.5
Goldington Road	29.7	26.4	low	5
Goldington Road	30.0	27.5	high	2.5
Goldington Road	29.9	27.3	high	5
High Street	27.7	19.9	low	2.5
High Street	27.7	19.8	low	5
High Street	28.2	21.3	high	2.5
High Street	28.1	21.1	high	5
Prebend Street	29.7	26.6	high	2.5
Prebend Street	29.7	26.4	high	5

These predictions exceed the measured 2004 results from sites in the HBAPMN, despite this however the predictions indicate that the 2004 PM_{10} objectives are not exceeded at any of the roads assessed.

8.6 Industrial sources

There are no new industrial processes of relevance for PM_{10} in the Borough, or neighbouring areas. There has been one change relating to an existing industrial process. This concerned a new combustion chamber at the Goosey Lodge Power Plant at Wymington. This is a Part A1 waste incineration installation permitted by the Environment Agency.

8.7 Solid fuel burning

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

8.8 Quarries, landfill sites, etc

There are no quarries within the Bedford Borough, although there are licensed landfill sites within the area (see Appendix). These were considered in the previous USA and since that time no dust complaints have arisen from these establishments 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 Bedford Council as there are no large poultry farms within the Borough.

8.9 Aircraft

There is not a large airport in the Borough or immediate neighbouring areas.

8.10 Conclusion

There have been no significant changes to PM_{10} concentrations or emissions in the Borough since the second round USA and as a result a Detailed Assessment for PM_{10} will not be required.

However in line with previous government guidance and for the purposes of future planning the Council will note that the close to localised sources such as busy roads and junctions, the 2010 annual mean objective is likely to be exceeded in 2010.

9. Conclusion / 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 particles (for 2004 only) 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 will be exceeded at locations with relevant public exposure. As a result it designated AQMAs in part of Bedford town centre and in Great Barford. Further monitoring in the area confirms that the annual mean objective has been exceeded and that there is no need to consider revoking these AQMAs.

Results in 2005 from additional monitoring sites close to the AQMA in Bedford town centre also exceeded the objective and therefore the Council will incorporate these findings into its Further Assessment. Monitoring at other new sites, in Goldington Road and Ampthill Road in Bedford, also exceeded the objective. As a result the Council should confirm that there is relevant exposure at these sites and upon confirmation undertake a Detailed Assessment of these areas.

The Council previously identified a risk that the air quality objective for SO_2 was exceeded. As a result it designated an area close to Stewartby an AQMA. Further monitoring in this area has confirmed that the 15-minute objective is still being exceeded. Based on this finding there is no need to amend or revoke its AQMA. The Council is currently completing a Further Assessment of this area.

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 are 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.

The Council is therefore recommended to undertake the following action:

1) Undertake consultation on the findings arising from this report with the statutory and other consultees as required.

2) Confirm that there is relevant exposure close to its NO_2 diffusion tube monitoring sites in Ampthill Road and Goldington Road in Bedford and upon confirmation undertake a Detailed Assessment of these areas.

3) Complete the Further Assessment of its existing AQMAs.

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Appendix 1

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

REF. No	TRADING NAME	ADDRESS
46	BP Bedford Bypass	A421/A6 Junction, Bedford Bypass
48	Richard Tebbutt Ltd	52-56 Stagsden Road, Bromham, Bedford
49	Sainsburys Limited	252/274 Bedford Road, Kempston, Bedfordshire
51	Sainsburys Limited	90 Clapham Road, Bedford
52	BP Safeway	Newham Avenue, Bedford
54	Tesco Stores Ltd	Riverfield Drive, Bedford
55	Tesco Stores Ltd	Cardington Road, Bedford
61	Kempston Filling Station	47 High Street, Kempston MK42 7BT
62	Murco Service Station	Allhallows Car Park, Hassett Street, Bedford
63	Esso Southgate	59 London Road, Bedford
64	Total Service Station	3 Elstow Road, Bedford
65	BP Service Station	A1 Southbound, Wyboston, Bedfordshire
66	Putnoe Service Station	122 Queens Drive, Putnoe, Bedford
69	Total Fina Black Cat Service Station	Great North Road, Chawston
70	Total Fina Kempston	Woburn Road, Kempston
78	Q8	GA Henman & Sons Ltd, 95 High Street, Clapham MK41 6AQ
79	Murco	Wootton Garage, 2 Fields Road, Wootton, MK43 9JJ

Table 13 List of Part A1 installations in the Council's area

Operator Name	Authorisation No.	Site address	Process type
Hanson Building Products Limited	BX1616IU	Stewartby Brickworks Stewartby Bedfordshire	CERAMIC PRODUCTION
RWE NPOWER PLC	AJ2747	LITTLE BARFORD, ST. NEOTS, HUNTINGDON, CAMBRIDGESHIRE	COMBUSTION
BOURNS LTD	AL1008	MANTON LANE, BEDFORD, BEDFORDSHIRE	ORGANIC CHEMICALS
ONYX UK LTD	SHA008/75018	Treatment Plant, Green Lane, Stewartby, Beds, MK43 9LY	OTHER WASTE DISPOSAL
WOODBRIDGE FOAM (UK) LTD	AT8894	CAXTON ROAD, ELMS INDUSTRIAL ESTATE, BEDFORD	ORGANIC CHEMICALS
ANCILLARY COMPONENTS LTD	AY2214	GOOSEY LODGE, WYMINGTON, RUSHDEN, NORTHAMPTONSHIRE	WASTE INCINERATION

Table 14 List of Part B installations in the Council's area

REF No	TRADING NAME	ADDRESS
Non ferrous metals		
19	Norse Precision Castings Ltd	276/280 Ampthill Road, Bedford
31	Caress Precision Products Ltd	Allington Road, Little Barford, St Neots
Production of cement and lime		
6	Hanson Aggregates	Bedford Plant, Cople Turn, Sandy Road, Cople, Bedford
8	Lafarge Aggregates Ltd	Cople Road, Willington, Beds
13	Cemex Materials	Great North Road, Wyboston, Beds
15	Cemex Materials	Manor Road, Kempston Hardwick
17	St Neots Premix	Ducks Cross, Wilden, Bedford
28	Supreme Concrete Ltd	Hardwick Hill Works, Ampthill Road, Kempston Hardwick
73	Paving Direct	Unit 1, Airfield Road, Podington, Northants
Other mineral industries		
16	Lafarge Aggregates	Elstow Depot, The Old Brickworks, Wilstead Road, Bedford
18	C Jackson & Son	Keysoe Road, Thurleigh
43	Ibbott & Moorbey Demolition	Church Walk Wilden, Beds
45	G Moore Haulage	Major Road, Kempston Hardwick, Beds
75	C Jackson & Son	Keysoe Road, Thurleigh
Gasification, Liquefaction and Refining		
57	National Grid Gas	Little Barford Power Station, Little Barford, Beds.
Disposal of waste by incineration		
39	Bedford Crematorium	Cemetery Complex, 104 Norse Road, Bedford
36	Tri D Motor Engineers	Bury Walk, Goldington
Organic chemicals		
37	Interfoam Ltd	15/17 Ronald Close, Woburn Industrial Estate, Kempston
Tar and bitumen		
5	Elstow Roofing Products Ltd	Old Brickworks, Wilstead Road, Elstow
Coating activities, printing and textile treatments		
20	Select Plant Hire Company Ltd	Barford Road, St Neots
21	Evans Halshaw	Barkers Lane, Bedford
22	Mercedes Benz of Bedford	Ampthill Road, Bedford
25	ACR Auto Crash Repairs	Brunel Road, Barkers Lane, Bedford
32	VW Panels	302 Ampthill Road, Bedford
38	Stratstone	Pioneer Park, 200 Ampthill Road, Bedford
44	Brycol	3 Wilstead Industrial Estate, Wilstead
47	QA Accident Repair Centre	1 Lyon Close, Woburn Industrial Estate, Kempston
50	Paragon Automotive Ltd	Thurleigh Airfield Business Park, Thurleigh
59	Autocare UK Ltd	Thurleigh Airfield Business Park, Thurleigh
74	Hudson Kapel Ltd	Building 140, Thurleigh Airfield Business Park, Thurleigh

Appendix 2

Table 15 Locations of Bedford Council's NO_2 diffusion tube monitoring sites

Code	Address	Easting	Northing	Location
BF06	20 High St Bedford	505030	249870	K (AQMA)
BF07	135 George St Bedford	506170	250190	I
BF08	Arrowleys Bedford	506660	251660	B
BF09	61 The Links Kempston	503530	247380	B
BF10	Bromham Road Bedford	503830	250070	K
BF11	Goldington Road Bedford	506720	250260	K
BF12	Bunyan Road Kempston	503160	247690	I
BF14	Riverfield Drive Bedford	507530	249740	K
BF16	Great Barford	512770	252410	K (AQMA)
BF17	The Lane Wyboston	516320	256640	I
BF18	Great North Road Wyboston A1	516450	256630	I
BF20	St Johns Street car park Kempston	503020	247150	K
BF21	Kempston Road Bedford	504590	248980	K
BF22	Ampthill Road Bedford	504790	248790	K
BF23	Castle Road Bedford	505840	249870	I
BF24	Kimbolton Road Bedford	505590	250620	I
BF25	Prebend Street Bedford	504570	249510	K (AQMA)
BF28	Churchville Road Bedford	504500	248400	I
BF29	Kirkstall Close Bedford	504600	246800	B
BF30	River Street Bedford	504800	249600	K
BF31	Great North Road Wyboston A1 North 1	503020	247150	K
BF32	Great North Road Wyboston A1 North 2	504590	248980	K
BF33	Great North Road Wyboston A1 South	504790	248790	K
BF34	Great Barford outside number 11 Bedford Rd	505030	249870	K (AQMA)
BF35	London Rd Bedford outside number 5	505030	249870	I
BF36	Great Barford outside 5 Bedford Rd	505030	249870	I (AQMA)
BF37	High Street Bedford Outside Ladbrokes	505030	249870	I (AQMA)
BF38	Prebend St Bedford Corner near 24 Commercial Rd	505030	249870	I (AQMA)
BF39	Goldington Rd Bedford Opp. university and shop	505030	249870	I
BF40	The Broadway Bedford Outside Collins jewellers	505030	249870	K
BF41	High Street Bedford Outside Luddingtons	505030	249870	I (AQMA)
BF42	Prebend Street Bedford Opposite number 8	505030	249870	I (AQMA)
BF43	Shakespeare Rd Bedford Outside number 4	505030	249870	I
BF44	St Mary's St Bedford Outside Kings Arms PH	505030	249870	I
BF45	Prebend Street Bedford Near Crown Quay entrance	505030	249870	I (AQMA)
BF46	Ashburnham Rd Bedford Outside number 35	505030	249870	I
BF47	Ampthill Rd Bedford Outside number 38	505030	249870	I
BF48	Prebend Street Bedford Outside number 44	505030	249870	I (AQMA)
BF49	Great Barford near 37 Bedford Road	505030	249870	K (AQMA)
BF50	Tavistock Street Bedford Outside YMCA	505030	249870	I
BF51	Great Barford outside 610 Roxton Rd	505030	249870	I (AQMA)
BF52	St Johns St Bedford Outside old BT building	505030	249870	I
BF53	Dame Alice St Bedford Outside number 45	505030	249870	I

Table 16 Bedford town centre DMRB traffic data

	2005 low	2005 high	HGV	LGV
Ampthill Road	25175	27763	4.8%	95.2%
London Road	10723	11825	5.1%	94.9%
Shakespeare Road	13391	14767	3.1%	96.9%
Ashburnham Road	13547	14939	3.9%	96.1%
Dame Alice Street	14218	15679	6.1%	93.9%
Goldington Road	17361	19145	5.7%	94.3%

Appendix 3

Table 17 Licensed landfill sites in the Bedford Borough Council area

Company	ADDRESS	POSTCODE	Registration No	Licence No	Type	Area	ISSUED
Redland Aggregates Ltd	Land Near Dog Farm	n/a	Oct-94	70006	Landfills taking non-biodegradeable wastes (not construction)	Small	30/12/1994
G Moore (Haulage) Bedford	Bromham Landfill, Lower Farm Road	MK41 6AA	Feb-79	70022	Landfills taking non-biodegradeable wastes (not construction)	Large	16/01/1979
Anglian Water Services Ltd	Sludge Drying Beds, Lower Farm Road	n/a	24/1977	70034	Lagoons	n/a	n/a
Bedfordshire County Council	Elstow Landfill Site A6, Wilstead Road	MK42 9YU	26/1977	70037	Household, Commercial and industrial waste landfills	Large	27/05/1977
Blackwell C A (Contracts) Ltd	Elstow Borrow Pit, Medbury Lane	n/a	Mar-95	70048	Landfills taking other wastes (construction, demolition, dredgings)	Medium	19/09/1995
WASTE RECYCLING GROUP LTD	L Field, Green Lane, Stewartby, Beds	MK43 9LY	Apr-86	70053	Co-disposal landfill sites	Large	06/11/1986
Redland Aggregates	Octagon Farm, Cople	n/a	Jun-96	75024	Landfills taking non-biodegradeable wastes (not construction)	Large	24/12/1997
Lafarge Redland Aggregates Ltd	Octagon Farm North Landfill, Willington	MK44 3PG	75061	75061	n/a	n/a	n/a