Updating and Screening Assessment for the Bedford Borough Council

July 2003

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Executive Summary

The role of the local authority review and assessment process is to identify the areas where it is considered that the government's air quality objectives will be exceeded. The Council has previously undertaken the first round of review and assessment (R&A).

This report concerns the Updating and Screening Assessment under the second round of review and assessment (R&A). Local authorities are now required to review and assess air quality against the objectives in the Air Quality Regulations 2000 and the amendment regulations. 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 latest prescribed guidance given in Technical guidance LAQM. TG (03), which replaced that produced for the previous round of R&A. It gives guidance on the use of background pollutant concentrations, monitoring results, industrial sources, and road traffic. It 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 report identifies that the risk of the objectives for carbon monoxide, benzene, 1,3-butadiene, and lead being exceeded is not significant in the Council's area.

The updating and screening assessment for nitrogen dioxide, sulphur dioxide and PM_{10} (for 2010) has identified that the risk of the objectives being exceeded are significant. In accordance with the LAQM guidance the Council should therefore undertake a Detailed Assessment for nitrogen dioxide and sulphur dioxide only.

The Detailed Assessment for nitrogen dioxide should relate to narrow congested roads in the Bedford town centre (A6 Bedford High Street and A5141 Prebend Street) and the A421 in Great Barford.

The Detailed Assessment for sulphur dioxide should relate to brickworks in Stewartby.

(Note – the new PM_{10} objective for 2010 is not currently included within in the Air Quality Regulations and therefore the Council need not undertake a detailed assessment for this pollutant at this time).

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Background

The Bedford Borough Council is a predominantly rural area incorporating the County town of Bedford, the smaller town of Kempston and 43 villages, located in eastern England. The area also includes industrial areas, which have declined over the last decade. Significant industry that remains includes the brickworks at Stewartsby and power station at Little Barford. The population of the area is approximately 142,000 (of which half live in Bedford) and the total area covered by the Council is 477 km^2.

The area is well served by transport links to London and the midlands via both the road and rail. A network of subsidiary routes connects with other towns and small centres of population across Bedfordshire and neighbouring counties.

Progress with Local Air Quality Management (1997-2000)

As apart of its Local Air Quality Management (LAQM) responsibilities, the Council has completed the first round review and assessment (R&A) of air quality (see the individual Stage 1, 2 and 3 reports prepared between 1998 and 2000). These reports present a staged approach whereby the seven air pollutants in the Government's Air Quality Strategy related to LAQM, were first assessed and screened as to their relative importance to air quality within the Council's area.

Four AQS pollutants (benzene, 1,3 butadiene, carbon monoxide, and lead) were only considered at earliest stage of the review and assessment (Stage 1). Particles (PM_{10}) and sulphur dioxide (SO_2) were considered at Stages 1 and 2 only. The findings for all these pollutants was that none were found likely to lead to the air quality objectives being exceeded and therefore no further action was required in respect of these pollutants.

The Stage 3 report was only undertaken for nitrogen dioxide (NO_2) and this report assessed air quality across the Council's area in accordance with DEFRA guidance. The predictions in the Stage 3 report were that the statutory objectives for NO_2 would not be exceeded within the Council's area.

Introduction to Updating Screening and Assessment

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 remain and that these 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. Experience has shown that such areas may range from single residential properties to whole town centres.

This report concerns the second round of LAQM review and assessment (R&A). It follows the latest prescribed guidance given in Technical guidance LAQM. TG (03), which replaced the guidance produced for the previous round of R&A. TG03 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.

Local authorities are now required to review and assess air quality against the objectives in the Air Quality Regulations 2000 and the 2002 amendment regulations. In addition the EU has set limit values for NO_2 and benzene and indicative limit values for PM_{10} for 2010. In the case of NO_2 the limit values are the same as the 2005 objectives, hence meeting the latter automatically means that the former will be met. The guidance confirms that local authorities are not statutorily required to assess air quality against these, but it advises that they may find it helpful to do so, to assist with longer term development planning.

Tables 1 and 2 below provide details of the objectives for the purposes of this round of R&A.

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 second round of review and assessment.

The first step is the Updating and Screening Assessment (USA), which all local authorities are required to undertake. TG03 gives guidance on the use of background pollutant concentrations, monitoring results, industrial sources, road traffic, as well as the specific AQS pollutants to be examined for both the USA and the subsequent step, i.e. the Detailed Assessment.

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 (5 ppb)	Running Annual Mean	31 Dec 2003
	5 μg/m^3	Annual Mean	31 Dec 2010
1, 3 Butadiene	2.25 μg/m^3 (1 ppb)	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 (105 ppb) not to be exceeded more than 18 times a year	1 hour mean	31 Dec 2005
	40 μg/m^3 (21 ppb)	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 (132 ppb) not to be exceeded more than 24 times a year	1 hour mean	31 Dec 2004
	125 μg/m^3 (47 ppb) not to be exceeded more than3 times a year	24 hour mean	31 Dec 2004
	266 μg/m^3 (100 ppb) 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}) (Except London 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

Background Pollutant Concentrations

Background concentrations provide an understanding of the prevailing pollution in the absence of specific local emission sources. Mapping techniques based on the National Atmospheric Emission Inventory (NAEI) have been used to provide an understanding of future concentrations on a 1x1 km grid square for the U.K (see http://www.airquality.co.uk/archive/laqm/tools.php). It is important to note that the NAEI (incorporates all major sources, including roads) within each grid square. Interpolated background plots based on these data are given in the report for benzene (based on 2010), 1,3-butadiene (based on 2003), nitrogen dioxide (based on 2005) and PM_{10} (based on 2010) for indicative purposes.

Monitoring Data

The monitoring of air quality in a local authority's 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. 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 preferably ratified. The site operated by the Council at Stewartby is part of the Herts and Beds Air Pollution Monitoring Network (HBAPMN) and thus the standards of QA/QC meet those of the TG03 guidance. The site started operation in late 2000 and the most recent data are given in the report, with 2002 being provisional only. The Council also carries out diffusion tube monitoring for nitrogen dioxide. The data capture for the continuous site, with the locations of the diffusion tubes is given in Appendix 1.

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 A 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 are also interest to LAQM. TG03 requires details of boilers with a thermal rating of greater than 5 MW that burn coal or fuel oil (e.g. in universities, hospitals, etc) to be obtained.

Updated lists of Part A, Part B/A2 and other processes of potential concern in Council's area are given in Appendix 3.

Road Traffic

Details of road traffic movements are required across the Council's area and the Bedfordshire County Council and NAEI have provided these data. Recent traffic data are shown in Appendix 2. Predicted future flows have been estimated based on National Road Traffic growth factors.

To estimate the air quality impact in this step of review and assessment it is necessary to use the DMRB methodology produced by the Highways Agency. The version used (i.e. version 1.01) was released in February 2003 and incorporates the most recent emission factors. It is intended to provide conservative estimates, however in some instances it can under predict concentrations. In these specific instances factors can be applied, as advised in TG03.

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Carbon Monoxide

The air quality objective for carbon monoxide (CO) has been tightened and is now 10mg/m^3 as a maximum daily running 8-hour concentration to be achieved by the end of 2003, which is in line with second Air Quality Daughter Directive limit value.

Perspective

The main source of CO remains road transport (nationally about 67% based on 2000), although annual emissions are declining mainly as a result of uptake of abatement technologies.

Current monitoring indicates that none of the UK national network sites exceeded the objective during the period between 1999 and 2001, with kerbside/ roadside sites having higher concentrations than urban background sites (see TG03). Despite this the guidance highlights that under certain meteorological conditions the objective was approached within 2mg/m^3 at four urban background sites in 2001.

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 round based on the previous objective of 11.6mg/ m^3. Based on TG03, it is considered highly unlikely that any authority will be required to proceed beyond the updating and screening assessment.

Methodology Overview

Full details of the methodology employed can be found in TG03. The following represents a summary of the methods used. To undertake this it is necessary to draw on the first stage report of the first round of review and assessment.

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

1. For monitoring data only, roadside data are required where there is public exposure. The data will be assumed to be applicable to 2003 and 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 annual average daily traffic flows exceeding stated flows (which are dependent on the type of road) for areas where the 2003 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 2003 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.

Updating and Screening Assessment of Carbon Monoxide for the Bedford B.C

The only source screened at Stage 1 during the previous round of R&A was the A1 motorway. CO was found to pose a negligible risk in localities where there might be exposure and further Stages of R&A were therefore not undertaken.

A) Monitoring

No monitoring for CO is carried out across the Council's area. Across the HBAPMN there are three sites currently monitoring CO. The results for the roadside site in Watford for 1999 and 2000 only are given in the Table 3 below. There was more than 90% data capture in 1999, however in 2000 there was only 87% data capture for the site. Full details relating to the QA/QC for the sites can be found in the HBAPMN annual reports, for the reports produced since 1999 see http://www.seiph.umds.ac.uk/hbnet.htm.

Table 3 Carbon monoxide monitoring at Watford roadside site (mg/m^3)

Objective	1999	2000
8hr mean	3.7	*3.3*
Annual Mean	0.75	*0.59*

(*italics* represents insufficient data capture)

The above results confirm that current maximum daily running 8-hour concentrations are less than 10 mg/m^3 objective for a representative site elsewhere in the HBAPMN.

Recent results from the background network continuous monitoring sites also indicate that CO levels remained well below the objective and that concentrations are unlikely to exceed 3 mg/m^3 (running 8 hour mean) in any part of the HBAPMN area.

B) Very busy roads/ junctions in built up areas

Based on the results from the urban background sites in the HBAPMN, the background in the Council's area can reasonably be assumed at approximately 0.4 mg/m^3 (from the 2001 results). The estimated 2003 annual mean concentration can be determined from this figure and the expected reduction in future concentrations (from TG03). This is predicted as 0.35 mg/m^3. It is thus less than the $1mg/m^3$ concentration where further action is necessary.

Traffic flows in the area are given in Appendix 2 and this indicates 'very busy' roads with single carriageways exceeding 80,000 vehicles per day (vpd); dual carriageway exceeding 120,000vpd and motorways exceeding 140,000vpd (as classified by TG03) are not found anywhere in the Council's area. There are similarly no junctions of the busiest roads where these traffic flows are approached in the Council's area.

Conclusion

The updating and screening assessment for carbon monoxide has not identified a risk of the new objective being exceeded by 2003 anywhere in the Council's area. The Council need not therefore proceed beyond this updating and screening assessment for carbon monoxide.

Benzene

The air quality objective for benzene of 16.25mg/m^3 as a running annual mean to be achieved by the end of 2003 has been added to with an additional objective of 5mg/m^3 as an annual mean concentration to be achieved by the end of 2010. This is in line with second Air Quality Daughter Directive limit value.

Perspective

Petrol engine vehicles, petrol refining and the uncontrolled emissions from petrol filling stations without vapour recovery systems are the main sources of benzene.

Current monitoring indicates that all of the UK national network sites were significantly below the 2003 objective during the period between 1999 and 2001 (from TG03). Since 2001 the concentrations were also below the 2010 objective, with kerbside/ roadside sites having higher concentrations than urban background sites.

National mapping has indicated that for most areas the 2003 objective will not be exceeded. However for 2010 there is the possibility that some areas will exceed.

No AQMAs were declared in the first round of R&A. Therefore traffic emissions need not be considered. It is also considered that only those local authorities with relevant locations close to major industrial processes involving benzene will be required to proceed beyond the updating and screening assessment for the 2003 objective.

For the 2010 objective however it is necessary to consider both petrochemical processes and busy roads, as monitoring from the first round indicates that this objective has recently been exceeded.

Methodology Overview

Full details of the methodology employed can be found in TG03. The following represents a summary of the methods used. To undertake this it is necessary to draw on the first stage report of the first round of review and assessment.

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 and 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 2003/ 2010. If the data indicate that the objective is exceeded then the local authority will be required to proceed to the Detailed Assessment stage.

2. This relates to 2010 only, where the 2010 annual mean background exceeds 24µg/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 process. The results from this should be cited. Authorities are also asked to check information from the first round of R&A if there were doubts about their validity. 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 petrol stations with a throughput of more than 2000m^3, and with a road with more than 30000 vehicles per day nearby. If there is relevant exposure within 10m of the pumps it is necessary to proceed to a Detailed Assessment.

   For major petrol storage depots it is necessary to identify relevant exposure and annual emissions to calculate whether the relevant threshold in the guidance has been exceeded.

   For combined sources the 2010 objective need only be considered. The methodology relies on an assessment based on the establishment of emission rates for the industrial/ fugitive source combined with DMRB for busy roads.

Updating and Screening Assessment of Benzene for the Bedford Borough Council

No sources were identified as needing screening during the previous round of R&A and therefore benzene was found to pose a negligible risk in localities where there might be exposure, hence progression beyond Stage 1 R&A was not undertaken.

A) Monitoring

The Council does not undertake any benzene monitoring across its area. Four other districts in Hertfordshire and Bedfordshire however do undertake benzene monitoring by diffusion tube. This monitoring indicates that annual mean levels in all areas are well below the 2003 objective. Concentrations have steadily decreased in recent years but have now levelled off at around 3.25 µg/m^3 in kerbside locations and 1.6 µg/m^3 in background locations. As no continuous monitoring of benzene is undertaken in Hertfordshire and Bedfordshire there has been no site co-location and no derivation of bias correction.

The results for representative locations confirm that the current running annual mean concentrations are less than the 2003 objective of 16.25 µg/m^3 and the 2010 objective of 5 µg/m^3.

The following table gives an estimated annual average mean concentration for 2003 and 2010 for roadsides, based on the measured data above and using the correction factors from TG03. The estimates below are based on the concentration measured in 2001.

Table 4 Estimated Benzene for 2003 – 2010 (using TG03 methodology) (µg/m^3)

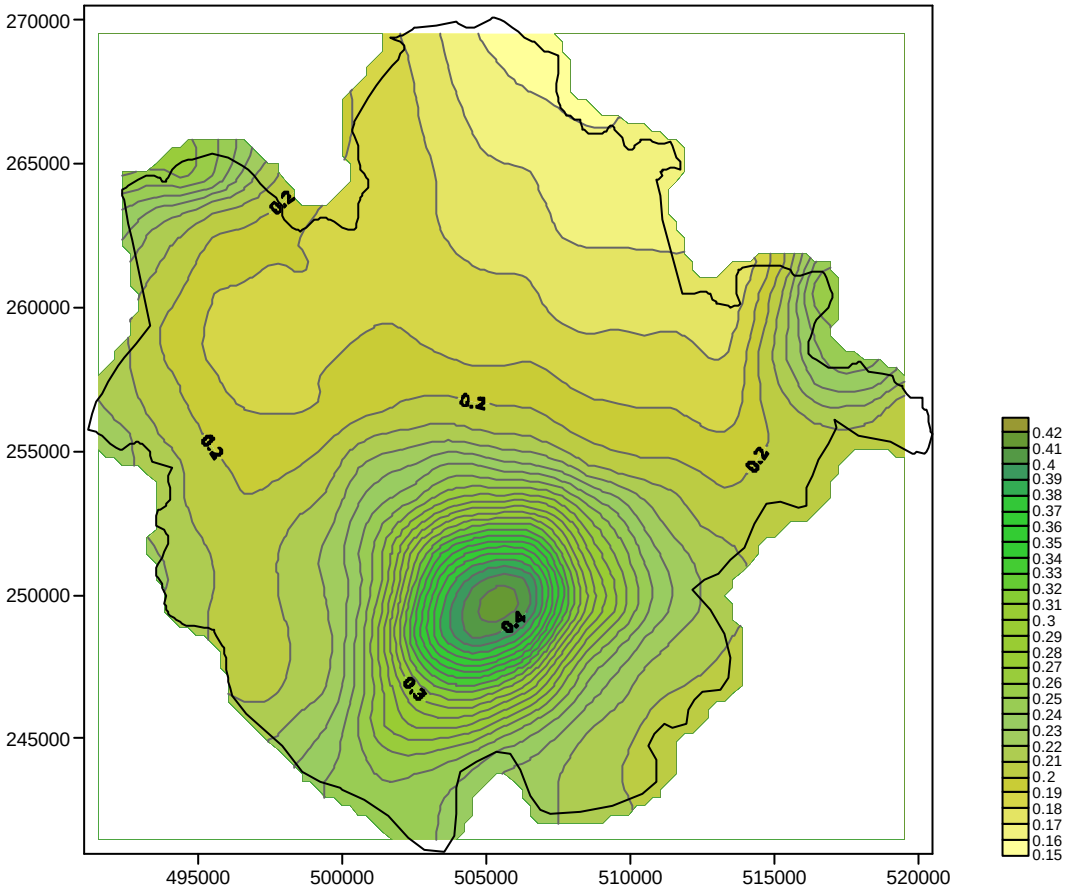
Site	Class	2003	2010
H&B average	k	2.83	2.10

The estimated 2003 and 2010 running annual mean concentrations are between 2.10 and 2.83 µg/m^3 and thus are less than 16.25 and 5 µg/m^3 respectively where further assessment of benzene is deemed necessary.

B) Very busy roads/ junctions in built up areas

Traffic flows in the area are given in Appendix 2 and this indicates the 'very busy roads' and junctions as outlined are not found in the Council's area. The 2010 background from the ww.airquality.co.uk/archive/laqm/tools.php site also confirms that 2010 background is less than 2 µg/m^3 (see Figure 1). The estimated background predictions vary between 0.14 and 0.46 µg/m^3 across the Council's area.

Figure 1 Interpolated benzene (annual mean concentration µg/m^3) plot for Bedford B.C (2010)



C) Industrial sources

There are no IPC/ IPPC petroleum, petrochemical, carbonisation processes within the Council's area.

Examination of the Environment Agency's Pollution Inventory has confirmed that there has been no release of benzene from any of the processes operating within the Council's area. A list of the processes is given in Appendix 3

There is no Part B process for the storage and unloading of petrol at terminals in the Council's area.

D) Petrol stations

The list of authorised petrol stations is attached in Appendix 3; details on the exact throughput in terms of quantity of petrol are not available. However based on a worst case assumption that all are greater than 2000m^3, it is necessary to identify whether the petrol stations are close to a busy road with more than 30,000vpd. From the Appendix 2 showing a summary of traffic flows it can be seen that there is only one road which are applicable; the A1 in the east of the Council's area. The only petrol station along this stretch within the Council's area is on A1 Southbound at Wyboston and there is no relevant exposure within 10m of the petrol pumps at this site.

E) Major fuel storage depots

There are no major fuel storage depots within the Council's area (as listed in TG03).

Conclusion

The updating and screening assessment for benzene has not identified a risk of the objectives being exceeded by 2003 and 2010 anywhere in the Council's area. The Council need not therefore proceed beyond this updating and screening assessment for benzene.

1,3-Butadiene

The air quality objective for 1,3-butadiene remains 2.25mg/m^3 as a maximum running annual mean concentration to be achieved by the end of 2003.

Perspective

Emissions from road vehicle exhausts and a small number of industrial sites handling bulk quantities are the main sources of 1,3-butadiene.

Current monitoring indicates that all of the UK national network sites were significantly below the 2003 objective during the period between 1999 and 2001 (from TG03) apart from the Marylebone Road site in London in 1999. This site is a very busy kerbside site and concentrations at this site appear to have tailed off since. Reductions in emissions from road vehicles is continuing as a result of the uptake of abatement technology hence only locations close to industrial sites are expected to proceed beyond the updating screening and assessment for this objective.

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

Methodology Overview

Full details of the methodology employed can be found in TG03. The following represents a summary of the methods used. To undertake this it is necessary to draw on the first stage report of the first round of review and assessment.

A checklist approach is used, based on 1) monitoring data 2) new industrial sources 3) 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 indicate that the objective is exceeded then the local authority will be required to proceed to the Detailed Assessment stage (as there is no need to correct it for future years).

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 process. The results from this should be cited. Authorities are also asked to check information from the first round of R&A if there were doubts about their validity. Where it is necessary to check industrial sources then 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. A substantial increase in emissions is one where the increase is greater than 30%.

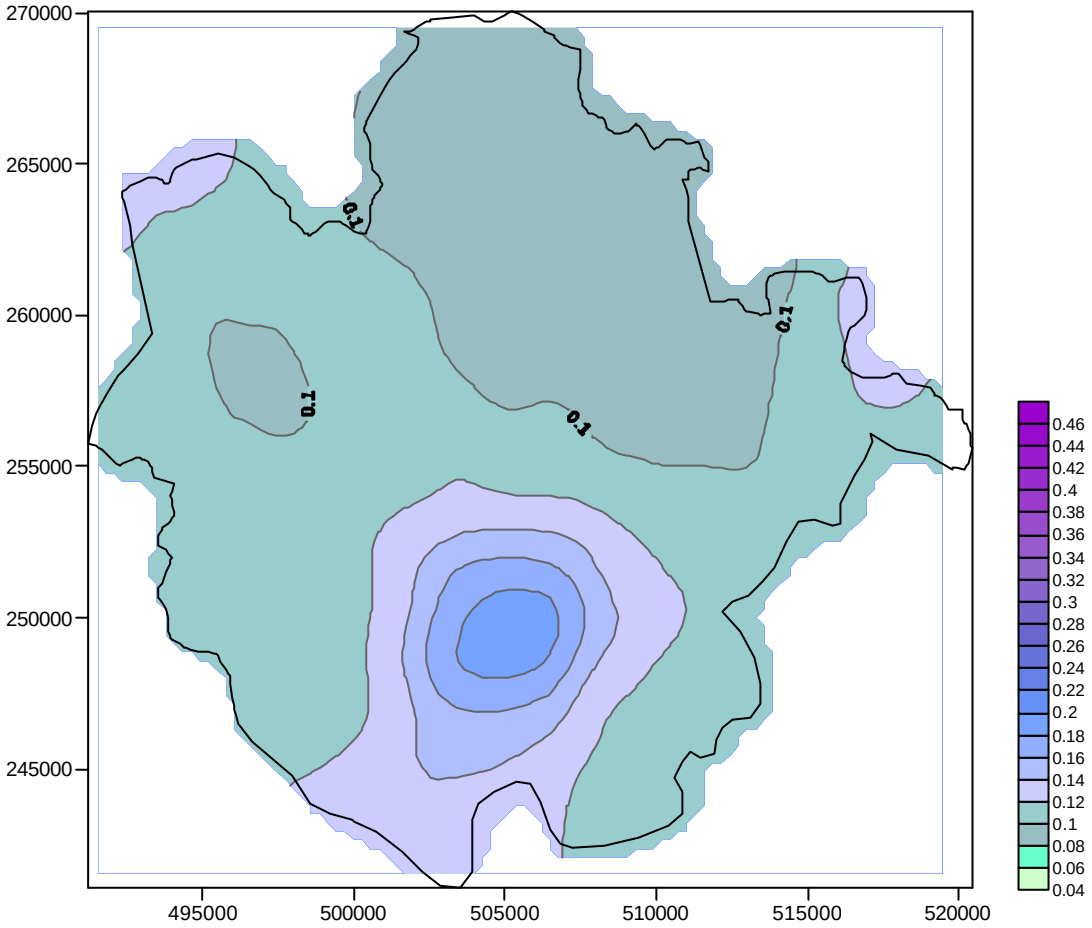
Updating and Screening Assessment of 1,3-Butadiene for the Bedford Borough Council

No sources were identified as needing screening during the previous round of R&A. Thus 1,3-butadiene was found to pose a negligible risk in localities where there might be exposure, and progression beyond the Stage 1 R&A was not undertaken.

A) Monitoring

The Council has undertaken no specific monitoring of 1,3-butadiene since the last round of review and assessment. Monitoring is also not undertaken elsewhere in the HBAPMN. The 2003 background from the ww.airquality.co.uk/archive/laqm/tools.php site also confirms that 2003 background is less than 2 µg/m^3 (see Figure 2). The estimated background predictions vary between 0.08and 0.18 µg/m^3 across the Council's area.

Figure 2 Interpolated 1,3-butadiene (annual mean concentration µg/m^3) plot for Bedford B.C (2003)



B) Industrial sources

There are no new IPC/ Part B/ A2 processes or existing processes with substantially increased emissions of 1,3-butadiene within the Council's area since the last round of review and assessment.

Conclusion

The updating and screening assessment for 1,3-butadiene has not identified a risk of the objective being exceeded by 2003 anywhere in the Council's area. The Council need not therefore proceed beyond this updating and screening assessment for 1,3-butadiene.

Lead

The current air quality objective for lead is 0.5mg/m^3 as an annual mean concentration to be achieved by the end of 2004, with a lower air quality objective of 0.25mg/m^3 as an annual mean concentration to be achieved by the end of 2008.

Perspective

Emissions of lead are now restricted to a small number of industrial processes, including battery manufacture, pigments in paint, alloys, radiation shielding tank lining and piping.

Current monitoring indicates that lead in air at all background and kerbside UK national network sites was significantly below the 2004 and 2008 objectives during the period between 1999 and 2001 (from TG03).

Further assessments however have been undertaken nationally at specific sites near industrial processes. For one industrial site in 2000 the result exceeded the 0.5 μg/m^3 objective, followed in 2001 by an exceedence of the 0.25 μg/m^3 objective. For the other site the result was exceeded at 2 locations in 1999, one for the 0.5 μg/m^3 objective and the other of 0.25 μg/m^3. Concentrations at this site however since have dropped markedly. Thus the monitoring results indicated generally no exceedences of the 2004/ 2008 objectives although locations in proximity to non-ferrous metal production and foundry processes were deemed to be at risk.

No AQMAs were declared in the first round of R&A.

Methodology Overview

Full details of the methodology employed can be found in TG03. The following represents a summary of the methods used. To undertake this it is necessary to draw on the first stage report of the first round of review and assessment.

A checklist approach is used, based on 1) monitoring data 2) new industrial sources 3) 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 indicate that the objective is exceeded then the local authority will be required to proceed to the Detailed Assessment stage (as there is no need to correct it for future years).

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 process. The results from this should be cited. Authorities are also asked to check information from the first round of R&A if there were doubts about their validity. 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. A substantial increase in emissions is one where the increase is greater than 30%.

Updating and Screening Assessment of Lead for the Bedford Borough Council

No sources were identified in the first round of review and assessment in the Council's area, thus lead was found to pose a negligible risk in localities where there might be exposure and a Stage 2 R&A was therefore not undertaken.

A) Monitoring

The Council has undertaken no specific monitoring of lead since the last round of review and assessment.

B) Industrial sources

There are no new IPC/ Part B/ A2 processes or existing processes with substantially increased emissions of lead within the Council's area since the last round of review and assessment.

Conclusion

The updating and screening assessment for lead has not identified a risk of the objectives being exceeded by 2004 and 2008 anywhere in the Council's area. The Council need not therefore proceed beyond this updating and screening assessment for lead.

Nitrogen Dioxide

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

Perspective

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 TG03). 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 nitrogen oxides emissions 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 emissions include 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 100 AQMAs were declared in the first round of R&A 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 include parts of major conurbations, town centres with congested traffic and dual carriageways and motorways.

Methodology Overview

Full details of the methodology employed can be found in TG03. The following represents a summary of the methods used. To undertake this it is necessary to draw on the first stage report of the first round of review and assessment.

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. Monitoring data are to be considered both outside an AQMA and within an AQMA. The data will be corrected to 2005 using factors in TG03 and if the data indicate that the concentration exceeds the objective then the local authority will be required to proceed to the Detailed Assessment stage.

2. These sections focus on specific examples that may not have been fully considered in the first round of review and assessment. This relates to annual average daily traffic flows exceeding stated flows (which are dependent on the type of road) for different locations. If the indications arising from these assessments are greater than 40 $\mu g/m^3$ in 2005 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 should be re-assessed.

3. Bus stations should be assessed specifically 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 or exceeds these stated levels of activity then DMRB is to be used to obtain a predicted annual mean. If the predicted concentration is greater than 40 $\mu g/m^3$ in 2005 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 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 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.

Updating and Screening Assessment of Nitrogen Dioxide for the Bedford Borough Council

The Council did not declare any AQMAs in its area following the first round of R&A. The main sources identified in the Council's area were road transport sources and those examined are listed in Appendix 2 with the most recent traffic counts. In addition the Part A power station at Little Barford and brickworks at Stewartby were examined at the Stage 2 R&A. In both instances there was deemed to be no significant risk of the NO_2 objective being exceeded.

A Stage 3 R&A was also previously undertaken for NO_2 for the A1 at Wyboston in the east of the Council's area. The predicted results were that the annual mean objective was not exceeded by 2005 and therefore the first round R&A ended at this stage.

A) Monitoring

The results given in the table below represent the most recent years (i.e. from 1999 to 2002) for the sites monitored in the Council's area (the exact locations of the sites are given in Appendix 1). The sites represent locations relevant for public exposure.

The monitoring is undertaken by diffusion tube, with the analysis undertaken by Gradko International Ltd. The method of preparation is 50% TEA in water. The Council does not operate a continuous monitoring site and therefore it has not undertaken a co-location study. The TG03 guidance however recommends use of a bias correction factor to produce data that

are comparable to reference methods wherever possible. The adjustment is made through a comparison of results from a continuous analyser relative to those from diffusion tubes over a period of a year in accordance with TG03. A default bias adjustment factor of 1.39 has been applied in this instance (as derived by Laxen et al. (IAPSC paper 2002)). This indicates that the tubes underestimate concentrations by almost 40%.

(Note – n/o indicates that the site had not started and 0.0 represents insufficient information available to determine the annual mean concentration.)

Table 5 NO_2 monitoring in Bedford B.C area (1999 – 2002) ($\mu g/m^3$)

Site Code	Class.	1999	2000	2001	2002	2005
BF08	b	22.9	30.3	22.4	25.4	n.a
BF09	b	23.9	27.2	23.6	24.1	n.a
BF13	b	27.8	0.0	closed	closed	n.a
BF29	b	n/o	n/o	32.1	32.1	n.a
BF07	i	0.0	31.7	0.0	29.1	n.a
BF12	i	37.7	37.8	0.0	34.8	n.a
BF15	i	31.6	37.1	closed	closed	n.a
BF17	i	30.7	32.7	23.1	26.0	n.a
BF18	i	40.7	35.3	0.0	34.9	n.a
BF23	i	n/o	0.0	0.0	36.0	n.a
BF24	i	n/o	40.9	0.0	34.6	n.a
BF28	i	n/o	n/o	0.0	24.6	n.a
BF06	k	42.8	0.0	0.0	45.5	44.1
BF10	k	36.0	33.5	0.0	34.4	33.4
BF11	k	0.0	0.0	0.0	36.1	35.0
BF14	k	32.4	29.9	0.0	29.4	28.5
BF16	k	39.8	47.2	37.2	49.4	47.9
BF19	k	0.0	43.0	closed	closed	n.a
BF20	k	33.9	41.1	0.0	31.9	30.9
BF21	k	n/o	41.3	0.0	39.9	38.7
BF22	k	n/o	43.5	0.0	38.1	36.9
BF25	k	n/o	53.0	0.0	47.0	45.6
BF30	k	n/o	n/o	33.8	41.2	39.9
BF31	k	n/o	n/o	n/o	41.0	39.8
BF32	k	n/o	n/o	n/o	40.7	39.4
BF33	k	n/o	n/o	n/o	32.9	31.9

The highest concentrations in 2002 include the kerbside locations at Prebend Street and the High Street in Bedford. Additional high concentrations have been observed in Great Barford and along the A1 also at kerbside locations. No background or intermediate sites have exceeded the objective.

The kerbside data have been corrected to 2005 using the TG03 correction factors and these indicate that the High Street, Prebend Street and Great Barford locations will exceed the objective.

The most recent provisional results for 2002 from the continuous sites in neighbouring authorities in the HBAPMN confirm that two of the four network roadside sites failed to meet the provisional annual mean NO_2 objective. The measurements at the other two sites were just below this level (see Table 6 below).

Table 6 NO_2 Monitoring results from HBAPMN sites (2002 provisional data) ($\mu g/m^3$)

Monitoring Site	2002	% Data capture
Broxbourne Roadside	47	100
E. Herts Roadside	36	98
Stevenage Roadside	35	86
Watford Roadside	44	94

B) Roads including narrow streets/ junctions/ busy streets/ high flows of HGVs and buses/ new roads/ roads close to the objective in first round of R & A/ roads with significantly changed flows.

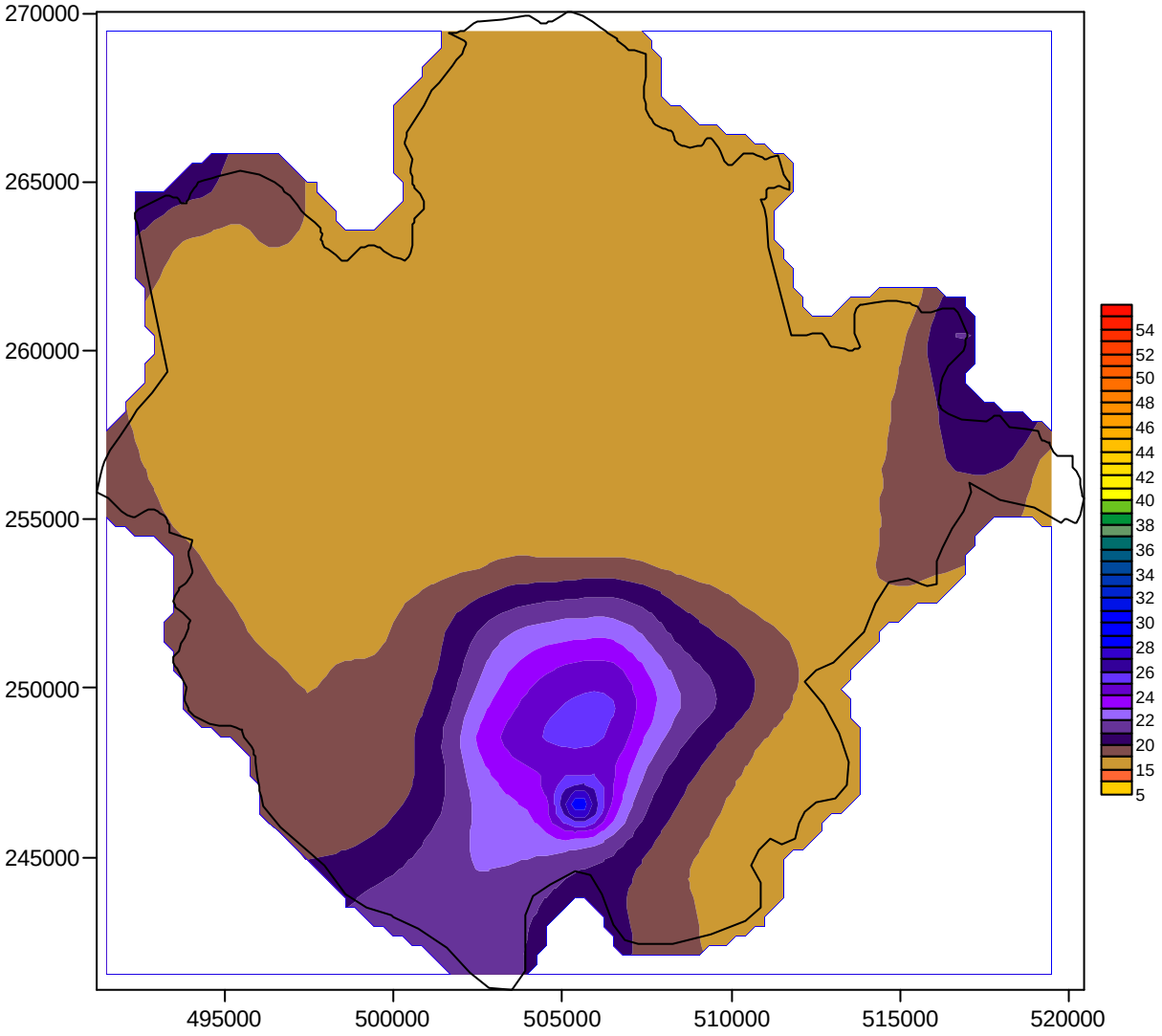
The Stage 1 and 2 reports for the previous round of R&A provided DMRB modelling of the main roads in Bedford town centre, plus the major trunks of the A1 and A421. These roads also included narrow congested streets and busy streets where members of the public may spend more than one hour. The only road, which was modelled at Stage 3, was the A1 and it was not predicted to exceed the NO_2 objectives at sites of relevant exposure.

Narrow congested streets in the Council's area include both Prebend Street and Bedford High Street. These have already been assessed above from monitoring results and therefore need not be assessed further. Both of these streets can be considered as street canyons. A street canyon is defined as being a relatively narrow street with buildings on both sides, where the height of the buildings is generally greater than the width of the road. No other additional narrow and congested streets based on TG03 guidance were identified.

Details of the traffic flows used for this updating and screening assessment are given in Appendix 2. These are based on updated traffic counts supplied by the Bedfordshire County Council and derived from the National Atmospheric Emissions Inventory (NAEI). An additional traffic growth of 1% per annum on these was also included based on discussions with the B.C.C. Traffic speeds are based those used for the previous assessment, which in the town centre were determined by specific assessment and elsewhere based on national speed limits.

To predict concentrations close to roads an understanding of the future predicted background concentrations of both NO_x and NO_2 for 2005 is required. These details have been derived from the NAEI as explained earlier. An interpolated map of these data for NO_2 is given in Figure 3 below. (It should be noted that the TG03 methodology was used to derive background concentrations close to major roads).

Figure 3 Interpolated NO_2 (annual mean concentration µg/m^3) plot for Bedford Borough (2005)



The above plot highlights as expected that the highest predicted concentrations are located close to the main urban centre of Bedford, with the maximum background concentration approaching 30 µg/m^3, which is less than the objective.

TG03 also requires an assessment of busy streets where people might spend an hour or more close to traffic and in the Council's case, this only applies Bedford High Street. This street has been assessed earlier as liable to exceed the objective and therefore it will also need to be assessed for the one hour objective.

An assessment incorporating the effects at junctions where there is exposure within 10m of the kerb has been undertaken using the revised DMRB at the busy junction at the top end of Bedford High Street and St. Peters. Following TG03 methodology junctions have been added; the road is not considered a street canyon at the junction. The results are given in the following table:

Table 7 Results of 2005 DMRB assessment of junctions for NO_2 ($\mu g/m^3$)

Road	NO_2 concentration
Bedford High St St. Peters St	38.3

The assessment for this junction indicates that the objective is not exceeded. The junction however does lie at the top of Bedford High Street and therefore it recommended that it be assessed as part of the Detailed Assessment for that road.

The only road from the previous R&A identified, as a road close to the objective during the first round R&A is the A1 near Little Barford. The previous Stage 2 assessment indicated an exceedence, whereas the Stage 3 comparison of the link with nearby links of the same road in other districts, confirmed that there was little significant risk of a breach of the objective. This road has been re-assessed in Table 8 below:

Table 8 DMRB NO_2 ($\mu g/m^3$) prediction for A1 at Little Barford for 2005

Road	NO_2 concentration
A1 Little Barford	31.1

The result of the DMRB assessment incorporating new emission factors confirms that the road is not predicted to exceed the annual mean NO_2 objective.

Discussions with the Bedfordshire C.C have confirmed that no traffic flow in the Council's area has increased by more than 25% since the previous R&A and therefore no road needs to be re-assessed on that basis.

Similarly no roads were identified from the traffic information obtained as having less than 20000vpd and a proportion of greater than 25% HGVs.

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

C) Bus stations

The main bus station serving Bedford is sited in Greyfriars, near the town centre. It is estimated from local timetables that approximately 655 buses flow through the bus station every day. TG03 advises that investigations are only carried out for bus stations with flows of more than 1000 buses per day and therefore further information for this potential source is not required.

D) Industrial sources

There are no new IPC/ Part B/ A2 processes or existing processes with substantially increased emissions of nitrogen oxides within the Council's area since the last round of review and assessment.

E) Aircraft

There is not an airport within the Council's area and therefore no assessment need be made.

Conclusion

The updating and screening assessment for nitrogen dioxide has identified a risk of the objectives being exceeded after 2005 in the Council's area, based on an assessment of the monitoring undertaken in narrow congested roads in the Bedford town centre (A6 Bedford High Street and A5141 Prebend Street) and on the A421 at Great Barford.

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Sulphur Dioxide

The current air quality objectives for sulphur dioxide are a 15 mean concentration of 266 mg/m^3 not 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 350 mg/m^3 not be exceeded more than 24 times per year and a 24 hour mean concentration of 125 mg/m^3 not 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.

Perspective

The main source of sulphur dioxide in the UK is power stations, which accounted for more than 71% of emissions in 2000. There are also significant emissions from other industrial combustion sources. Domestic sources now only account for 4% of emissions, but can be locally much more significant. Road transport currently accounts for less than 1% of emissions.

Measurements from the national monitoring network indicate that concentrations have fallen in recent years, with the objectives only being exceeded in Belfast (from TG03). This is associated with widespread domestic coal burning. The 15 minute objective is the most stringent for sulphur dioxide.

A small number of AQMAs were declared during the first round of review and assessment. These relate to a number of coal-fired boilers, domestic coal burning and shipping at a major port.

Methodology Overview

Full details of the methodology employed can be found in TG03. The following represents a summary of the methods used. To undertake this it is necessary to draw on the first stage report of the first round of review and assessment.

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) railway locomotives.

1. Monitoring data are to be considered both outside an AQMA and within an AQMA. The data will be assumed to relate to the relevant objective year and if the data indicate that the concentration exceeds the objective then the local authority 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 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 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 burn 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.

5. 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.

Updating and Screening Assessment of Sulphur Dioxide for the Bedford Borough Council

The main sources examined during the previous round of R&A were the large Part A industrial processes in the Council's area. No Part B process was identified as a significant emission source of SO_2. Details of the Part A and B processes are listed in Appendix 3. A survey of large boilers identified that no school boilers were large enough to exceed the 5MW (thermal) threshold and the only boilers that did were those at the Bedford Hospital (with an aggregated net rated thermal input of 11.79MW). Domestic solid fuel burning and other transport sources were also examined and found not to need further screening.

The sources screened at Stage 1 included Bedford Hospital and this was found not to pose a significant risk so as to lead to the SO_2 objectives being exceeded. Of the Part A sources examined the combustion unit at Ancillary Components at Wymington was considered not to pose a significant risk. The only sources examined in Stage 2 of the R&A of the previous round of R&A were the large Part A processes, specifically Hanson Brick at Stewartby and Little Barford Power Station. The latter process was not found to pose a significant risk in localities where there might be exposure. Whereas Hanson Brick, whilst although also not found to pose a significant risk was to be kept under review pending the installation of new plant at the site. The assessment of SO_2 therefore ended at the Stage 2 R&A.

A) Monitoring

The Council undertakes the continuous monitoring of SO_2 at its monitoring site as part of the HBAPMN. The Bedford Rural site was positioned to monitor the effects of a nearby industrial process at a site representive of relevant public exposure. The industrial site in Stewartby lies 0.5km to the west of the monitoring station and has a number of stacks, or chimneys, one or more of which may be in use at any one time.

An analysis of 15 minute SO_2 readings has been made in the 2001 HBAPMN annual report. The findings from this indicate a major source of SO_2 to the west of the monitoring site. Thus suggesting that the source of emissions is the nearby industrial site.

During 2001 and 2002, Bedford Rural recorded 25 and 26 instances of 15 minute mean concentrations greater than 266 ug/m^3. The objective is less than 36 exceedences in one year, to be achieved by the end of 2005. Thus for these years the objective was achieved. It

should however be noted that there are potential areas of relevant exposure closer to the source, it is therefore possible that these areas could have experienced a greater number of exceedences.

The following table presents the results for the period 2001 – 2002 at the Council's monitoring site. It confirms that the 15 minute mean is the most stringent, with more periods exceeding this standard than that of the hourly mean.

Table 9 SO_2 monitoring results for Bedford B.C rural site (2001 – 2002) ($\mu g/m^3$)

Objective	2001	2002
15min mean	25	26
Hourly mean	1	2
24hr mean	0	0

(NB 2002 results are provisional)

As part of its authorisation the operator of the brickworks also maintains a separate continuous monitoring site at Kempston Hardwick, which is approximately 1km north east of the Stewart by Brickworks. The results for this site are given below in Table 10:

Table 10 SO_2 monitoring results for Kempston Hardwick (2001 – 2002) ($\mu g/m^3$)

Objective	2000	2001	2002 *
15 min mean	64	70	153
Hourly mean	4	0	4
24 hr mean	2	1	-

(Note - * indicates for period up to 31 July 2002 only)

Details of the QA/QC and data capture for this site are not available, however the results clearly indicate exceedences of the 15 minute objective as well as periods in 2000 and 2001 when hourly and daily standards were exceeded. The latter also approached the 24 hour objective of a maximum permitted number of 3 instances in 2000. These results confirm that a Detailed Assessment is required for SO_2.

B) Industrial sources

There are no new relevant IPC/ Part B/ A2 processes within the Council's area or nearby in neighbouring authorities since the last round of review and assessment. Examination of the Environment Agency's Pollution Inventory for the Hanson Brick Part A processes at Stewartby confirms that emissions of SO_2 in 2001 were increased from the previous year by 26%, however this level was below that for 1998 for the two Part A authorised processes at Hanson Brick. The total amount emitted in 2001 for the Hanson Brick authorised process was 4688 tonnes. The increase between 2000 and 2001 is just below the 30% level given in TG03 for substantially increased emissions.

The outcome of the previous round of R&A was that this process would be kept under review pending the installation of new plant at the site. (The monitoring at the site is reported in the

above section). An assessment using TG03 has therefore been undertaken and the emission source characteristics used were from the previous Stage 2 report (see the following table):

Table 11 Hanson Bricks (from Bedford B.C Stage 2 report)

Stack modelled	Stack No 22	Stack No CK3
Height (m)	70	67.85
Inside diameter (m)	3.27	3.33
SO_2 emission rate (g/s)	62.6	63.6

For both stacks the maximum emission rate is more than 1800 tonnes per annum. This rate exceeds the emission rate for corresponding stacks in Figure 7.1 of TG03. Hence the Council will need to go to Detailed Assessment.

C) Domestic sources

A detailed assessment was carried out in the last R&A and the data obtained from this assessment were used to estimate the housing density (i.e. houses per 25ha) in those villages where there is no gas supply was determined. Examination of these data indicated that the housing density averaged less than 50 per 25ha, which is less than the threshold in TG03 to be identified. Furthermore local knowledge and professional judgement indicates that significant domestic coal burning is not undertaken across the Council's area.

D) Boilers

The Council undertook an assessment of large institutions in the previous round of R&A where there may boilers greater than 5MW(thermal) operating. No specific boilers were identified, apart from the Bedford Hospital. The boilers at Bedford Hospital however were found not to cause a significant risk of breaching the SO_2 objectives in the previous R&A. No additional boilers have been identified in the updating and screening assessment.

E) Railway locomotives

An assessment has been made of railway activity at sites where locomotives are known to operate in the Council's area. From this it has been established that there is no relevant exposure within 15m of the sites where locomotives are stationary with engines running for two periods of more than 15 minutes per day.

Conclusion

The updating and screening assessment for sulphur dioxide has identified a risk of the objectives being exceeded after 2005 in the Council's area, based on the assessment of the industrial process at the Stewartby brickworks.

Particles (PM_{10})

The current air quality objectives for PM_{10} are an annual mean concentration of 40 mg/m^3 and a 24 hour mean concentration of 50 mg/m^3 not 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 beginning of 2010. These limit values are more stringent than the existing objectives. They are an annual mean concentration of 20 mg/m^3 and a 24 hour mean concentration of 50 mg/m^3 not be exceeded more than 7 times per year. The government has adopted these as provisional objectives, although it has not brought them into regulation for the purposes of LAQM. The TG03 guidance suggests that local authorities however 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.

Perspective

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, 1999): (i) Primary particle emissions are derived directly from combustion sources, including road traffic, power generation, industrial processes etc. (ii) Secondary particles are formed by chemical reactions in the atmosphere, and comprise principally of sulphates and nitrates. (iii) Coarse particles comprise of emissions from a wide range of sources, including resuspended 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.

Measurements from the national monitoring network indicate that concentrations are generally below the current annual mean objective (TG03). The 24-hour mean objective however has been exceeded at a small number of sites, principally close to busy roads or close to industrial activities. The 2010 annual mean and 24 hour mean objectives are widely exceeded across the network.

An analysis of PM_{10} projections for the AQS indicated that exceedences of the 2004 objectives might be found in areas adjacent to busy roads, particularly in urban areas, areas with significant emissions from domestic solid fuel burning, and areas in the vicinity of industrial plant or which have significant uncontrolled or fugitive emissions.

An analysis for 2010 indicates that, dependant on meteorological conditions; exceedences of annual mean concentrations at background locations are only likely to occur in the Southeast of England. In addition exceedences of the annual mean objectives are still expected at some busy roadsides throughout the UK.

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 nitrogen dioxide and are associated with road transport sources. Other AQMAs have declared in relation to industrial activities and fugitive sources around a quarry and from port handling activities.

Methodology Overview

Full details of the methodology employed can be found in TG03. The following represents a summary of the methods used. To undertake this it is necessary to draw on the first stage report of the first round of review and assessment.

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. Monitoring data are to be considered both outside an AQMA and within an AQMA. The data will be corrected to 2004 using factors in TG03 and if the data indicate that the concentration exceeds the 24-hour objective then the local authority will be required to proceed to the Detailed Assessment stage.

2. These sections focus on specific examples that may not have been fully considered in the first round of review and assessment. This relates to 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 exceedences of 50 $\mu g/m^3$ in 2004. 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 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 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 there is the need to identify small areas (500 x 500m) where significant solid fuel burning still takes place. If the density of such premises exceeds 50 per 500 x 500m then the nomogram in TG03 is used to determine whether or not a detailed assessment is required.

5. For quarries, landfill sites and ports where dusty cargoes are handled then it is necessary to identify whether is relevant exposure near to any unpaved haul road, processing plant and materials handling facility. The proximity 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 and the equivalent passenger numbers is predicted to exceed 10 million passengers per annum.

Updating and Screening Assessment of PM_{10} for the Bedford Borough Council

The main sources examined during the previous round of R&A were road transport sources, (see Appendix 2), Part A processes and landfill sites and these are listed in (Appendix 3).

A) Monitoring

The Council does not undertake continuous monitoring in its area. The following table presents the results for the period 1999 – 2002 for representative sites in neighbouring districts in the HBAPMN. The sites use TEOM instruments for monitoring PM_{10}; the results are therefore presented as a gravimetric equivalent, i.e. TEOM times 1.3. The results confirm for that the 2004 annual mean objective is being met. It also confirms for both sites that there were days where the 24-hour mean standard is being exceeded, however the total number of days does not exceed 35 and thus the objective is not being exceeded.

Table 12 PM_{10} monitoring at East Herts and Luton sites (1999 – 2002) ($\mu g/m^3$)

Monitoring Site	Objective	1999	2000	2001	2002
East Herts background	24hr mean	0	2	2	4
	Annual Mean	21	21	20	21
Luton background	24hr mean	*N/a*	14	6	5
	Annual Mean	*33*	29	25	25

(*italics* means insufficient data capture)

An estimated concentration for the monitoring sites has been derived using TG03 methodology; the results are given in the following table.

Table 13 Estimated PM_{10} daily means greater than 50 $\mu g/m^3$ for 2004 (using TG03)

	2004 No. of days> 50ug/m3
East Herts background	2.65
Luton background	19.82

The results in Table 13 are based on a relationship for the years 1997-2001 and thus it does not represent worst-case meteorology. These estimates do not indicate an exceedence of the 2004 objective. The details of the estimated PM_{10} concentrations in 2010 are given in the following table:

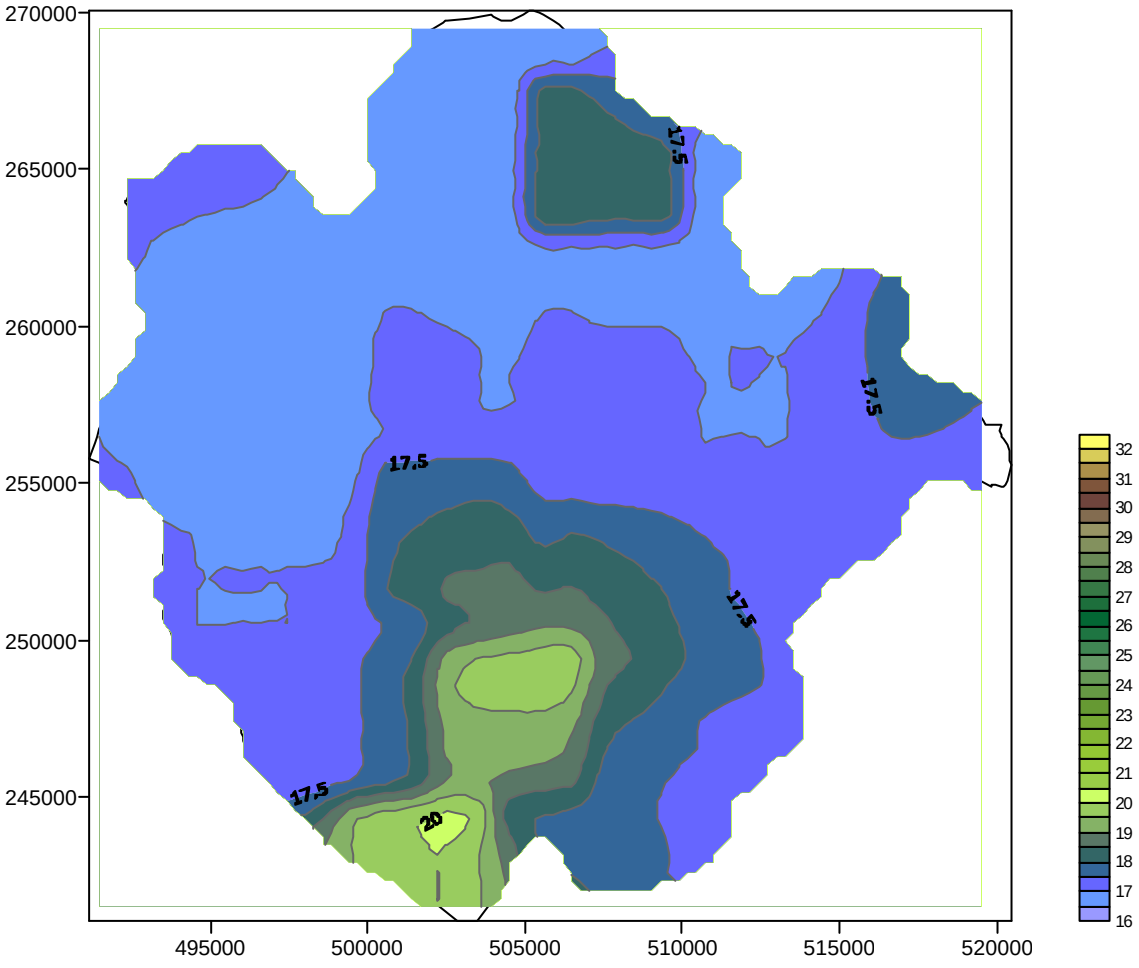
Table 14 Estimated PM_{10} concentrations in 2010 (using TG03 methodology) ($\mu g/m^3$)

	2010	Annual mean	No. of days> 50ug/m^3
East Herts background		18.07	1.46
Luton background		22.15	6.55

The estimate for the Luton site only indicates an exceedence of the 2010 objective.

Figure 4 is a plot of the Council's area, based on an interpolation of the national projections (from the ww.airquality.co.uk/archive/laqm/tools.php site) for the predicted annual mean concentrations in 2010. The estimated background predictions vary between 17 and 20 $\mu g/m^3$ across the Council's area. It indicates only a small area of exceedence in the south west of the Council's area. Care however is needed with this interpretation as the map of background concentrations has been calculated for the whole of the UK at a 1 km x 1km square resolution. It therefore does not represent locations (and emissions) other than on a general scale.

Figure 4 Interpolated PM_{10} (annual mean concentration $\mu g/m^3$) plot for Bedford Borough (2010)



B) Roads

Details of the traffic flows for all roads monitored in the Council's area are given in the tables in Appendix 2.

An assessment incorporating the effects at junctions where there is exposure within 10m of the kerb has been undertaken using DMRB for the busy road junction at the top end of Bedford High Street and St. Peters Street. Following TG03 methodology junctions have been added. The results are given in the following table:

Table 15 DMRB predictions for assessing road junctions (2004)

Road	Days > 50 µg/m^3
Bedford High St St. Peters St	31

This assessment indicates that the number of days will not exceed those of the daily mean objective.

Appendix 2 also highlights those roads where traffic flows have changed since the previous R&A. From this it can be seen that no traffic flow has increased by more than 25% and therefore no road needs to be re-assessed on that basis.

The road assessed identified as being closest to the objective during the first round R&A is the A1 near Little Barford. This road was screened out in the earlier Stage 2 assessment. It is however re-assessed here using the latest version of DMRB. The prediction from this confirms that the road is not predicted to exceed the PM_{10} objectives

Table 16 DMRB PM_{10} prediction for A1 at Little Barford for 2004

Road	Annual mean (µg/m^3)	No. of days > 50 µg/m^3
A1 Little Barford	25.1	13

No roads were identified from the traffic information obtained as having a proportion of greater than 20% HGVs.

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

C) Industrial sources

No new relevant processes have started in the Council's area since the last round of review and assessment. An examination of the Environment Agency's Pollution Inventory and the Part B processes on the Council's Public Register has identified that there are no existing processes with substantially increased emissions of PM_{10} within the Council's area since the last round of review and assessment.

D) Domestic sources

From local knowledge and professional judgement, significant domestic burning of solid fuels is not undertaken across the Council's area.

E) Quarries/ landfill sites/ handling of dusty cargoes, etc

Potential sources within the Council's area include the licensed landfill sites in the Council's area. The landfill sites are listed in Appendix 3. These areas were assessed in terms of the predicted annual mean background concentration in 2004, specifically to determine whether it was greater than or less than 26 $\mu g/m^3$. This assessment confirmed that the annual mean background concentration in 2004 in these is approximately 18-20 $\mu g/m^3$. The only area with a predicted concentration greater than 26 $\mu g/m^3$ is towards the southwest near Wotton and the boundary with Mid Beds D.C. Evidence of relevant exposure within 200m of the potential sources of emissions was then sought for the landfill sites and no relevant exposure was found at any of the sites.

F) Aircraft

As stated earlier in the section for nitrogen dioxide there is not an airport in the Council's area and no assessment is needed.

Conclusion

The updating and screening assessment for PM_{10} has not identified any additional risk of the objectives being exceeded by 2004. This assessment however has identified that there is a risk that the 2010 objectives will be exceeded across part of the Council's area.

Conclusion and Recommendations

This report follows the technical guidance (TG03) produced for the updating and screening assessment of the second round of review and assessment and it therefore fulfils this part of the continuing LAQM process.

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

The Council have identified a risk that the air quality objectives for nitrogen dioxide, sulphur dioxide and PM_{10} (for 2010 only) will be exceeded at locations with relevant public exposure. The TG03 guidance advises that a Detailed Assessment against these objectives is required to determine with reasonable certainty whether or not there is a likelihood of the objectives not being achieved

The Council is recommended to undertake the following actions, in respect of the findings relating to annual mean nitrogen dioxide and 15 minute mean sulphur dioxide:

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

2. Undertake a Detailed Assessment against the nitrogen dioxide and sulphur dioxide objectives for the identified locations to determine with reasonable certainty whether or not there is a likelihood of the objectives not being achieved.

3. The Council are not required to undertake a detailed assessment for PM_{10} at this stage. For this pollutant (and the other pollutants not requiring detailed assessments) the LAQM guidance requires the production of annual air quality progress reports by the end of April 2004 and 2005, prior to undertaking the next updating and screening assessment by the end of April 2006

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Glossary

AADT	Annual Average Daily Traffic (vehicles per day)
APEG	Airborne Particles Expert Group
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
BCC	Bedfordshire County Council
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
HGV	Heavy Goods Vehicles
LAQM	Local Air Quality Management
mg/m^3	Milligrams of the pollutant per cubic metre of air
$\mu g/m^3$	Micrograms of the pollutant per cubic metre of air
ppb	Parts per billion
ppm	Parts per million
NAEI	National Atmospheric Emissions Inventory
AQS	Air Quality Strategy
NO	Nitric oxide
NO_2	Nitrogen dioxide
PM_{10}	Particles with diameter less than 10µm
QA/QC	Quality Assurance / Quality Control
R&A	Review and Assessment
SO_2	Sulphur dioxide
TEOM	Tapered Element Oscillating Microbalance
USA	Updating and Screening Assessment

Appendix 1

Table 17 Data capture rate (%) for the SO_2 continuous monitoring site (2001-2002)

% Data capture	Analyser	2001	2002
Bedford Rural	SO_2	90	97

(N.B 2002 data are provisional)

Table 18 Data capture rates (%) for the PM_{10} continuous monitoring sites (1999-2002)

Monitoring Site	1999	2000	2001	2002
East Herts background	97	98	97	93
Luton background	65	90	94	94

(N.B 2002 data are provisional)

Table 19 Locations of diffusion tube in Bedford B.C area

Site Code	Class.	easting	northing	Address
BF06	k	505030	249870	20 High St, Bedford
BF07	i	506170	250190	135 George St, Bedford
BF08	b	506660	251660	Arrowleys, Bedford
BF09	b	503530	247380	61 The Links, Kempston
BF10	k	503830	250070	Bromham Road, Bedford
BF11	k	506720	250260	Goldington Road, Bedford
BF12	i	503160	247690	Bunyan Road, Kempston
BF13	b	506420	251230	Cambrian Way, Bedford
BF14	k	507530	249740	Riverfield Drive, Bedford
BF15	i	508290	251430	Hudson Road, Bedford
BF16	k	512770	252410	Great Barford
BF17	i	516320	256640	The Lane, Wyboston
BF18	i	516450	256630	Gt Nth Road, Wyboston (A1)
BF19	k	504870	249660	Horne Lane, Bedford
BF20	k	503020	247150	Woburn Road, Kempston
BF21	k	504590	248980	Kempston Road, Bedford
BF22	k	504790	248790	Ampthill Road, Bedford
BF23	i	505840	249870	Castle Road, Bedford
BF24	i	505590	250620	Kimbolton Road, Bedford
BF25	k	504570	249510	Prebend Street, Bedford
BF28	i	504500	248400	Churchville Road, Bedford
BF29	b	504600	246800	Kirkstall Close, Bedford
BF30	k	504800	249600	River Street, Bedford
BF31	k	503020	247150	Gt Nth Road, Wyboston (A1) North
BF32	k	504590	248980	Gt Nth Road, Wyboston (A1) North
BF33	k	504790	248790	Gt Nth Road, Wyboston (A1) South

Appendix 2

Table 20 Estimated 2004/5 traffic count data for Bedford Borough Council's roads

Road name	Distance from receptor to road centre (m)	Width of road (m)	AADT	%HGV	Average Speed (kph)
A1 Little Barford	15	20.9	44255	11	100
A6 Bedford High St	6	8	19761[2]	2.44	31
A428 St. Peters Street	4.7	8	21899[1]	4.51	31

(Supplied by the Bedfordshire County Council and NAEI)

Notes 1. Based on 2000 traffic counts with 1% growth to 2005
2. Based on traffic count information from previous R&A

Appendix 3

Table 21 Part A processes in the Bedford B.C area (from Environment Agency)

Authorisation ID	Operator name	Process name	Site address
AB1436	BEDFORD HOSPITAL NHS TRUST	NOT APPLICABLE	SOUTH WING, KEMPSTON ROAD, BEDFORD
AH9464	HANSON BRICK LTD	CERAMIC PRODUCTION	STEWARTBY WORKS, STEWARTBY, BEDFORD
AI0012	HANSON BRICK LTD	CERAMIC PRODUCTION	MANOR ROAD, KEMPSTON HARDWICK, BEDFORD, BEDFORDSHIRE
AJ2747	INNOGY PLC	COMBUSTION PROCESSES	LITTLE BARFORD, ST. NEOTS, HUNTINGDON, CAMBRIDGESHIRE
AL1008	POWER INNOVATIONS LTD	PROCESSES INVOLVING HALOGENS	MANTON LANE, BEDFORD, BEDFORDSHIRE
AT8894	WOODBRIDGE FOAM (UK) LTD	DI-ISOCYANATE PROCESSES	CAXTON ROAD, ELMS INDUSTRIAL ESTATE, BEDFORD
AY2214	ANCILLARY COMPONENTS LTD	INCINERATION	GOOSEY LODGE INDUSTRIAL ESTATE, WYMINGTON, RUSHDEN, NORTHAMPTONSHIRE

Table 22 Part B/ A2 processes in the Bedford Borough Council area

EPA REF. No	TRADING NAME	ADDRESS	TYPE OF PROCESS	PG NOTE
37	Interfoam Ltd	15/16 Ronald Close, Woburn Industrial Estate, Kempston	6.2	PG6/29(97)
20	Select Plant Hire Company Ltd	Barford Road, St Neots	6.5	PG6/34(97)
21	Riverside Vauxhall	Barkers Lane, Bedford	6.5	PG6/34(97)
22	Arlington of Bedford	Ampthill Road, Bedford	6.5	PG6/34(97)
25	Auto Crash Repairs	Brunel Road, Barkers Lane, Bedford	6.5	PG6/34(97)
27	Polar Ford	Hudson Road, Bedford	6.5	PG6/34(97)
32	VW Panels	302 Ampthill Road, Bedford	6.5	PG6/34(97)
38	Herbert Robinson Ltd	Pioneer Park, 200 Ampthill Road, Bedford	6.5	PG6/34(97)
44	Brycol	3 Wilstead Industrial Estate, Wilstead	6.5	PG6/34(97)
47	AQ Accident Repair Centre	1 Lyon Close, Woburn Industrial Estate, Kempston	6.5	PG6/34(97)
50	Pantech Vehicle Services	Thurleigh Airfield Business Park, Thurleigh	6.5	PG6/34(97)
59	Richard Lawson Auto Logistics	Thurleigh Airfield Business Park, Thurleigh	6.5	PG6/34(97)
74	Hudson Kapel Ltd	Building 140, Thurleigh Airfield Business Park, Thurleigh	6.5	PG6/34(97)
19	Norse Precision Castings Ltd	276/280 Ampthill Road, Bedford	2.2	PG2/4/(91)
31	Caress Precision Products Ltd	Allington Road, Eynesbury, Little Barford, St Neots	2.2	PG2/6(96)
36	Tri D Motor Engineers	Bury Walk, Goldington	1.3	PG1/1(95)
6	Hanson Aggregates	Bedford Plant, Cople Turn, Sandy Road, Cople, Bedford	3.1	PG3/1(95)
8	La Farge Aggregates Ltd	Bedford Road, Cople, Beds	3.1	PG3/1(95)
13	RMC Readymix Home Counties	Great North Road, Wyboston, Beds	3.1	PG3/1(95)
15	RMC Home Counties Ltd	Manor Road, Kempston Hardwick	3.1	PG3/1(95)
17	Acorn Concrete	Ducks Cross, Wilden, Bedford	3.1	PG3/1(95)
28	Supreme Concrete Ltd	Hardwick Hill Works, Ampthill Road, Kemspton Hardwick	3.1	PG3/1(95)

5	Elstow Roofing Products Ltd	Old Brickworks, Wilstead Road, Elstow	3.4	PG6/42(94)
16	Redland Aggregates	Elstow Depot, The Old Brickworks, Wilstead Road, Bedford	3.4	PG3/15(96)
18	C Jackson & Son	Redbrick Cottages, Keysoe Road, Thurleigh, Bedford	3.4	PG3/16(96)
30	Hanson Brick	Hanson Brick, Stewartby Works, Stewartby, Beds.	3.4	PG3/15(96)
43	Ibbitt & Mourbey Demolition	Church Walk Wilden, Beds	3.4	PG3/16(96)
45	G Moore Haulage	Major Road, Kempston Hardwick, Beds	3.4	PG3/16(96)
73	Paving Direct	Unit 1, Airfield Road, Podington, Northants	3.1	PG3/1(95)
57	Transco	Little Barford Power Station, Little Barford, Beds.	1.1	PG1/15(97)
39	Bedford Crematorium	Cemetery Complex, 104 Norse Road, Bedford	5.1	PG5/2(95)

Table 23 List of authorised petrol stations in the Bedford B.C area

EPA REF. No	TRADING NAME	ADDRESS	TYPE OF PROCESS
46	BP Bedford Bypass	A421/A6 Junction, Bedford Bypass	1.4
48	Richard Tebbutt Ltd	52-56 Stagsden Road, Bromham, Bedford	1.4
49	Sainsburys Limited	252/274 Bedford Road, Kempston, Bedfordshire	1.4
51	Sainsburys Limited	90 Clapham Road, Bedford	1.4
52	BP Safeway	Newham Avenue, Bedford	1.4
54	Tesco Stores Ltd	Riverfield Drive, Bedford	1.4
55	Tesco Stores Ltd	Cardington Road, Bedford	1.4
62	Murco Service Station	Allhallows Car Park, Hassett Street, Bedford	1.4
63	Esso Southgate	59 London Road, Bedford	1.4
64	Total Service Station	3 Elstow Road, Bedford	1.4
65	BP Service Station	A1 Southbound, Wyboston, Bedfordshire	1.4
66	Putnoe Service Station	122 Queens Drive, Putnoe, Bedford	1.4
67	Brickhill Drive Service Station	89 Brickhill Drive, Bedford	1.4
69	Total Fina Black Cat Service Station	Great North Road, Chawston	1.4
70	Total Fina Kempston	Woburn Road, Kempston	1.4

Table 24 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
Shanks Waste Services Ltd	L Field, Green Lane	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