Air Quality Updating and Screening Assessment

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In January 2001 NWLDC completed its first stage review and assessment of air quality for the district. The purpose of the assessment was to determine whether the objectives set by the government for the seven pollutants, considered as being of most concern to public health and as detailed in the National Air Quality Strategy would be achieved. The seven pollutants are Benzene, 1,3-butadiene, Lead, Carbon Monoxide, Nitrogen Dioxide, fine particles (PM10) and Sulphur Dioxide.

As a result 6 Air Quality Management Areas were declared in NWLDC, because the review and assessment predicted that levels of nitrogen dioxide were likely to exceed the set objective. A further detailed assessment (stage 4) is currently proceeding within the AQMAs to clarify the initial predictions.

This report is NWLDC Updating and Screening Assessment (USA), which is the start of the second round review and assessment of air quality in the district, in accordance with the requirements of the Technical Guidance TG (03) issued by DEFRA.

The USA builds upon the phased approach of the last round of review and assessment and identifies areas where the objectives will not be met. It takes into account changes that have occurred outside AQMAs, and any improvements that have been made in the methods of predicting air quality. If areas are identified as not meeting the objectives and there is relevant exposure, then it is necessary to proceed to a more detailed assessment for that particular pollutant in the area identified.

The USA indicates that the objective will not be met for nitrogen dioxide within two of the AQMAs but will be achieved in the other 4 AQMAs and else where throughout the district. The more detailed assessment (and the stage 4 assessment) will confirm this and conclude if these AQMAs should be undeclared, as well as provide information to develop action plans to improve air quality.

The USA also indicates that the objective for PM_{10} may not be met at one location within the district because of a mineral process. It will be necessary to proceed to a detailed review and assessment for this location, to confirm these predictions.

The scheduled date for completion of the Detailed Report is the end of April 2004.

1.0 Introduction

1.1 Background to Local Air Quality Management

Good air quality is essential for our health, quality of life and the environment. Over the years the Government have introduced controls through legislation to improve air quality. However, the previous simple solutions applied to preventing the heavy smog type image prevalent in urban areas in the 50's are no longer applicable and any solution to current air quality problems requires a coherent national strategy applied flexibly at a local level.

Government experts have estimated that up to 24,000 people die prematurely each year in the United Kingdom as a result of poor air quality (1). We therefore, are all stakeholders in our air quality and improvements will require the participation of all members of the community as well as the specialist input from scientific and professional groups and the support of government locally, nationally and internationally.

In the early 90's the Expert Panel on Air Quality Standards (EPAQS) was set up by the Secretary of State for the Environment following the publication of the white paper 'Our Common Inheritance'. The remit of the panel was to advise on the establishment and application of Air Quality Standards based on the effects of pollutants on human health and the wider environment.

In 1995 the Environment Act introduced initiatives for the protection of air quality in the UK. Section 80 of this Act required the Secretary of State for the Environment to publish a National Air Quality Strategy. Following consultation the National Air Quality Strategy (NAQS) was published in 1997 then revised and re-issued in early 2000. This strategy bought about a change in the way local air quality is managed. All local councils are required to review and assess air quality in their areas through a process known as Local Air Quality Management (LAQM).

The Air Quality Regulations 2000 and the Air Quality (England) (Amendment) Regulations 2002 prescribe pollutant specific air quality objectives to be achieved by certain dates specific to each pollutant, ranging from 2003 to 2010. Local authorities have to consider the present and likely future quality of the air up to these dates, and to assess whether these objectives will be met.

If as the result of the review process, it appears that the air quality objectives are not, or are unlikely to be achieved in any area within the boundary of the local authority – then the local authority shall by order designate it as an 'Air Quality Management Area' (AQMA). Once such an area has been designated a more detailed assessment of the air quality in each of these areas (a stage 4 review and assessment) shall be conducted within 12 months of declaration of the AQMA. Based on the findings of the Stage 4 assessment air quality action plans to reduce air quality pollution to acceptable levels should then be developed.

1.2 Updating screening and Assessment

The purpose of this report is to undertake an up dating screening and assessment of the whole district. With a view to establish if there are any matters that have changed significantly since

the first round of review and assessment – that may have either a negative or positive impact on the districts air quality.

In the context of this report 'review' of air quality means a consideration of the levels of pollutants in the air for certain pollutants and the estimation of future levels. An 'assessment' of air quality is the consideration of whether these estimated levels for the relevant future period are likely to exceed the levels set in the objectives, as set out in Table 1.1.

The review and assessment process will involve two steps for each pollutant. The first step, which is this report, will involve an updating and screening assessment. This will identify those matters that have changed since the last review and assessment. Where it seems likely from the updating and screening process that a pollutant is now likely to exceed its objective at certain locations with relevant exposure, a detailed assessment will be required for that pollutant. This second step will be sufficiently detailed to allow the authority to determine whether it is necessary to designate an AQMA.

Part IV of the Environment Act 1995, Local Air Quality Management, Technical Guidance LAQM. TG(03), DEFRA 2003, is designed to guide local authorities through the review and assessment process. Any reference to the Technical Guidance within this report relates to this document.

Estimated background air pollution data for 2001 and projections for other years have been empirically derived for the UK for each 1 x1km grid square, these maps can be accessed at www.airquality.co.uk . The site is prepared by NETCEN, part of AEA Technology Environment, on behalf of the Department for the Environment. These maps have been used in this report to estimate background levels for the pollutants for 2001 and projections of pollutants for other relevant years.

1.3 *The current situation in North West Leicestershire District Council*

North West Leicestershire District Council (NWLDC) completed its stage 3 Air Quality Review and Assessment in January 2001. The results indicated that exceedences of the annual objective for nitrogen dioxide are likely at various locations throughout the district by the relevant dates. As a result, six Air Quality Management Areas (AQMA) were declared in April 2001 and detailed in appendix 1.

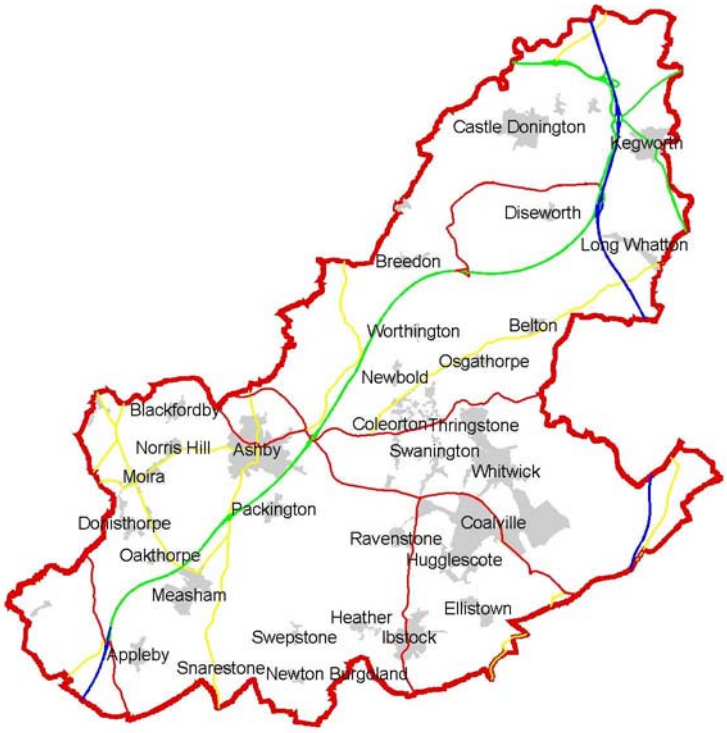
A stage 4, more detailed assessment of air quality in each of these areas is still being undertaken – from which results will be included as an addendum to this report. Air quality action plans will then be developed to work towards improving air quality within these areas.

1.4 National Air Quality Objectives

Table 1.1 below details a summary of the air quality objectives included in the Air Quality Regulations and (Amendment) Regulations 2002 for the purpose of Local Air Quality Management.

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25μg/m^3	Running annual mean	31 December 2003
	5μg/μg/m^3	Annual mean	31 December 2010
1,3-Butadiene	2.25μg/m^3	Running annual mean	31 December 2003
Carbon Monoxide	10mg/m^3	Maximum daily running 8 hour mean	31 December 2003
Lead	0.5μg/m^3	Annual mean	31 December 2004
	0.25μg/m^3	Annual mean	31 December 2008
Nitrogen dioxide	200μg/m^3 not to be exceeded more then 18 times a year	1 hour mean	31 December 2005
	40μg/m^3	Annual mean	31 December 2005
Particle (PM10)	50μg/m^3 not to be exceeded more than 35 times a year	24-hour mean	31 December 2004
	40μg/m^3	Annual mean	31 December 2004
Sulphur Dioxide	350μg/m^3 not to be exceeded more than 24 times a year	1-hour mean	31 December 2004
	125μg/m^3 not to be exceeded more than 3 time a year	24-hour mean	31 December 2004
	266μg/m^3 not to be exceeded more than 35 times a year	15-minute mean	31 December 2005

2.0 Description of the District



North West Leicestershire lies in the East Midlands Region and is both the name and geographical location. The District is situated in the heart of the National Forest and lies between Leicester, Burton –on- Trent, Derby and Nottingham, and covers 105 square miles. The district is mostly rural with a large extent of industry both historically from coal mining, and more recently with East Midlands Airport and large opencast mines and quarries. The population of 88,800, mainly live in the principle towns of Coalville and Ashby-de-la Zouch, and within the large villages of Castle Donington, Kegworth and Ibstock. Three established main roads run through the District the M42/A42 between Birmingham and Nottingham, the M1 and the A50/A511 from Leicester to Burton-on-Trent. As does the recently completed Stoke/Derby by-pass.

3. Review and Assessment of Carbon Monoxide

3.1 Introduction

Carbon Monoxide (CO) is a colourless and odourless gas consisting of one carbon atom and one oxygen atom.

Carbon Monoxide is largely produced due to the incomplete combustion of fuels containing carbon. The main source of emissions in the UK is road transport, which accounted for 67% of the total releases in 2000. Current projections indicate that road transport emissions will decline by a further 42% between 2000 and 2005.

CO is best known as a pollutant in restricted areas with poor ventilation – in particular domestic houses with badly maintained gas fired appliances where it can reach dangerously high concentrations. These sources only contribute 6% of the total CO generated in the UK. Similarly CO is only a significant pollutant in the wider environment near to heavily trafficked or congested roads. Concentrations fall away rapidly with distance from roads and CO is only therefore a pollutant of concern in the immediate vicinity of its production.

At high levels of CO, prolonged exposure can lead to death as it inhibits the distribution of oxygen around the body by blocking the carrier molecule in red blood cells. At lower levels the effect, whilst not fatal, can lead to impaired mental performance and coronary stress. Short term exposure causes reversible effects whilst long term exposure may lead to chronic health effects.

3.2 Objective for Carbon Monoxide

The Government and the Devolved Administrators have adopted a tighter objective for Carbon Monoxide which is now in line with the second Air Quality Daughter Directive limit value, and detailed in table 3.1

Pollutant	**Objective**		**Date to be achieved by**
	Concentration	**Measured as**	
Carbon Monoxide	$10mg/m^3$	Maximum daily 8 hour running mean	End of 2003

Table 3.1 Objective for Carbon Monoxide

3.3 Background Concentrations

Estimated annual mean background concentrations for 2001 have been mapped for the UK, and have been downloaded from the following web site – www.airquality.co.uk. The 2001 concentrations have been adjusted using the correction factors outlined in the Technical Guidance and detailed below.

Background
2001 to 2003 => concentration for 2001 x 0.826

The adjusted background concentrations for 2003 within the boundaries of the District indicate that the predicted levels will not exceed 0.3mg/m^3.

3.4 Summary of the Updating and Screening checklist approach for Carbon Monoxide

Carbon Monoxide		
Ref No.	**Source, location, or data that need to be assessed**	**Status**
A	Monitoring data	No exceedances
B	Very busy roads	No exceedances

3.5 Conclusions of the previous Review and Assessment

The stage 2 Review and Assessment concluded that:

Road traffic emissions are not likely to cause exceedance of the objective by 2005 in areas where people may be exposed for the periods of 8 hours. Emissions from individual industrial sources are also unlikely to cause exceedance of the objective and do not significantly overlap with major roads and residential areas. Further assessment to stage 2 will not be necessary.

This review and assessment continues to build on the original report.

3.6 Carbon Monoxide within NWLDC

A. Monitoring data

The Technical Guidance states that the Authority's focus for review and assessment should be on all locations where members of the public might be regularly exposed, such as building facades of residential properties, schools, and hospitals as well gardens of residential properties where public exposure is likely.

North West Leicestershire District Council does not monitor for Carbon Monoxide. The nearest automatic monitoring station (AUN) is operated by Leicester City Council at an urban centre location. The maximum daily running annual means are detailed below in table 3.2

Site	**Site classification**	**Maximum daily running 8-hour mean concentration**		
		1999	**2000**	**2001**
Leicester Centre	Urban Centre	2.8	4.5	3.1

Table 3.2: Monitoring data from Leicester City Council

The maximum daily running 8-hour mean concentrations measured at the Leicester site are well below the objective of 10mg/m^3. This is an urban site and is not representative of NWLDC, which is predominantly rural; consequently lower concentrations would be expected.

The background concentrations for CO taken from the NETCEN web-site have estimated that the maximum mean annual concentration for NWLDC was 0.4mg/m^3 for 2001. If the correction factor of 0.826, as detailed above for 2003 is applied to the 2001 background data, the estimated annual mean background concentration will not exceed 0.3mg/m^3, which is well below the objective level.

B. Very busy roads or junctions in built-up areas

The updating and screening checklist for carbon monoxide, Box 2.2 in Technical Guidance states that a Local Authority should:

'Identify 'very busy' roads and junctions in areas where the 2003 background is expected to be above 1 mg/m^3.'

As indicated above the predicted background level for carbon monoxide is not expected to be above 0.3mg/m^3 in 2003. Hence, there are no areas where the expected background concentration will be above 1mg/m^3, and therefore it is not necessary to proceed any further with the assessment for road traffic.

In addition to the above the guidance states that the 'a very busy road' is defined as having an annual average daily traffic flow (AADT) that exceeds 80,000 vehicles a day on single carriage way roads 120,000 on dual carriageway roads and 140,000 vehicles per day on motorways. There should also be a relevant receptor within 10m of the kerb. No roads within the district fulfil these criteria.

3.8 Conclusion for Carbon Monoxide

It can be concluded that the objective of 10mg/m^3 as a maximum daily running 8-hour mean will be achieved by 2003 and it will not be necessary to proceed to a Detailed Assessment for Carbon Monoxide.

4.0 Review and Assessment of Benzene

4.1 Introduction

Benzene (C_6H_6) is a volatile aromatic hydrocarbon composed of a ring of carbon atoms with single hydrogen atoms attached to each.

In the UK the main source of benzene is the combustion and distribution of petrol of which it is a constituent. Petrol vehicles are the main source (67% of the total emissions) where benzene is released either as an un-burnt constituent of the fuel or as the product of the combustion of other hydrocarbons. Other significant sources include other motor vehicles (8%), stationary combustion sources (7%), some industrial activities (7%) and evaporation due to spillage or other loss (5%). Due to the nature of its source and its propensity to rapidly disperse in air, benzene is seen only of concern to human health in the immediate vicinity of its production.

Benzene is a carcinogen that can cause leukaemia over long term exposure. There is therefore no level of exposure at which there is zero risk.

A number of national policy measures are in place or planned for future years, which will continue to reduce emissions of benzene. Since January 2000, the maximum benzene content of petrol has been reduced from 5% to 1%. Except for a small number of sites close to the busiest roads, none of which exist in NWLDC, it is expected that the benzene objective for 2003 and 2010 will be met nationally.

4.2 Objective

The Government and the Devolved Administrators have adopted a running annual mean concentration as detailed in Table 4.1. In the light of the health advice from EPAQS and the Department of Health's Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment (COC) to reduce concentrations of benzene in air to as low a level as possible, additional tighter objectives have also been set to be achieved by the end of 2010, as detailed in table 4.1.

Pollutant	**Objective**		**Date to be achieved by**
	Concentration	**Measured as**	
Benzene	16.25μg/m^3	Running annual mean	2003
Benzene	5μg/m^3	Annual mean	2010

Table 4.1: Objectives for Benzene

4.3 Conclusions of the previous Review and Assessment

The stage 1 Review and Assessment concluded that:

The concentrations fall well below the objective for the nearest residential locations. It will not be necessary to continue the review and assessment to stage 2.

This review and assessment continues to build on this original report.

4.4 Summary of the Updating and Screening checklist approach for benzene

Benzene		
Ref No.	**Source, location, or data that need to be assessed**	**Status**
A	Monitoring data	No exceedances
B	Very busy roads or junctions in built up areas	No exceedances
C	Industrial sources	No exceedances
D	Petrol stations	No exceedances
E	Major fuel storage depots (petrol only)	No exceedances

4.5 Benzene within NWLDC

A) Monitoring Data

NWLDC does not monitor for benzene. The nearest monitoring station is an urban centre site located in Leicester City, which was commissioned on 22nd January 2002. This is not representative of NWLDC, which is predominately rural but levels will be obtained from this site once they are available.

B) Very busy roads or junctions in built-up areas

The updating and screening checklist for benzene, Box 3.2 in Technical Guidance states that Local Authorities should:

'Identify 'very busy' roads and junctions in areas where the 2010 background is expected to be above 2 μg/m^3.'

There are no instances throughout the district where the predicted background level for benzene in 2010 is expected to be above 0.503μg/m^3, evidently there are no areas where the expected background concentration will be above 2μg/m^3.

C) Industrial Sources

Using the checklist in Annex 2 of the Technical Guidance it has been concluded that there are no processes within the boundaries of the District, which are likely to release significant quantities of benzene.

D) Petrol Stations

There is a potential for benzene to be emitted from petrol stations during loading and distribution of petrol.

The Technical Guidance states that studies have concluded that the presence of a petrol station is unlikely to have a significant influence on the concentrations of benzene close to residential properties where:

- The throughput of petrol is less than 2million litres/annum,
- The distribution pumps are more than 10m from residential properties.

There are 13 petrol stations in the district with a throughput of petrol greater than 2million litres/annum. These petrol stations utilise vapour recovery systems, which recover vapours that are displaced when filling underground tanks, known as stage 1 emissions. All of these petrol stations have distribution pumps more than 10 m from residential properties.

E) Major fuel storage depots (petrol only)

There are no major fuel storage depots handling petrol within the boundaries of the district. The nearest major petrol storage and distribution facility is located at Kingsbury in the North Warwickshire District Council, which is some 8 miles from NWLDC.

4.6 Conclusion for Benzene

NWLDC is unlikely to exceed the benzene objectives set for 2003 and 2010. It can therefore be concluded that it will not be necessary to proceed to a detailed assessment for benzene.

5.0 Review and Assessment of 1,3-butadiene

5.1 Introduction

1,3 Butadiene is a volatile hydrocarbon composed of four carbon and six hydrogen atoms.

In the UK the main source is from road vehicles with petrol engines emitting 67% of the total annual mass and diesel a further 11%. The compound is not present itself in fuel, but is formed as a product of the combustion of the olefines in the fuel. Approximately 17% of 1,3 butadiene is derived from a few industrial sources primarily specialising in the production of synthetic rubber for tyres. Similar to benzene, 1,3 butadiene disperses fairly rapidly in air and is only of concern in the immediate vicinity of its source.

1,3 butadiene is a carcinogen, which can cause cancers of the bone marrow, lymphomas and leukaemia. There is therefore no level of exposure at which there is zero risk. EPAQS set a level of 2.25μg/m^3 as a running annual mean as representing a exceedingly small risk to heath.

5.2 Objective

The Government and the Devolved Administrators have adopted a maximum running annual mean concentration as the air quality standard for 1,3-butadiene, as detailed in Table 5.1.

Pollutant	**Objective**		**Date to be achieved by**
	Concentration	**Measured as**	
1,3-butadiene	2.25μg/m^3	Maximum running annual mean	End of 2003

Table 5.1:Air Quality objectives for 1,3-butadiene

5.3 Summary of the Updating and Screening checklist approach for 1,3 butadiene

1,3 butadiene		
Ref No.	**Source, location, or data that need to be assessed**	**Status**
A	Monitoring data	No exceedances
B	New industrial sources	No exceedances
C	Existing industrial sources with significantly increased emissions	No exceedances

5.4 Conclusions of the previous Review and Assessment

The stage 1 Review and Assessment concluded that:

Emissions from the nearest sources are unlikely to affect this district therefore further assessment to stage 2 will not be necessary.

This review and assessment continues to build on the original report.

5.5 1,3 – Butadiene within NWLDC

A) Monitoring data

North West Leicestershire District Council does not monitor for 1,3-butadiene. The nearest monitoring station is an urban background site located in East Birmingham. The maximum running annual mean concentrations for this site in 1999 and 2000, were 0.39μg/m^3 and 0.34μg/m^3 respectively. However, this is not representative of NWLDC, which is predominately rural.

Background concentrations taken from the NETCEN web-site have estimated mean annual concentrations of no more than 0.253μg/m^3 for 2003 which are evidently well below the current objective.

B) New Industrial Sources

Using the checklist in Annex 2 of the Technical Guidance it can be concluded that there are no new industrial sources within the boundaries of the District, which are likely to release significant quantities of 1,3-butadiene.

C) Existing industrial sources with significantly increased emissions

There are no authorised processes within the district that emit 1,3 – butadiene within NWLDC or from neighbouring authorities.

5.6 Conclusion for 1,3 – butadiene

NWLDC is unlikely to exceed the 1,3 – butadiene objective set for 2003. It can therefore be concluded that it will not be necessary to proceed to a detailed assessment for 1,3 – butadiene

6.0 Review and Assessment of Lead

6.1 Introduction

Lead is an elemental metal. Most lead in the atmosphere is in the form of very fine particles of less than 1 micron (one thousandth of a millimetre) although some sources of lead generate larger particles which tend to fall relatively quickly out of the atmosphere. The lead in particulates may be in its elemental form or as an alloy or compound.

The majority of emissions of lead in the UK come from petrol driven vehicles (72%) where the lead is emitted as fine particulates in the exhaust fumes. However, leaded fuel has been banned from sale in the UK since 1 January 2000 and so emissions of lead are now restricted to a variety of industrial activities such as battery manufacture, pigments in paints and glazes, alloys, radiation shielding, tank lining and piping. Human exposure to lead is primarily through ingested food. However, whilst the percentage absorption of lead in the gastrointestinal tract is only 10% in adults, the level of absorption of lead through the respiratory tract may be as high as 60%.

Lead is bio-accumulative, namely it concentrates within the body tissue once absorbed, primarily in the bones, teeth, skin and muscle. It exhibits toxic effects by interfering with haemoglobin synthesis, causing neurological damage and affecting the kidneys, gastrointestinal tract, joints and reproductive system.

6.2 Objective

The Government and the Devolved Administrators have adopted two annual mean concentrations as the air quality standards for Lead as detailed in Table 6.1.

Pollutant	**Objective**		**Date to be achieved by**
	Concentration	**Measured as**	
Lead	0.5μg/m^3	Annual mean	End of 2004
Lead	0.25μg/m^3	Annual mean	End of 2008

Table 6.1: Air Quality objectives for Lead

6.3 Conclusions of the Previous Review and Assessment

The stage 1 Review and assessment concluded that;

'..it is unlikely that the air quality objective would be exceeded and that it was not necessary to continue the review and assessment to stage 2.'

6.4 Summary of the Updating and Screening checklist approach for Lead

Lead		
Ref No.	**Source, location, or data that need to be assessed**	**Status**
A	Monitoring data outside AQMA	No exceedances
B	New industrial sources and sources with substantially increased emissions.	No exceedances

6.5 Lead within NWLDC

A) Monitoring Data outside an AQMA

NWLDC does not monitor for Lead and there are no national network sites located in close vicinity of the district.

B) New Industrial Sources and sources with substantially increased emissions.

The first round of review and assessment concluded that there were no industrial processes within the boundaries of the district or within neighbouring authorities, which were likely to emit concentrations of lead that would breach the objective, within NWLDC.

There have been no new industrial processes within this district or neighbouring authorities, or existing sources with substantially increased emissions.

6.4 Conclusion for Lead

NWLDC is unlikely to exceed the lead objectives set for 2004 and 2008. It can therefore be concluded that it will not be necessary to proceed to a detailed assessment for lead.

7.0 Review and Assessment for nitrogen dioxide

7.1 Introduction

Nitrogen dioxide is a gas formed from one nitrogen molecule and two oxygen molecules.

Nitrogen dioxide is formed to a small extent directly in combustion processes. However, most nitrogen based combustion products are emitted as nitric oxide (NO). Nitric oxide is relatively unstable and is relatively rapidly oxidised to nitrogen dioxide in air. Nitrogen dioxide and nitric oxide are collectively referred to as nitrogen oxides (NOx). All combustion processes produce NOx emissions, largely in the form of nitric oxide, which is 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 is road transport, which accounted for about 49% of total UK emissions in 2000. The contribution of road transport to nitrogen oxides emissions has declined significantly in recent years as a result of various national policy measures and further reductions are expected up until 2010 and beyond. Other significant sources of nitrogen oxides emissions include the electricity supply industry and other industrial and commercial sectors, which accounted for about 24% and 23% respectively in 1999.

The principal health effects of nitrogen dioxide relate to impaired lung performance from changes in structure and function and suspected hyper reactivity to allergens (causes of allergic responses). Effects are reversible; however, ongoing exposure may lead to poorer lung function later in life. Exposure to high concentrations for short periods is considered more toxic than low concentration exposure for long periods.

7.2 Objective

The Government and the Devolved Administrators have adopted two Air Quality Objectives for nitrogen dioxide (NO_2) as detailed in Table 7.1.

Pollutant	**Objective**		**Date to be achieved by**
	Concentration	**Measured as**	
NO_2	**40μg/m^3**	Annual mean	2005
NO_2	**200μg/m^3** *Not to be exceeded more than 18 days*	1-hour mean	2005

Table 7.1: Air Quality objectives for nitrogen dioxide

7.3 Conclusions of the previous Review and Assessment

The stage 3 Review and Assessment concluded that:

The air quality objective for hourly NO_2 is likely to be achieved, however it was predicted that the objective for the annual mean was likely to be exceeded at several locations throughout the district. As a result 6 AQMAs were declared as detailed in Appendix 1

This review and assessment continues to build on this original report.

7.4 Summary of the Updating and Screening checklist approach for Nitrogen dioxide

NO_2		
Ref No.	**Source, location, or data that need to be assessed**	**Status**
A	Monitoring data outside an AQMA	No exceedances
B	Monitoring data within an AQMA	Exceedances
C	Narrow congested streets with residential properties close to the kerb	No exceedances
D	Junctions	No exceedances
E	Busy streets where people may spend 1-hour or more close to traffic	No exceedances
F	Roads with high flow of buses or HGVs	No exceedances
G	New roads constructed or proposed since first round of review and assessment	No exceedances
H	Roads close to the objective during the first round of review and assessment.	No exceedances
I	Roads with significantly changed traffic flows	No exceedances
J	Bus Stations	None on district
K	New industrial sources	No exceedances
L	Industrial sources with substantially increased emissions	No exceedances
M	Aircraft	Exceedances

7.6 Nitrogen Dioxide within NWLDC

A. Monitoring data

Nitrogen dioxide is monitored at 24 sites by diffusion tubes located at various sites throughout the district, a summary of the results is presented in Table 7.2 below, the data highlighted in yellow are tubes which are located in AQMAs. In addition to the diffusion tube network a chemiluminescent continuos monitor has been commissioned within the boundaries of the AQMA at Kegworth.

The diffusion tubes are sent to Casella Stanger and analysis is conducted by Gradko International Analytical Laboratories. Gradko International is a UKAS recognised laboratory for the provision and analysis of diffusion tubes, and the analysis is performed in accordance with guidelines set out by the UK Nitrogen Dioxide Diffusion Tube Network. The diffusion tubes are prepared using the 50% TEA in acetone method.

An NO_2 tube is placed alongside the real-time monitor at Kegworth. This co-location arrangement allows a bias adjustment to be determined for the district. It should be noted that a problem with the monitor meant that only 9 months of data was collected during 2002. However, the Technical Guidance indicates that 9 months worth of data is acceptable as it takes account seasonal variations in the bias. The calculation for the bias adjustment is shown in Box 1, see Appendix 2 for the results of the co-location study.

Box 1. Bias adjustment for Nitrogen dioxide based on 9 months of data

Bias adjustment A = $\frac{\text{Mean annual chemiluminesence concentration (CM)}}{\text{Mean annual diffusion tube concentration (DM)}}$

Bias adjustment A = 37.25/33.36 = 1.1166

From the co-location study it can be concluded that the tubes underread by 10.04%. Therefore, the diffusion tube annual mean results have been multiplied by 1.1166 and are given in Table 7.2.

The adjusted measured concentrations have been projected forward to 2005 and 2010 using the factors detailed in the Technical Guidance to predict future concentrations. As detailed in table 7.2 and Appendix 2.

Tube number	Location	Bias adjusted (Micrograms)	2005 prediction (Micrograms) based on 2002 bias adjusted values	2010 prediction (Micrograms) bases on 2002 bias adjusted value
1	Coalville Belvoir	26.37	24.26	20.04
2	Coalville Jackson	28.23	25.97	21.45
3	Coalville Oxford St.	28.09	25.84	21.35
4	Coalville Abbotts Oak	23.79	21.89	18.08
5	Bardon Rd C/V	32.77	30.15	24.91
6	All Saints Coalville	28.52	26.24	21.68
7	Measham, High	28.05	25.81	21.32
8	Boundary	20.28	18.66	15.41
9	Ashby Marlborough	22.27	20.49	16.93
10	Ashby Market St.	26.62	24.49	20.23
11	Ashby A42	26.90	24.75	20.44
12	C/Don High St	31.98	29.42	24.30
13	C/Don E.M.A	20.09	18.48	15.27
14	C/Don Stat. Rd.	28.19	25.93	21.42
15	CD Dise	23.37	21.50	17.76
16	Kegworth A6	37.35	34.36	28.39
17	Whatton Rd Keg	24.40	22.45	18.54
18	Keg Molehill Fm	**43.73**	**40.23**	33.23
19	M1 Long Whatton	30.85	28.38	23.45
20	M1 Long Wh'n West	27.50	25.30	20.90
21	Copt Oak	31.70	29.16	24.09
22	Charley	24.16	22.23	18.36
23	Broom	38.63	35.54	29.36
24	Sinope	22.95	21.11	17.44

Table 7.2 Bias adjusted annual average concentrations between January and December 2002 in NWLDC, plus predictions for 2005 and 2010. (Figures shown in bold are those which exceed the annual average objective)

Based on the above assessment the only monitoring location, which is likely to breach the annual mean objective in 2005, is location 18, Molehill Farm, which is an AQMA.

The government objective for the 1-hour mean is 200µg/m^3 not to be exceeded more than 18 times in a year. The 1-hour mean objective at the real time monitor located at Kegworth was breached on two separate occasions during 2002. The maximum peak 1-hour mean was recorded as 620.75µg/m^3, at 1800hours on 3rd November, and 253.8µg/m^3 was recorded on 30th September at 1100hours. The next highest hourly peak average was recorded in July at 138.4µg/m^3. The rest of the mean hourly average readings were significantly below the current objective.

Although there is no straightforward way to project future exceedances of the 1-hour objective. It can be deduced using the data from the real time monitor and the bias adjusted data that it is unlikely that the hourly mean objective at each of the monitoring locations will be breached.

Although it is predicted that there will only be a single breach of the annual mean objective in 2005– it is likely to be necessary to proceed to a Detailed Assessment for NO_2 for this area. However, it should be noted that this area is included in the stage 4 review and assessment and further information will be included as an addendum to this section as to what further action will be required at this monitoring location and others throughout the district for NO_2.

B. Narrow congested streets with residential properties close to the kerb

There are no streets within NWLDC, which fulfil the criteria detailed in the Technical Guidance, hence it will not be necessary to proceed to a Detailed Assessment for nitrogen dioxide.

C. Junctions

Box 6.2 in Chapter 6 of the Technical Guidance states that a 'busy' junction can be taken as one with more than 10,000 vehicles per day. Using Annual Average Daily Traffic (AADT) count data supplied by Leicestershire County Council and local knowledge, junctions fulfilling this criteria were identified. It was then determined if there was relevant exposure within 10 m of the kerb. Four potential sites were identified. The DMRB Screening Method – Version 1.01 (April 2003) was used to predict the annual mean, objective. The DMRB Screening Method concluded that none of the potential sites would exceed the 2005 objective, as detailed in Table 7.3, below,

Site	Annual Mean (μg/m3)
Castle Donnington	**33.4**
Ashby	**27.6**
Kegworth	**36.8**
Broom Leys	**36.6**

Table 7.3: Predicted NO2 levels for 2005 using DMRB at busy junctions.

It should be noted that there is an NO_2 tube (Tube No5) located in the vicinity of the Broomleys junction. The results from this tube indicate that the bias adjusted annual mean for 2002 was 32.77μg/m^3 and predicted as 30.15μg/m^3 for 2005 – this indicates that the DMRB model has over predicted the 2005 concentration at this location by 6.45μg/m^3.

D. Busy streets where people may spend 1 –hour or more close to traffic

A busy street where people spend 1 hour or more close to traffic is defined in Technical Guidance - as having more than 10,000 vehicles a day and where members of the public may be exposed within 5m of the kerb for 1 hour or more. There are no such streets in NWLDC.

E. Roads with high flow of buses and/or HGVs

Roads with a high flow of buses and/or HGVs are defined in the Technical Guidance as having greater than 25% composition buses or HGVs, and are within 10m of relevant exposure. There are no such roads, which meet these criteria in NWLDC.

F. New roads constructed or proposed since first round of review and assessment

Since the last round of review and assessment the Ashby by-pass has been completed. The AADT is in excess of 10,000 vehicles a day – however, there are no relevant receptors within 10m of the kerb, hence it is not necessary to proceed to a more Detailed Assessment for this new road.

G. Roads close to objective during the first round of review and assessment

All the roads which were predicted to be above the 36μg/m^3 but below the 40μg/m^3, at relevant locations, in 2005 from the first round of review and assessment are incorporated into NWLDC Air Quality Management Areas - and will be considered as part of the stage 4 review and assessment.

H. Roads with significantly changed traffic flows

The Technical Guidance defines a 'large' increase in traffic as being more than 25% since the last review and assessment. No such roads have been identified within the boundaries of NWLDC.

I. Bus Stations

The Technical Guidance states that for a bus station to cause a significant impact – there needs to be a flow of vehicles greater than 1000 buses per day. There are no such sites within NWLDC.

J. New industrial sources

Using the checklist in Annex 2 of the Technical Guidance it can be concluded that there are no new processes within the boundaries of the District, which are likely to release significant quantities of nitrogen dioxide.

K. Industrial sources with substantially increased emissions

Based on evidence from the Environment Agency and the Councils own records. There have been no industrial sources within the district or surrounding areas, which have substantially increased their emissions of nitrogen dioxide.

L. Aircraft

Aircraft are significant sources of nitrogen dioxide emissions, especially during take off. East Midlands Airport is located in the north of the district.

The nearest relevant exposure from the boundary of the airport are several residential properties located approximately 250m from the northern boundary.

Information on the expected annual throughput of passengers and tonnes of freight for the financial year 2002 – 2003 has been obtained from EMA as detailed in Table 7.4. Figures for 2005 are not currently available; hence the 2002-2003 figures have been used.

Type of cargo	Throughput
Passengers	3659441
Freight (including mail)	231994 tonnes

Table 7.4: Annual throughput of passengers and freight for the financial year 2002-2003 (data supplied by EMA)

The Technical Guidance states that the tonnes of freight should be converted to an equivalent number of passengers using 100000 tonnes = 1 million passengers per annum (mppa):

mppa => 231994/100000 = 2.3

The total annual throughput of passengers and freight for the financial year 2002-2003 can be calculated as:

Total annual throughput ≈ 3,659,441 + 2,300,000 = 5,959,441

The total annual throughput in mppa for 2002-2003 is 5.9 mppa for EMA. To proceed to a Detailed Assessment the total equivalent passenger throughput for 2005 should be more than 5mppa. It can therefore be concluded that it will be necessary to proceed to a Detailed Review and Assessment for EMA for nitrogen dioxide. However, it should be noted that the above site is incorporated into NWLDC Air Quality Management Areas - and will be considered as part of the stage 4 review and assessment.

7.7 Conclusion for Nitrogen Dioxide

The USA indicates that some locations in NWLDC may experience levels of nitrogen dioxide in excess of the annual average nitrogen dioxide objective. These locations must be subject to a more detailed review and assessment. As detailed above, no locations in NWLDC are likely to exceed the hourly mean nitrogen dioxide objective.

As highlighted previously work is currently being progressed on NWLDC stage 4 Review and Assessment for nitrogen dioxide the results of which when completed will be added to this section of the USA as an addendum.

8.0 Review and Assessment of sulphur dioxide

8.1 Introduction

Sulphur dioxide (SO_2) is a soluble gas consisting of one sulphur and two oxygen atoms. On dissolving in water it gives rise to an acidic solution of sulphuric acid.

The principal source of SO_2 is the electricity generating power stations (67%) followed by other industrial combustion plant – in particular refineries and iron and steel processes. Domestic sources of SO_2 can be significant in areas where there is still extensive use of solid fuel fires.

Sulphur dioxide gives rise to concerns due to its local and global effect. Trans-national transport of SO_2 in the atmosphere followed by its dry and wet deposition (acid rain) has accounted for deforestation and lake acidification in continental Europe. In terms of its local effects the acidic nature of dissolved SO_2 causes irritation to lung tissue and may provoke attacks of asthma. If exposed to sufficiently high concentrations of the gas the onset of clinical effects can be very rapid. Hence, three air quality standards have been set at which SO_2 are unlikely to have any significant health effects.

8.2 Objective

The Government and the Devolved Administrators have adopted three objectives for sulphur dioxide, as detailed in Table 8.1.

Pollutant	**Objective**		**Date to be achieved by**
	Concentration	**Measured as**	
Sulphur dioxide	**266 μg/m^3** *not to be exceeded more than 35 times in any one year*	15 minute mean	End of 2005
Sulphur dioxide	**350 μg/m^3** *not to be exceeded more than 24 times in any one year*	1 hour mean	End of 2004
Sulphur dioxide	**125 μg/m^3** *not to be exceeded more than 3 times in any one year*	24 hour mean	End of 2004

Table 8.1: Air Quality Objectives for sulphur dioxide

8.3 Background Concentrations

Estimated annual mean background concentrations for 2001 have been mapped for the UK, and have been downloaded from the following web site – www.airquality.co.uk,.

The Technical Guidance states that it can be assumed that the background annual mean sulphur dioxide concentrations at the end of 2004 and 2005 will be 75% of the 2001 values.

The highest estimated annual mean background concentration for 2001 is 8.46μg/m^3 (grid reference 443500 328500), in the vicinity of the old Castle Donnigton power station, which was decommissioned in 1994. It can therefore be calculated that the predicted highest annual mean background concentration for the 2004 and 2005 will be 2.12μg/m^3 (75% less).

8.3 Summary of the Updating and Screening checklist approach for sulphur dioxide

Sulphur dioxide		
Ref No.	**Source, location, or data that need to be assessed**	**Status**
A	Monitoring data outside an AQMA	No exceedances
B	New Industrial sources	No exceedances
C	Industrial sources with substantially increased emissions	No exceedances
D	Areas of domestic coal burning	No exceedances
E	Small boilers (>5MW (thermal)) burning coal or oil	No exceedances
F	Railway Locomotives	No exceedances

8.4 Conclusions of the previous Review and Assessment

The stage 3 Review and Assessment concluded that:

Both monitoring and modelling results suggest that there will be no exceedances of the objectives in 2005 and therefore no AQMAs are required for this pollutant.

This review and assessment continues to build on the original report.

8.5 Sulphur Dioxide in NWLDC

A) Monitoring Data

North West Leicestershire District Council does not have a real time SO_2 monitor. However, there were three, 8-port bubblers sited at three locations, which are analysed by using the net acidity titration procedure. Two of these sites were decommissioned in June 2002 as they were operationally unreliable and although the third monitor is still in operation the data set is limited because of recurring problems with the monitor.

Although the results from the 8 port samplers are not conclusive they do provide a coarse indication of the levels of sulphur dioxide within the district.

The Technical Guidance states that where the net acidity measurements are made then the measured maximum daily mean concentration should be multiplied by 1.25 to take account of a general tendency for bubblers to under-read at high concentrations. The results of the three bubblers with the correction factor applied are shown below in table 8.2. The Technical Guidance also details correction factors which can be used to convert the maximum daily mean to the 15 minute and the 1 hour objectives, as detailed below;

99.9^{th} percentile of 15-minute means = 1.8962 x maximum daily mean

99.7^{th} percentile of 1-hour means = 1.3691 x maximum daily mean

Location	**Coalville, Council Offices (4 months in 2001)**	**Castle Donnington, Parish Council (4 months in 2001)**	**Moira, Woulds Court (Oct 01-May 02)**	**Objective**
Maximum Daily Mean ($\mu g/m^3$)	60	68.7	80	**125**
Maximum 15-min mean ($\mu g/m^3$)	113.7	130.4	151.7	**266**
Maximum 1-hour mean ($\mu g/ m^3$)	82.1	94.1	109.5	**350**

Table 8.2: Sulphur dioxide results from bubblers with the correction factor applied.

As stated above although the results shown in table 8.2 are of limited value they do indicate that the levels of sulphur dioxide within the district are approximately half that of the current objectives for the daily, 15-minute and 1-hour measurement periods.

B) New Industrial Sources

Using the checklist in Annex 2 of the Technical Guidance it can be concluded that there are no new processes within the boundaries of the District, which are likely to release significant quantities of sulphur dioxide.

C) Industrial sources with substantially increased emissions

There have been no industrial sources within the district or surrounding areas, which have substantially increased their emissions of sulphur dioxide.

However, it should be noted that since the last round of review and assessment, the Drakelow Power Station located 6 miles from the district -permanently closed on 31st March 2003, hence ceases to be a potential concern.

D) Domestic Sources

Due to the heritage of coal mining in the district there are a large number of homes still heated by coal. The distribution of the number of properties using primarily solid fuel is difficult to determine. However, for stage 1 of the first round of review and assessment the numbers of customers receiving concessionary coal were plotted onto a km grid. It was found that some parts of the district have high densities of coal users. For example the south-west sector of North West Leicestershire was found to have 114 so domestic coal users per km^2.

A further methodology to assess the number of coal users within the district was completed for the stage 3 Review and Assessment, which included modelling and monitoring. The main concerns were where there was a combination of high domestic coal burning properties in the vicinity of power stations. The modelling results predicted no exceedances of the objectives in 2005 and monitoring sites showed that levels were well below the daily average.

It is expected that more people are converting to other forms of heating and that solid fuel is less likely to be the primary source of heating. Consequently, it is unlikely that there are any areas within the district where there may be more than 100 houses in an area of 500 x 500m, which burn solid fuel as their primary source of heating.

Although, the above indicates that it will not be necessary to proceed to a Detailed Assessment, it is recognised that due to the heritage of coal burning in the district it may be appropriate to conduct further screening. It should be noted that the housing section of NWLDC is currently embarking on this authority's' energy strategy. This strategy will assess all the properties in the district and include an assessment of the type of fuel used. It is expected that the results of this assessment will be available towards the end of 2003, hence, these results will be used to identify any areas, which may require a more detailed assessment for sulphur dioxide.

E) Boilers

The first round of review and assessment confirmed that boiler plant greater than $5MW_{(thermal)}$ can give rise to high short-term concentrations of sulphur dioxide.

No boiler plant greater than $5MW_{(thermal)}$ have been identified within the boundaries of NWLDC.

F) Railway Locomotives (Diesel and coal-fired locomotives)

There are no regularly run locomotives within the district.

8.4 Conclusion

NWLDC is unlikely to exceed the sulphur dioxide objective for 2004 and 2005. A further detailed assessment is not recommended.

9.0 Review and Assessment for PM_{10}

9.1 Introduction

PM_{10} differ from the other pollutants discussed in this Report in that they are not from a single substance. Particulate matter in the atmosphere is composed of a wide range of materials of various origins.

There are a wide range of emission sources of PM_{10} concentrations in the UK, which can be divided into 3 main categories. *Primary particulate emissions* derived directly from combustion sources, including road traffic, power generation, industrial processes. *Secondary particles* formed by chemical reactions in the atmosphere, and comprise principally of sulphates and nitrates. Coarse particles comprising of 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.

PM_{10} is the description given to particles falling below 10μm in diameter, and are therefore respirable. In recent years, a clear association has been established between fine particles which includes PM_{10}'s, and respiratory or cardiovascular ill-heath, asthma and mortality.

9.2 Objective

The Government and the Devolved Administrators have therefore adopted two Air Quality Objectives for fine particulates (PM_{10}) in Table 9.1.

Pollutant	**Objective**		**Date to be achieved by**
	Concentration	**Measured as**	
PM_{10}	**40μg/m^3**	Annual mean	2004
PM_{10}	**50μg/m^3** *Not to be exceeded more than 35 days per year)*	Fixed 24-hour mean	2004

Table 9.1: Air quality objectives for PM10

The EU has also set indicative limit values for PM_{10} which are to be achieved by 1st January 2010.These are considerably more stringent and are detailed in table 9.2 below. These provisional limit values have not been incorporated into Regulation for the purpose of Local Air Quality Management at this stage, however, they have been considered within this report.

Pollutant	Objective		Date to be achieved by
	Concentration	**Measured as**	
PM10	**20μg/m^3**	Annual Mean	2010
PM10	**50μg/m^3** *Not to be exceeded more than 7 times per year*	Fixed 24-hour mean	2010

Table 9.2. Provisional Objectives EU objectives for PM10.

9.3 Summary of the Updating and Screening checklist approach for PM10

PM10		
Ref No.	**Source, location, or data that need to be assessed**	**Status**
A	Monitoring data outside an AQMA	Exceedances
B	Monitoring data within an AQMA	No exceedances
C	Junctions	No exceedances
D	Roads with high flow of buses and/or HGVs	No exceedances
E	New roads constructed or proposed since first round of review and assessment	No exceedances
F	Roads close to the objective during the first round of review and assessment.	No exceedances
G	Roads with significantly changed traffic flows	No exceedances
H	New industrial sources	No exceedances
I	Industrial sources with substantially increased emissions	No exceedances
J	Areas with domestic solid fuel burning	No exceedances
K	Quarries, landfill sites, opencast coal, handling of dusty cargoes at ports etc	No exceedances
L	Aircraft	No exceedances

9.4 Conclusions of the previous Review and Assessment

The stage 3 Review and Assessment concluded that:

There were uncertainties associated with the modelling for PM_{10} and it could not be predicted with a certain degree of accuracy whether the 2005 objective would be exceeded. Although it

was concluded that areas which are likely to exceed the PM_{10} objective for traffic related PM_{10} are likely to be the same areas where nitrogen dioxide levels are exceeded and hence any such areas will already be included in AQMAs for NO_2.

This review and assessment continues to build on this original report.

9.5 PM_{10} within NWLDC

A) Monitoring Data outside AQMA

Within the boundaries of the district there are two light scatter PM_{10} monitors, which are located outside AQMAs. These monitors are both Turnkey monitors, which determine particulate concentration by measuring the degree of scattering occurring when the particle stream is passed through a beam of laser light. The Technical Guidance advises measurements of PM_{10} concentrations carried out using optical analysers that have not been certified will need careful consideration. (See section B).

One of these monitors is run by Bardon Aggregate Industries and is located at a residential care home called Tilson House, which is located 200m from the boundary of the quarry site. The other is run by RJB mining and is located at Donsithopre School and monitors particulate from the open cast coal-extraction process.

The operators of both these monitors are responsible for processing the data from these monitors and provide NWLDC details of the monitoring data on a monthly basis. Table 9.3 below details the results obtained from both monitors.

Site	**Annual Mean ($\mu g/m^3$)**			**Number of days >50$\mu g/m^3$**		
	2000	*2001*	*2002*	*2000*	*2001*	*2002*
Bardon Quarry			37.54			33
Donisthorpe (Hicks Lodge)	18.72	19.38	17.57	7	8	7

Table 9.3: Annual mean PM_{10} concentrations ($\mu g/m^3$ optical) and number of 24-hour exceedances of 50$\mu g/m^3$, measured at two sites outside AQMAs.

Both monitors are indicating that the annual objective and the 24hour objective have not been exceeded when compared with the 2004 objective. However, when considering the 2010 objective both monitors show greater than 7 exceedances of the 24hour objective and the Bardon monitor also exceeds the annual mean objective of 20$\mu g/m^3$.

The measured data can then be adjusted for the relevant future year. Box 8.6 of the Technical Guidance has been followed to adjust the measured annual mean PM_{10} data forwards to 2004 and 2010 using the correction factors described in Box 8.7. The year 2002 data has been used as the measured data. *It should be noted that at this stage the 1.3 correction factor for gravimetric has not been applied.* However, the assessment provides an indication of the estimated annual mean PM_{10} concentrations for 2004 and 2010 as detailed in Table 9.4.

The estimated exceedances of the 50μg/m^3 24 hour objective have been determined using Figure 8.1 of the Technical Guidance (see table 9.4), which provides an estimate of the number of 24 hour exceedances based on the annual mean.

Site	**Predicted future annual Mean (μg/m^3)**		**Predicted number of days >50μg/m^3**	
	2004	*2010*	*2004*	*2010*
Bardon Quarry	36.25	**32.76**	**51**	**39**
Donisthorpe	17.07	16.24	1	0

Table 9.4. Predicted annual mean PM_{10} concentrations (μg/m^3) and number of 24-hour exceedances of 50μg/m^3, at two sites outside AQMAs (exceedances indicated in bold).

From the above crude screening assessment it can be predict that:

Bardon Monitor

- 2004 the predicted annual mean is below the current objective however, there are more than 35 predicted 24- hour exceedances of 50μg/m^3

- 2010 the predicted annual mean is above the 20μg/m^3 provisional 2010 objective and there are more then 7 exceedances of the 50μg/m^3.

It should be noted that when using Figure 8.1 of the Technical Guidance to predict the number of exceedances of the 50μg/m^3 -based on the 2002 annual mean – Figure 8.1 indicates that there will be 62 exceedances, when in fact there were only 33. If this over prediction is applied to the 2004 then the predicted number of days exceeding 50μg/m^3 will be in the region of 22 and hence below the 2004 objective.

Donisthorpe Monitor

- 2004 the predicted annual mean is below the current objective, as is the predicted 24 hour exceedances of 50μg/m^3

- 2010 this objective is not applicable as the open-cast operations are due to finish in December 2004.

It can be concluded that it will not be necessary to proceed to a Detailed Assessment for Donisthorpe. However, due to the predicted levels and the uncertainty of the predictions for Bardon, it will be necessary to proceed to a Detailed Assessment for Bardon Quarry for the areas where members of the public are regularly present.

B) Monitoring data within an AQMA

The Stage 3 Assessment completed by NWLDC concluded that 6 AQMAs should be declared because it was predicted that it was likely that the air quality objective for annual mean NO_2 may not be achieved at various locations throughout the District. It was also indicated that there were uncertainties associated with the modelling which was conducted to predict the levels of PM_{10} originating from roads for 2005. It was concluded that there was not sufficient evidence to declare AQMAs for PM_{10} but it was likely that any area where PM_{10} levels are above the objective in 2005 (due to traffic sources) will already be included in AQMAs for NO_2.

For this reason a PM_{10} monitor was commissioned and is operated by NWLDC within in the boundaries of the Kegworth AQMA, which was considered to be the 'worst case' location and represent the majority of roads in the district except the M1 and M42. The monitor is managed in accordance with the manufactures guidance, and is located adjacent to the A6, this road is fronted by shops and houses, many with facades within 10m of the kerbside.

The particulate monitor is identical to those operated by Bardon and Donisthorpe, a OSIRIS light scatter monitor manufactured by Turnkey, which determines the particulate concentration by measuring the degree of scattering occurring when the particle stream is passed through a beam of laser light. The Technical Guidance advises measurements of PM_{10} concentrations carried out using optical analysers that have not been certified will need careful consideration. Contact has been made with DEFRA regarding this matter and we have been advised that such monitors are acceptable for screening studies but should not be used for further Detailed Studies. The manufactures of the monitor are currently conducting trials to gain MCERTS approval the data gathered so far shows a good relationship with the Government approved TEOM.

Table 9.5, below shows the processed data obtained from this monitor

Site	**Annual Mean (μg/m^3)**				**Number of days >50μg/m^3**			
	1999 (July – Dec)	*2000*	*2001*	*2002*	*1999 (July – Dec)*	*2000*	*2001*	*2002*
Kegworth AQMA	30.68	27.33	13.66	14.49	10	20	1	1

Table 9.5. Annual mean PM_{10} concentrations (μg/m^3 optical) and number of 24-hour exceedances of 50μg/m^3, measured at two sites outside AQMAs.

The monitor is indicating that the annual objective and the 24hour objective have not been exceeded when compared with both the 2004 objective and the provisional 2010 objective.

The measured data can then be adjusted for the relevant future year. Box 8.6 of the Technical Guidance has been followed to adjust the measured annual mean PM_{10} data forwards to 2004 and 2010 using the correction factors described in Box 8.7. The year 2002 data has been used as the measured data as there are some uncertainties with the 2000 data. *It should be noted that*

at this stage the 1.3 correction factor for gravimetric has not been applied. However, the assessment provides an indication of the estimated annual mean PM_{10} concentrations for 2004 and 2010 as detailed in Table 9.6 below.

Site	**Predicted future annual Mean ($\mu g/m^3$)**		**Predicted number of days >50$\mu g/m^3$**	
	2004	*2010*	*2004*	*2010*
Kegworth AQMA	14.31	13.67	0	0

Table 9.6. Predicted annual mean PM_{10} concentrations ($\mu g/m^3$) and number of 24-hour exceedances of 50$\mu g/m^3$, within Kegworth AQMA.

It can be concluded that neither the predicted 2004 or the provisional 2010 objectives will be exceeded. It will therefore not be necessary to proceed to a Detailed Assessment for Kegworth or any other similar location due to PM_{10} originating from traffic.

C) Junctions

The Technical Guidance states that a 'busy' junction can be taken as one with more than 10000 vehicles per day. Using AADT count data supplied by Leicestershire County Council and local knowledge, junctions fulfilling these criteria have been identified. It was then determined if there was relevant exposure within 10 m of the kerb. Four potential sites were identified. The DMRB Screening Method – Version 1.01 (April 2003) was used to predict the annual mean, and the number of days that the 24 hour objective was likely to exceed 50$\mu g/m^3$. The DMRB Screening Method concluded that none of the potential sites would exceed the 2004 objectives, as detailed in Table 9.7. Calculations have not been determined for 2010 in this instance due to not having reliable predicted traffic data for that year.

Site	**Annual Mean ($\mu g/m^3$)**	**Number of Days >50$\mu g/m^3$**
Castle Donnington	23.8	10
Ashby	23.2	8
Kegworth	26.4	16
Broom Leys	31.1	32

Table 9.7: Predicted PM_{10} levels for 2004 using DMRB at busy junctions.

D) New roads constructed or proposed since last round of review and assessment.

Since the last round of review and assessment the Ashby by-pass has been completed. The AADT is in excess of 10000 vehicles a day – however, there are no relevant receptors within 10m of the kerb, and hence it is not necessary to proceed to a more Detailed Assessment for this new road.

E) New industrial sources

Using the checklist in Annex 2 of the Technical Guidance it can be concluded that there are no new processes within the boundaries of the District, which are likely to release significant quantities of PM_{10}.

F) Industrial sources with substantially increased emissions

Based on evidence from the Environment Agency and the Councils own records. There have been no industrial sources within the district or surrounding areas, which have substantially increased their emissions of PM_{10}.

G) Areas of domestic solid fuel burning

As detailed for sulphur dioxide there is a heritage of coal mining in the district and there are a large number of homes still heated by coal. However, it is expected that more people are converting to other forms of heating and that solid fuel is less likely to be the primary source of heating.

Using professional judgement it has been concluded that it is unlikely that there are any areas within the district where there may be more than 50 houses in an area of 500 x 500m, which burn solid fuel as their *primary* source of heating.

Although, the above indicates that it will not be necessary to proceed to a Detailed Assessment, it is recognised that due to the heritage of coal burning in the district it may be appropriate to conduct further screening. The housing section of NWLDC is currently embarking on this authority's energy strategy. This strategy will assess all the properties in the district and include an assessment of the type of fuel used. It is expected that the results of this assessment will be available towards the end of 2003, hence, these results will be used to identify any areas, which may breach the governments objective and which may require a more detailed assessment for PM_{10}.

H) Quarries/landfill sites/open-cast etc.

The main sites that may be potential sources of PM_{10} have been identified; these are summarised in Table 9.8 below. All of these sources are Authorised processes and the emissions of dust are controlled through the conditions of their authorisations.

The distance of the relevant locations for public exposure is determined by the expected background concentration of PM_{10} for 2004 and 2010.

Site	Approx. Distance to nearest relevant exposure (m)	Predicted background μg/m3		Distance defined as 'near'- related to predicted annual mean (m)	
		2004	2010	2004	2010
Breedon quarry	24	22.1	19.8	200	1000
Cloud Hill quarry	110	21.7	19.6	200	1000
Hicks Lodge coal	83	20.2	18.6	200	1000
Ibstock – quarry	73	22.3	20.3	200	1000
Ibstock – Ellistown - quarry	80	25.1	24.4	200	1000
Redbank – quarry	65	21.2	19.6	200	1000
Bardon – quarry	200	21.8	20.1	200	1000
Hanson – quarry	On the boundary	21.8	20.1	200	1000
Coal products Ltd.	192	27.9	24.5	1000	1000
Albion – opencast	700	21.7	20.1	200	1000

Table 9.8: Distance (m) of potential sources of PM_{10}

Hicks Lodge and Bardon Quarry are the only two mineral sites that have real time PM_{10} monitors (see section A). Bardon Quarry is approximately twice as far from relevant exposure than Hicks Lodge and similar background concentrations for 2004 and 2010 are predicted at the nearest relevant exposure.

With regards to complaints Hicks Lodge and Bardon Quarry are the only two sites in the District that have recently been recognised as being the source of dust. The nature of the dust source is determinant in its deposition, i.e. granite dust, coal dust clay dust etc. In our opinion if comparisons can be made – dust from granite extraction gives a greater deposition rate than coal; this is evident in the fact that Bardon sits at a greater distance from residential properties than Hicks Lodge, yet complaints are still received.

No other site specific, dust nuisance complaints have recently been received from residential properties in the locality of the other sites that have been identified as possible sources of PM_{10}. Hence, as the objective is not presently exceeded at the Donisthorpe PM_{10} monitor (where complaints have been received) it is unlikely that the objective will be exceeded in the vicinity of other potential sources of PM_{10} in 2004 or 2010.

Future implications for PM_{10} include; alleged complaints of dust in the Ellistown area of the district which are currently being investigated; two proposed mineral extraction sites, Long Moor open cast mine (in the vicinity of Ravenstone); and an extension to Breedon Limestone quarry. NWLDC will work closely with the operators of the sites and the Mineral Planning Authority and make recommendations that will assist in the PM_{10} objectives being achieved.

I) Aircraft.

Aircraft are not major sources of PM_{10} emissions, but may make a contribution close to the source. Emissions from aircraft once they are above about 200m will make a negligible contribution to ground concentrations. East Midlands Airport is located in the north of the district.

The Technical Guidance indicates that relevant exposure should be established within 500m of the airport boundary. The nearest relevant exposure from the airport is several residential properties located approximately 250m from the northern boundary.

Information on the expected annual throughput of passengers and tonnes of freight for the financial year 2002 – 2003 has been obtained from EMA as detailed in Table 9.9. Figures for 2004 are not currently available; hence the 2002-2003 figures have been used. It is not envisaged that the throughput will be significantly greater for 2004.

Type of cargo	**Throughput**
Passengers	3659441
Freight including mail	231994 tonnes

Table 9.9: Annual throughput of passengers and freight for the financial year 2002-2003

The Technical Guidance states that the tonnes of freight should be converted to an equivalent number of passengers using 100000 tonnes = 1 million passengers per annum (mppa):

mppa => 231994/100000 = 2.3

The total annual throughput of passengers and freight for the financial year 2002-2003 can therefore be calculated as:

Total annual throughput => 3,659,441 + 2,300,000 = 5,959,441

The total annual throughput in mppa for 2002-2003 is 5.9 tonnes for EMA. The Technical Guidance states that to proceed to a Detailed Assessment the total equivalent passenger throughput for 2004 should be more than 10mppa. It will therefore not be necessary to proceed to a Detailed Review and Assessment for EMA for PM_{10}.

9.6 Conclusion for PM_{10}

Based on current information it can be concluded that it will not be necessary to proceed to a further detailed review and assessment for PM_{10} for any other location other than in the vicinity of Bardon Quarry.

10. Summary and Conclusions

Of the seven pollutants reviewed in this report nitrogen dioxide and PM_{10} are the only ones that have highlighted potential problems with reaching the statutory objectives.

10.1 Nitrogen dioxide

It is predicted that the statutory objective for nitrogen dioxide is likely to be met at most locations in the district, including 4 of the 6 AQMAs. The AQMAs, which are predicted not to meet the set objective for 2005 are, in the locality the M1 northbound based on monitoring data, and in the vicinity of EMA based on total annual throughput. However, as previously stated this authority is in the process of completing its stage 4 review and assessment. This assessment incorporates a more detailed review of all the AQMAs, the results of which will be issued as an addendum to this report and will allow final conclusions to be determined for nitrogen dioxide.

10.2 PM10

As a result of the Bardon quarry it is predicted that there will be more than 35 exceedances of the 50$\mu g/m^3$ 24-hour mean 2004 statutory objective for PM_{10} in the vicinity of Bradgate Drive, Greenhill, Coalville. A further detailed assessment will be necessary for this site.

NWLDC is a dynamic district that has undergone a lot of regeneration over recent years; the National Forest initiative is continuing to develop; the old industrial sites are being replaced with housing and modern industrial sites etc. In conjunction with this and the national policies to reduce vehicle, industrial and domestic emissions it is envisaged that air quality across the district will continue to improve. This Authority recognises that air quality is an essential resource that requires protecting and improving and will continue to work towards the objectives of the air quality strategy when ever possible, and this air quality review and assessment is the mechanism, which strives to achieve this.

Appendix 1: The Six Air Quality Management Areas declared in NWLDC in April 2001

1. **Vicinity of M1**
   Residential properties within 150m of M1
   7 properties in Long Whatton
   12 properties in Copt Oak
   3 isolated farms

2. **Kegworth A6**
   Residential properties with frontages within 10m of A6
   Approx. 60 properties

3. **A511**
   Residential properties with frontages within 10m of A511
   9 properties Sinope and Hoo Ash
   3 properties Broom Leys Road
   45 properties Bardon Road
   4 properties Bardon Hill

4. **Belvoir Road, Coalville**
   Residential flats and pedestrian area between High Street Junction and disused railway line

5. **Castle Donnington, Diseworth Road**
   3 properties

6. **Vicinity of A50**
   1 property

Appendix 2: Results of the NO2 tube co-location study with the real time monitor at Kegworth (2002), based on 9 months data.

Location	Grid Easting	Grid Northing	Average 2002 ($\mu g/m^3$)	Bias adjusted ($\mu g/m^3$)	2005 prediction ($\mu g/m^3$) based on 2002 bias adjusted value	2010 prediction ($\mu g/m^3$) bases on 2002 bias adjusted value
Coalville Belvoir	442351	314293	23.62	26.37	24.28	20.04
Coalville Jackson	442309	314205	25.28	28.23	25.98	21.45
Coalville Oxford St.	443279	314121	25.16	28.09	25.56	21.35
Coalville Abbotts Oak	444841	314639	21.31	23.79	21.65	18.08
Bardon Rd C/V	444189	313169	29.35	32.77	30.17	24.91
All Saints Coalville	444689	314627	25.54	28.52	26.25	21.68
Measham, High	433451	312207	25.12	28.05	25.82	21.32
Boundary	433358	318972	18.16	20.28	18.67	15.41
Ashby Marlborough	435386	317692	19.94	22.27	20.26	16.93
Ashby Market St.	435835	316778	23.84	26.62	24.50	20.23
Ashby A42	436340	315837	24.09	26.90	24.76	20.44
C/Don High St	444493	327304	28.64	31.98	29.44	24.30
C/Don E.M.A	444477	326735	17.99	20.09	18.49	15.27
C/Don Stat. Rd.	444784	328125	25.25	28.19	25.95	21.42
CD Dise	444355	326311	20.93	23.37		17.76
Kegworth A6	448818	326625	33.45	37.35	34.38	28.39
Whatton Rd Keg	448070	326249	21.85	24.40	22.46	18.54
Keg Molehill Fm	447445	326476	39.16	**43.73**	**40.25**	33.23
M1 Long Whatton	446941	323769	27.63	30.85	28.40	23.45
M1 Long Wh'n West	447022	323763	24.63	27.50	25.32	20.90
Copt Oak	448122	313068	28.39	31.70	29.18	24.09
Charley	448513	313572	21.64	24.16	22.24	18.36
Broom	443659	313997	34.60	38.63	35.56	29.36
Sinope	440169	315266	20.55	22.95	21.12	17.44

The bias adjusted measured concentrations for 2002 have been projected forward to 2005 and 2010 using the factors detailed in the Technical Guidance as shown below:

- *2002 to 2005 correction factor =>* *0.892/0.969 = 0.92*
- *2002 to 2010 correction factor =>* *0.734/0.969 = 0.76*