



Local Air Quality Management  
Environment Act 1995

## **UPDATED AIR QUALITY PROGRESS REPORT FOR 2007**



North Devon Council  
Environmental Health and Housing Services  
Prepared April/May 2008

# 1. Introduction

## 1.1 Background

The Environment Act 1995 required the UK Government to produce a national air quality strategy containing standards and objectives for improving ambient air quality. The Act introduced the system of local air quality management (LAQM). As a result, local authorities are required to periodically review and assess the current and future air quality in their areas against those in the Strategy, which have been prescribed in regulations. This report has been produced as part of North Devon Council's statutory obligation under the Environment Act 1995 to review and assess local air quality.

## 1.2 Regulations and Air Quality Objectives

The Air Quality Objectives considered in this report are set out in the Air Quality (England) Regulations 2000 and the Air Quality (England) Amendment Regulations 2002. The exception is the particles (PM<sub>10</sub>) objective for 2010 which for the time being is provisional, and not included in regulation. The Government will consider the inclusion of this objective after the EU first Air Quality Daughter Directive is adopted. The National air quality standards and objectives are contained in Table 1.1.

The provisional objectives for particles (PM<sub>10</sub>) for 2010 are different depending on which part of the UK is being assessed. The provisional objectives applicable to the North Devon district are given in Table 1.2.

Although local Authorities are not yet statutorily required to assess levels of particles for 2010, they are strongly recommended to do so, to assist with long term planning and the assessment of development proposals in their areas. Therefore this Authority has undertaken an assessment of particles against the 2010 objective.

Also not included in Table 1.1 is an annual mean standard for Nitrogen dioxide of 40µg/m<sup>3</sup> to be achieved by 2010. Although not formally part of the review and assessment process, Nitrogen dioxide annual mean concentrations have also been assessed against this objective.

**Table 1.1 - National air quality standards and objectives as outlined in regulations.**

POLLUTANT	OBJECTIVE		DATE TO BE ACHIEVED BY
	Concentration	Measured as	
<b>Benzene</b>	16.25µg/m <sup>3</sup> (5ppb)	running annual mean	31 December 2003
<b>1,3-butadiene</b>	2.25µg/m <sup>3</sup> (1ppb)	running annual mean	31 December 2003
<b>Carbon monoxide</b>	11.6mg/m <sup>3</sup> (10ppm)	running 8 hour mean	31 December 2003
<b>Lead</b>	0.5µg/m <sup>3</sup>	annual mean	31 December 2004
	0.25µg/m <sup>3</sup>	annual mean	31 December 2008
<b>Nitrogen dioxide</b>	200µg/m <sup>3</sup> (105ppb) not to be exceeded more than 18 times a year	1hour mean	31 December 2005
	40µg/m <sup>3</sup> (21ppb)	annual mean	31 December 2005
<b>Particles (PM<sub>10</sub>) (gravimetric)*</b>	50µg/m <sup>3</sup> not to be exceeded more than 35 times a year	24 hour mean	31 December 2004
	40µg/m <sup>3</sup>	annual mean	31 December 2004
<b>Sulphur dioxide</b>	350µg/m <sup>3</sup> (132ppb) not to be exceeded more than 24 times a year	1 hour mean	31 December 2004
	125µg/m <sup>3</sup> (47ppb) not to be exceeded more than 3 times a year	24 hour mean	31 December 2004
	266µg/m <sup>3</sup> (100ppb) not to be exceeded more than 35 times a year	15 minute mean	31 December 2005

\*measured using the European gravimetric transfer sampler or equivalent

**Table 1.2 – Provisional Objectives for Particles Not Included  
in the Regulations for the Purpose of Local Air Quality  
Management**

POLLUTANT	AIR QUALITY OBJECTIVE		DATE TO BE ACHIEVED BY
	Concentration	Measured as	
Particles (PM <sub>10</sub> ) (gravimetric)*	50µg/m <sup>3</sup> not to be exceeded more than 7 times a year	24 hour mean	31 December 2004
	20µg/m <sup>3</sup>	annual mean	31 December 2004
*measured using the European gravimetric transfer sampler or equivalent			

### 1.3 Purpose and Scope of Report

This Progress Report is produced in accordance with the national timetable for ongoing review and assessment of local air quality, as outlined in Table 1.3. It reports on new monitoring data and local developments that have been identified since the 2007 Progress Report, and reports progress on achieving or maintaining pollutant concentrations below the national air quality standards. The report has been produced in accordance with the requirements of DEFRA Progress Report Guidance LAQM TG(03).

**Table 1.3 – Recommended Timescales for Submissions of Reviews and Assessments and Progress Reports for Local Authorities**

<b>LAQM Activity</b>	<b>Completion Date</b>	<b>Which Authorities?</b>
<b>Updating and Screening Assessment (USA)</b>	End of May 2003	All Authorities
<b>Detailed Assessment</b>	End of April 2004	Those Authorities which have identified the need for one in their May 2003 USA
<b>Progress Report</b>	End of April 2004	Those Authorities which identified that there was no need for a Detailed Assessment in their May 2003 USA
<b>Progress Report</b>	End of April 2005	All Authorities
<b>USA</b>	End of April 2006	All Authorities
<b>Detailed Assessment</b>	End of April 2007	Those Authorities which have identified the need for one in their April 2006 USA
<b>Progress Report</b>	End of April 2007	Those Authorities which identified that there was no need for a Detailed Assessment in their April 2006 USA
<b><i>Progress Report</i></b>	<b><i>End of April 2008</i></b>	<b><i>All Authorities</i></b>
<b>USA</b>	End of April 2009	All Authorities
<b>Detailed Assessment</b>	End of April 2010	Those Authorities which have identified the need for one in their April 2009 USA
<b>Progress Report</b>	End of April 2010	Those Authorities which identified that there was no need for a Detailed Assessment in their April 2009 USA

#### **1.4 Public Exposure**

An important consideration in the completion of this report was public exposure to air pollution and an understanding of the general definitions and approach applied to the assessment of this public exposure is also important in order to understand those locations in North Devon that have, or have not, been assessed for the purposes of this report.

The regulations make it quite clear that likely exceedances of the objectives should be assessed in relation to "*the quality of the air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present*". Reviews and assessments are therefore focused on those locations where the public are likely to be regularly present and exposed over the averaging period of the

objective. Locations are not considered if relevant public exposure would not be realistic. Further guidance on the approach taken in this report is given in Table 1.4 below.

The examples below are guidance only and are not prescriptive in this manner; therefore at all locations local circumstances and any other relevant factors have been applied using local judgement and professional knowledge.

In the assessment of some pollutants and pollution source locations a definitive judgement has been applied using specific distances of exposure in relation to the individual source. Guidance contained in LAQM.TG(03) has also been applied where it is prescriptive. All examples of this are detailed in the subsequent review and assessment sections for each individual pollutant.

**Table 1.4 Examples of Where Air Quality Objectives Should/Should Not Apply**

<b>Averaging Period</b>	<b>Objectives should apply at:</b>	<b>Objectives should generally not apply at:</b>
<b><i>Annual Mean</i></b>	<p>All locations where members of the public might be regularly exposed.</p> <p>Building facades of residential properties, schools hospitals and libraries etc.</p> <p>Exposure must be likely for a cumulative period of at least six months in a year.</p>	<p>Building facades of offices or other places of work where members of the public do not have regular access.</p> <p>Gardens of residential properties</p> <p>Kerbside sites (as opposed to the building façade), or any other location where public exposure is expected to be short term.</p>
<b><i>24-hour and 8-hour mean</i></b>	<p>All locations where the annual mean objective would apply.</p> <p>Gardens of residential properties.</p>	<p>Kerbside sites (as opposed to the building façade), or any other location where public exposure is expected to be short term.</p>
<b><i>1-hour mean</i></b>	<p>All locations where the annual mean, 24-hour and 8-hour mean objectives apply.</p> <p>Kerbside sites (e.g. pavements of busy shopping areas).</p> <p>Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where the public might reasonably be expected to spend 1-hour or more.</p>	<p>Kerbside sites where the public would not be expected to have regular access or spend 1-hour or more.</p>
<b><i>15-min mean</i></b>	<p>All locations where members of the public might reasonably be exposed for a period of 15 minutes or more.</p>	

## 1.5 Summary of Findings From Previous Review And Assessment Work

### ***First Round of Review And Assessment***

The first round of review and assessment (carried out in 2000) concluded that the risk of exceeding the air quality objectives for the following pollutants was negligible: -

1. Carbon monoxide, Benzene, 1,3-butadiene, Lead, Sulphur dioxide, PM10 & Nitrogen dioxide.
2. On this occasion these conclusions were dependent on a proposed gas fired power station in Yelland not being constructed. If constructed, a third stage review would have been required to consider localised exceedances of *Sulphur dioxide* and *Nitrogen dioxide*.

### ***Updating and Screening Assessment***

The Updating and Screening Assessment (produced in 2002/03) concluded that: -

The risk of exceeding the air quality objectives for the following pollutants was negligible: -

1. *Carbon monoxide, Benzene, 1,3-butadiene, Lead, PM10 & Nitrogen dioxide.*
2. A detailed assessment was required for the *15-minute Sulphur Dioxide* only arising from public exposure to idling trains at Barnstaple railway station.
3. Monitoring results for *Nitrogen dioxide* identified potential exceedances of the annual mean objective at several locations in Barnstaple, however these locations were likely to see significant reductions in road traffic numbers should the proposed western bypass and downstream bridge be constructed. As this was scheduled for completion by early 2006, it was considered that a detailed assessment for Nitrogen dioxide was not necessary.

### ***Progress Report***

The Progress Report (produced in 2005) concluded that: -

1. The findings of the 2003 Updating and Screening Assessment remain valid for *Carbon monoxide, Benzene, 1,3-Butadiene, Lead and PM<sub>10</sub>.*
2. A Detailed Assessment is not required for the *15-minute Sulphur dioxide* objective, due to changes in the timetable for trains operating from Barnstaple Station.
3. Construction of the Barnstaple Western Bypass has now commenced. The predicted reductions in road traffic in central Barnstaple are still expected to be achieved, however compliance with the annual mean objective for *Nitrogen dioxide* at Rolle Street is expected to be approximately 12 months later than stated in the 2003 USA.
4. There are no new industrial processes or planned developments in the North Devon District with the potential to significantly impact upon achievement of the National Air Quality Standards.

### ***Updating and Screening Assessment***

The Updating and Screening Assessment (produced in 2006) concluded that:

- 1 Monitoring results for *Nitrogen dioxide* identified potential exceedances of the annual mean objective at several locations in Barnstaple, however these locations were likely to see significant reductions in road traffic numbers should the proposed western bypass and downstream bridge be constructed. As this was scheduled for completion by May 2007, it was considered that a detailed assessment for Nitrogen dioxide was not necessary.

### ***Progress Report***

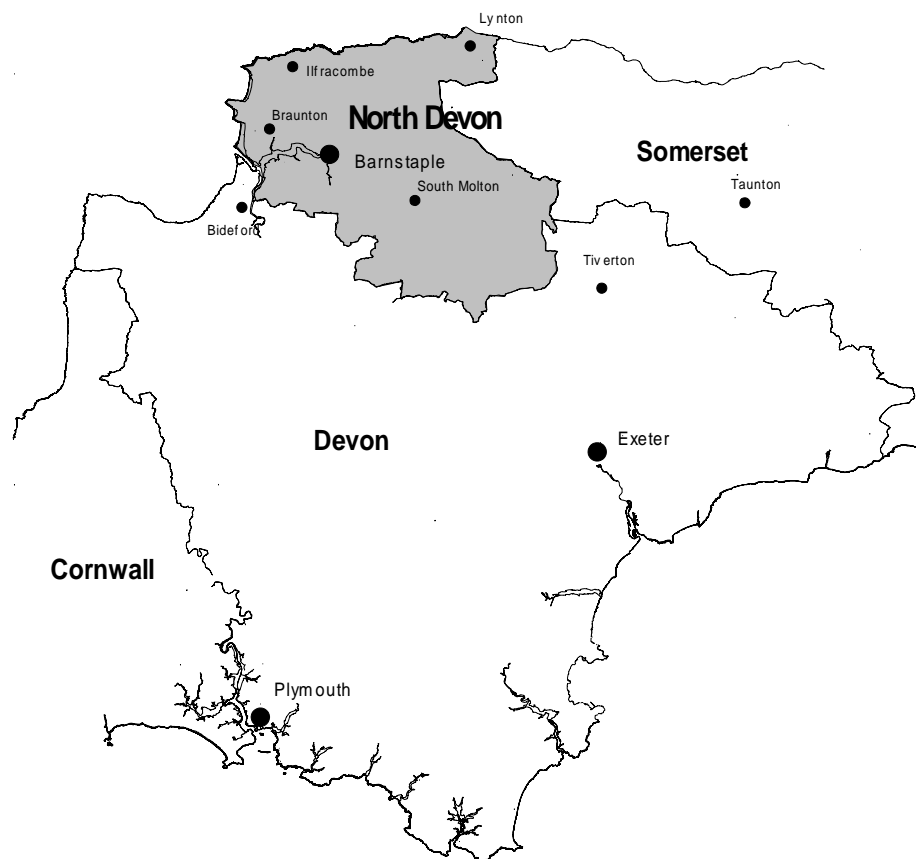
The Progress Report (produced in 2007) concluded that:

- 1 The findings in the Progress Report prepared in 2007 in relation to Carbon Monoxide, Benzene, 1,3-Butadiene, Lead, Sulphur Dioxide and PM<sub>10</sub> remain valid.
- 2 It was determined that whilst 2 of the 16 sites monitored in 2006 were equal to the threshold limit for Nitrogen Dioxide, and, and 1 site exceeded the limit. a detailed assessment of Nitrogen Dioxide at these locations was not necessary at that time. The western bypass and downstream bridge project was completed in May 2007, and was forecast to have a significant effect on traffic flows in and around Barnstaple. It was stated that the effects of the completion of this project on the Nitrogen Dioxide levels at these sites would be able to be assessed during this years LAQM Progress Report.



## 1.6 Characteristics of the North Devon District

The North Devon district occupies the northern most part of the county of Devon, and borders the western borders of Somerset, and the Bristol Channel, covering an area approximately 1085 square kilometres (419sq miles). The area is characterised by a rugged northern Bristol Channel coast, the sandy beaches of the West Coast, the estuarine and valley landscapes of the River Taw, and the open moorland and farmland of the Exmoor fringes. The district includes approximately one third of the area of Exmoor National Park. The character of the North Devon district is inextricably linked to its natural landscape, which is its most prized asset. The landscape is highly valued by residents and tourists alike, and incorporates numerous Sites of Special Scientific Interest, Areas of Outstanding Natural Beauty, and Heritage Coastline.



The population of the area in 2000 was approximately 91,800, with approximately half the residents living in the four main settlements of Ilfracombe, Branton, South Molton, and Barnstaple, which is also the regional centre for northern Devon. The remainder of the population lives in the open countryside or in one of the numerous villages and hamlets of the area.

The area has an extensive rural road network and is connected to the rest of the region by the A39, A361 and A377 roads. There is also a regional rail connection between Barnstaple and Exeter, which runs along the valley of the River Taw.

Employment in the district is concentrated in the main settlements. There is a strong dependence on the service industry, especially tourism related in the summer, and also in the public administration, health, and finance sectors, reflecting Barnstaple's role as a regional centre. There is also a healthy industrial

base in the area, and this is reflected in the 48 prescribed processes regulated under the Pollution Prevention and Control Regulations 2000, which are currently in operation within the administrative area of North Devon Council.

## 2. Carbon Monoxide

### 2.1 Introduction

Carbon monoxide is a colourless and odourless gas produced by the incomplete combustion of carbon containing fuels. In general, the more efficient the combustion process, the lower the carbon monoxide emission. The main outdoor source of carbon monoxide in the UK is currently road transport, which accounts for about 69% of UK emissions mainly from petrol engined vehicles. Road transport sources will constitute a larger proportion of the total in urban areas, especially near busy, congested, roads.

Carbon monoxide is one of the most dangerous pollutant gases because it can, and does, cause death. The main threats to human health from exposure to carbon monoxide are the formation of carboxyhaemoglobin, which substantially reduces the capacity of the blood to carry oxygen and deliver it to the tissues and blockage of important biochemical reactions in cells. People who have an existing disease which affects the delivery of oxygen to the heart or brain (e.g. coronary artery disease – angina) are likely to be at particular risk if these delivery systems are further impaired by carbon monoxide.

The focus of a review and assessment for carbon monoxide are the following non-occupational, near ground level outdoor locations: -

- background locations
- roadside locations (sites close to the façade of a building)
- other locations where potentially significant groups might be exposed, such as schools or hospitals

#### 2.1.1 Standard and Objective for Carbon monoxide

The UK Government has adopted an 8-hour running mean concentration of 11.6mg/m<sup>3</sup> as the air quality standard for carbon monoxide. The new objective for local air quality management has been set at a slightly tighter level of: -

Pollutant	Concentration Limit	Measured as	Date to be achieved by
Carbon Monoxide	10 mg/m <sup>3</sup> (8.6ppm)	Maximum daily running 8 hour mean	31 December 2003

This brings the objective in line with the second EU Air Quality Daughter Directive limit value for Carbon monoxide.

#### 2.1.2 The National Perspective

Studies at National level, based on both measured and modelled data, suggest there is little likelihood of the new objective for carbon monoxide being exceeded by 2003. While the national scale studies suggest the objective will be achieved, it is important that all local circumstances are fully considered. Local Authorities are therefore required to undertake a review and assessment for carbon monoxide.

## 2.2 Carbon Monoxide in North Devon

**Table 2.2.1 – Checklist for Carbon Monoxide**

<b>Item</b>	<b>Response</b>
<i>Monitoring data</i>	There is no Carbon monoxide monitoring data for North Devon from local or national monitoring programmes
<i>Very busy roads or junctions in built-up areas</i>	There are no roads in North Devon meeting the definition of "Very busy roads" as outlined in LAQM.TG(03) Update

## 2.3 Conclusions

There is no monitoring data for Carbon monoxide in North Devon as previous review and assessment has not identified any issues of concern with regard to Carbon monoxide. As there are no "very busy" roads in North Devon then it is consider highly unlikely that the Air Quality Standard for Carbon monoxide will be breached in North Devon.

## 3 Benzene

### 3.1 Introduction

Benzene is a clear, colourless aromatic hydrocarbon, which has a characteristic sickly sweet odour. At normal ambient temperatures it is a liquid, but it readily evaporates and small amounts are detectable in the atmosphere.

In the U.K. the main atmospheric source of benzene is the combustion and distribution of petrol. Diesel is only a minor source. The amount of benzene in petrol was, until the beginning of 2000, regulated to an upper limit of 5% by volume by EU legislation. In recent years it comprised on average 2% by volume in the UK. Since 1 January 2000, EU legislation has required that the amount of benzene in petrol be below 1% and is presently about 0.7% by volume on average for fuel sold in the UK. The main outdoor sources of benzene remaining beyond 2005 are expected to be petrol engined vehicle exhausts and petrol refining and distribution.

Benzene is a recognised genotoxic (i.e. it can alter the genetic make-up of cells) human carcinogen. Studies of industrial workers exposed in the past to high levels of benzene have demonstrated an excess risk of leukaemia, which increased in relation to their working lifetime exposure. Because it is a genotoxic carcinogen, no absolutely safe level can be specified for ambient air concentrations of benzene. However the rarity of the disease associated with benzene, means that it has been feasible to create an air quality standard for atmospheric benzene, which presents an exceedingly small risk to the UK population.

The focus of a review and assessment for benzene are the following non-occupational, near ground level outdoor locations:

- background locations
- roadside locations (sites close to the façade of a building)
- other locations where potentially significant groups might be exposed, such as schools or hospitals

#### 3.1.1 Standard and Objective for Benzene

The UK Government has adopted a running annual mean concentration of  $16.25\mu\text{g}/\text{m}^3$  as the air quality standard for benzene to be achieved by the end of 2003. The new objective for local air quality management has been set at a tighter level of: -

Pollutant	Concentration Limit	Measured as	Date to be achieved by
Benzene	$5\mu\text{g}/\text{m}^3$	running annual mean	31 December 2010

#### 3.1.2 The National Perspective

The main sources of benzene emissions in the UK are petrol-engined vehicles, petrol refining, and the distribution and uncontrolled emissions from petrol stations without vapour recovery systems. A number of policy measures already

in place, or planned for future years, will continue to reduce emissions of benzene.

Forecasts based on national mapping suggest that the policy measures currently in place will achieve the 2003 objective at all urban background and roadside/kerbside locations. Whilst the 2010 objectives are expected to be met at all urban background, and most roadside locations, there is a possibility for some remaining exceedances which will require additional measures at a local level.

### 3.2 Benzene in North Devon

**Table 3.2.1 – Checklist for Benzene**

<b>Item</b>	<b>Response</b>
<i>Monitoring data outside an AQMA</i>	There is no Benzene monitoring data for North Devon from local or national monitoring programmes
<i>Monitoring data within an AQMA</i>	There are no declared AQMAs within North Devon and therefore no monitoring data is available within an AQMA
<i>Very busy roads or junctions in built up areas</i>	There are no roads in North Devon meeting the definition of "Very busy roads" as outlined in LAQM.TG(03)
<i>New industrial sources.</i>	There are no new PPC Part B or A2 permitted processes in North Devon which will have an affect on benzene levels, since the date of the last LAQM Progress report
<i>Industrial sources with substantially increased emissions, or new relevant exposure</i>	There are no substantially increased emissions from existing PPC Part B or A2 authorised processes in North Devon, since the date of the last LAQM USA Report
<i>Petrol stations</i>	There has not been any significant change in relation to annual petrol throughputs since the date of the last LAQM Progress report
<i>Major fuel storage depots (petrol only)</i>	There are no major fuel storage depots located in North Devon

## 4 1,3-Butadiene

### 4.1 Introduction

1,3-Butadiene is a chemical compound, the molecule of which comprises of four carbon and six hydrogen atoms. At normal ambient temperatures it is a gas, and trace amounts can be found in the atmosphere that we breathe.

1,3-Butadiene in the atmosphere is usually derived from the combustion of petrol and other materials. Although neither petrol nor diesel contains 1,3-Butadiene, it is formed in the combustion process from olefins, which are a constituent of the fuel. 1,3-Butadiene is also an important industrial chemical, and is handled in

bulk in a number of industrial locations in the UK. The main sources in the UK however are emissions from motor vehicle exhausts.

1,3-Butadiene is a genotoxic (i.e. it alters the genetic structure of cells) carcinogen, and as such it is not possible to determine an absolutely safe level for human exposure. In practice however, it is clear from studies of groups of workers who have had substantial exposures to 1,3-Butadiene, that risks to the general population from the levels currently found in the atmosphere must be exceedingly small.

The focus of a review and assessment for 1,3-Butadiene are the following non-occupational, near ground level outdoor locations:

- background locations
- roadside locations (sites close to the façade of a building)
- other locations where potentially significant groups might be exposed, such as schools or hospitals

#### **4.1.1 Standard and objective for 1,3-Butadiene**

<b>Pollutant</b>	<b>Concentration Limit</b>	<b>Measured as</b>	<b>Date to be achieved by</b>
1,3-Butadiene	2.25µg/m <sup>3</sup> (1ppb)	running annual mean	<b>31 December 2003</b>

#### **4.1.2 The National Perspective**

The increasing numbers of vehicles equipped with three way catalysts will significantly reduce emissions of 1,3-butadiene in future years. Further reductions in vehicle emissions and improvements in fuel quality are expected to further reduce emissions of 1,3-butadiene from vehicle exhausts. These measures are expected to deliver the air quality objective by the end of 2003, and no further measures are thought to be necessary.

The studies at a national level, based on both measures and modelling data, suggest that there is little likelihood of the objective for 1,3-butadiene being exceeded by 2003. It is however important that local circumstances are fully taken into consideration within the review and assessment process. All local authorities are therefore required to complete the review and assessment for 1,3-butadiene.

## 4.2 1,3-Butadiene in North Devon

**Table 4.2.1 – Checklist for 1,3-Butadiene**

<b>Item</b>	<b>Response</b>
<i>Monitoring data</i>	There is no 1,3-Butadiene monitoring data for North Devon from local or national monitoring programmes
<i>New industrial sources.</i>	There are no new PPC Part B or A2 permitted processes in North Devon which will have an effect on 1,3-Butadiene levels, since the date of the last LAQM Progress Report
<i>Industrial sources with substantially increased emissions, or new relevant exposure</i>	There are no substantially increased emissions from existing PPC Part B or A2 authorised processes in North Devon, since the date of the last LAQM Progress Report



## 5 Lead

### 5.1 Introduction

Lead is the most widely used non-ferrous metal, and has a large number of industrial applications, both in its elemental form and in alloys and compounds. The single largest use globally is in the manufacture of batteries, but other uses are as a pigment in paints and glazes, in alloys, in radiation shielding, tank lining and piping. As the compound tetraethyl lead, it has been used as a petrol additive to improve its octane rating, however the sale of leaded petrol has been banned since 1 January 2000.

Lead is a cumulative poison, and in sufficient amounts can cause severe and sometimes permanent damage to the central nervous system. The first signs of lead poisoning are headaches, tiredness, constipation, and weight loss. Acute lead poisoning is now rare in the UK, while research into low level atmospheric exposure is inconclusive.

The focus of a review and assessment for lead are the following non-occupational, near ground level outdoor locations:

- background locations
- roadside locations (sites close to the façade of a building)
- other locations where potentially significant groups might be exposed, such as schools or hospitals

#### 5.1.1 Standard and Objective for Lead

Pollutant	Concentration Limit	Measured as	Date to be achieved by
Lead	0.5µg/m <sup>3</sup>	annual mean	31 December 2004
	0.25µg/m <sup>3</sup>	annual mean	31 December 2008

#### 5.1.2 The National Perspective

Detailed assessments of the potential impact of lead emissions from industrial processes have been undertaken by the Government based upon both monitoring and sector analysis studies. The monitoring data has generally indicated no exceedances of the 2004 or 2008 objectives, although locations in proximity to non-ferrous metal production and foundry processes were deemed to be at risk.

There have been no AQMAs declared in respect of the 2004 and 2008 objectives as a result of the first round of review and assessment. Only local authorities with relevant locations in the vicinity of major industrial processes that emit significant quantities of lead would need to progress to a detailed assessment.

## 5.2 Lead in North Devon

**Table 5.2.1 – Checklist for Lead**

<b>Item</b>	<b>Response</b>
<i>Monitoring data</i>	There is no lead monitoring data for North Devon from local or national monitoring programmes
<i>New industrial sources.</i>	There are no new PPC Part B or A2 permitted processes in North Devon which will have an affect on lead levels, since the date of the last LAQM Progress Report
<i>Industrial sources with substantially increased emissions, or new relevant exposure</i>	There are no substantially increased emissions from existing PPC Part B or A2 authorised processes in North Devon, since the date of the last LAQM Progress Report

## 6 Nitrogen Dioxide

### 6.1 Introduction

Nitrogen oxides are formed during high temperature combustion processes from the oxidation of nitrogen in the fuel or air. Nitrogen Dioxide (NO<sub>2</sub>) and nitric oxide (NO) are both oxides of nitrogen and together they are referred to as NO<sub>x</sub>. All combustion processes produce some NO<sub>x</sub>, but only NO<sub>2</sub> is associated with adverse effects on human health.

The main sources of NO<sub>x</sub> in the UK are road transport, which, in 2000, accounted for about 49% of the total UK emission. Power generation and general industrial activity are the other significant sources of NO<sub>x</sub>. In urban areas, the proportion of local emissions due to road transport sources is larger.

Nitrogen dioxide is a respiratory irritant, which can exacerbate asthma, and can cause throat and eye irritation in healthy individuals. In the presence of sunlight, it reacts with hydrocarbons to produce photochemical pollutants such as ozone

The focus of a review and assessment for the *annual mean objective* (see 6.1.1) for nitrogen dioxide are the following non-occupational, near ground level outdoor locations:

- background locations
- roadside locations (sites close to the façade of a building)
- other locations where potentially significant groups might be exposed, such as schools or hospitals

For the *1-hour mean objective* (see 6.1.1), the focus of the review and assessment for nitrogen dioxide shall include any non-occupational, near ground level outdoor locations (including kerbside sites), as short term exposures are likely at these sites.

#### 6.1.1 Standard and Objective for Nitrogen Dioxide

Pollutant	Concentration Limit	Measured as	Date to be achieved by
Nitrogen Dioxide	200µg/m <sup>3</sup> (105ppb) not to be exceeded more than 18 times a year	1 hour mean	31 December 2005
	40µg/m <sup>3</sup> (21ppb)	annual mean	31 December 2005

#### 6.1.2 The National Perspective

The annual mean objective is currently widely exceeded at roadside sites throughout the UK, and at some urban background sites in major conurbations. The number of exceedances of the 1-hour objective show considerable variation, and are driven by meteorological conditions which give rise to winter episodes of poor dispersion and summer oxidant episodes.

In practice, meeting the annual mean objective in 2005, and the limit value in 2010, is expected to be considerably more demanding than achieving the 1-hour objective. National studies have indicated that the annual mean is likely to be

achieved at all urban background sites outside of London by 2005, but the objective may be exceeded more widely at roadside sites in close proximity to busy road links.

Of the AQMAs declared for Nitrogen dioxide, 95% have traffic emissions as the main, if not only, component. Exceedances of the objective have been identified within major conurbations, within smaller town centres with congested traffic, and alongside dual carriageways and motorways in more rural areas. Local Authorities are expected to focus upon locations such as these where they expect pollutant concentrations to be highest (often referred to as "hot spots"). If there are no exceedances of the objectives at the most polluted locations, then it can be reasonably concluded that there should be no exceedances elsewhere.

## 6.2 Nitrogen Dioxide in North Devon

**Table 6.2.1 – Checklist for Nitrogen dioxide**

<b>Item</b>	<b>Response</b>
<i>Monitoring data outside an AQMA</i>	Nitrogen Dioxide is measured at 16 locations in the North Devon District. The monitoring programme has been in place since 2000 and results are detailed in appendix 2.
<i>Monitoring data within an AQMA</i>	There are no declared AQMAs within North Devon and therefore no monitoring data is available within an AQMA.
<i>Narrow congested streets with residential properties close to the kerb</i>	There are 5 monitoring locations in North Devon which fall into this category ( monitoring sites 1, 2, 3, 9, 8 ) the results for which are detailed in appendix 2.
<i>Junctions.</i>	There are 5 monitoring locations in North Devon which fall into this category (monitoring sites 1, 2, 3, 9, 8) the results for which are detailed in appendix 2.
<i>Busy streets where people may spend 1-hour or more close to traffic</i>	There is an outdoor cafe located on The Strand with potential for relevant exposure. There is a monitoring location within 100m of this cafe (monitoring site 9), the results for which are detailed in appendix 2.
<i>Roads with high flow of buses and/or HGVs.</i>	Devon County Council data indicates that here are no roads in North Devon with a HGV flow of greater than 20%
<i>New roads constructed or proposed since the previous round of R&amp;A</i>	The major new road scheme for Barnstaple identified in previous reports was completed in May 2007
<i>Roads with significantly changed traffic flows, or new relevant exposure</i>	The major new road scheme for Barnstaple identified in previous reports was completed in May 2007
<i>Bus Stations</i>	North Devons principal bus station is located in Barnstaple, with relevant exposure within 2 metres of the bus station boundary. Information from Devon County Council indicates vehicles movement of significantly less than 1000 buses per day.
<i>New industrial sources.</i>	There are no new PPC Part B or A2 permitted processes in North Devon which will have an affect on Nitrogen Dioxide levels, since the date of the last LAQM Progress Report
<i>Industrial sources with substantially increased emissions, or new relevant exposure</i>	There are no substantially increased emissions from existing PPC Part B or A2 authorised processes in North Devon, since the date of the last LAQM Progress Report
<i>Aircraft</i>	There are no major passenger or freight airports in the North Devon District, and the military airfield does not have substantial numbers of aircraft movements

## 6.2.2 Monitoring Data

Nitrogen Dioxide is measured by diffusion tube at 16 locations in the North Devon District. The monitoring programme has been in place since 2000, and the results for 2007 are tabulated in appendix 2.

### 6.2.2.1 Correction Factors Applied

In accordance with Technical Guidance LAQM TG (03), there are 2 correction factors, which need to be considered when interpreting the raw concentration data. The "bias adjustment factor", is to be applied to all annual mean concentrations, and an "annual mean from short term concentrations adjustment factor" is to be applied when data capture has been achieved for 9 or less of the total 12 months monitoring period.

The bias adjustment factor, which has been applied to the annual mean concentrations for 2007, was calculated to be 0.89. This was calculated using the recommended spreadsheet written for this exact purpose, the link for which can be found at <https://www.uwe.ac.uk/research/centres-and-groups/aqmrc> (accessed May 2008). The variables used in determining this adjustment factor, were Gradko as the analytical laboratory, 20% TEA in water as the preparation, and 2007 for the year.

Application of the "annual mean from short term concentration adjustment factor" should be considered for those sites with a collection efficiency of <75% (ie 9/12 months which) in accordance with the requirements of Technical Guidance LAQM TG (03). There are no sites which meet this criteria and therefore this adjustment factor has not been applied. The actual collection efficiencies for each site are clearly stated in Appendix 2.

### 6.2.2.2 Exceedances of the 40ug/m<sup>3</sup> threshold limit

When comparing the bias adjusted annual mean concentrations of NO<sub>2</sub> with the threshold limit of 40 ug/m<sup>3</sup>, 3 of the 16 sites monitored in 2007 exceed the limit.

These sites are identified below:

3	Rolle Street 2, Barnstaple	41 ug/m <sup>3</sup>
12	The Square, Braunton	42 ug/m <sup>3</sup>
13	The London Inn, Braunton	43 ug/m <sup>3</sup>

It is accepted that the main source of NO<sub>2</sub> emissions is road traffic.

The major new road scheme for Barnstaple as identified in previous reports opened on schedule in May 2007 and was forecast to have a significant impact on traffic flow in and around Barnstaple.

It was stated in last years Progress Report that the impact of the new road scheme on Nitrogen Dioxide emissions in North Devon would be assessed as a result of this LAQM Progress Report. However, in order to enable a comparison to be made with historical annual average data, but in contradiction to the statement made in last years Progress Report, it is considered more relevant to conduct this assessment when a full 12 months of both monitoring and traffic flow data will be available for assessment.

The impact of the new road scheme on Nitrogen Dioxide emissions in North Devon will therefore be assessed as a result of next years LAQM Progress Report.

In the meantime, should North Devon Council have reason to believe that completion of the new road scheme has not been effective in these predicted traffic reductions, it will consider a more detailed assessment of Nitrogen Dioxide emissions.

Note: on submission of this report to DEFRA, and following discussion with both DEFRA and the AQ Helpdesk, it has been determined that a detailed assessment of NOx at sites 3, 12, and 13 is necessary.

This has been actioned, a detailed assessment will be undertaken during 2009, and subsequently reported in April 2010. This update – 24/02/2009, ARC.

**Table 6.2.2.2.1 - Effect of Downstream Bridge Scheme on Traffic Flows in Barnstaple**

Location/Road Link	AADT ( May 2007)	Expected Reduction in Traffic Flow
A361 Rolle Street	20,000	54%
A3125 Longbridge	30,200	23%
The Strand	19,600	48%
Taw Vale	11,000	8%
A3125 Sticklepath	22,300	20%
A361 Inner Relief Road 1 (Alexandra Rd)	24,700	22%
A39 Pilton Causeway	23,400	21%
A361 Eastern Avenue	21,700	22%
South Street	11,900	32%

*Data supplied by Devon County Council May 2007*

## 7 Sulphur Dioxide

### 7.1 Introduction

Sulphur dioxide is a colourless gas with a choking taste, which is a harmful air contaminant and a constituent of winter smog. As it is acidic it corrodes stonework and other materials. Sulphur dioxide is primarily produced by the combustion of fossil fuels containing sulphur e.g. coal and oil.

Sulphur dioxide is an irritant when it is inhaled, because of its acidic nature, and high concentrations may cause breathing difficulties in people exposed to it. Recent studies have shown that people suffering from asthma may be especially susceptible to the adverse effects of sulphur dioxide and that, asthma attacks may be brought on by pollution episodes.

The focus of a review and assessment for the *24-hour mean objective* for sulphur dioxide are the following non-occupational, near ground level outdoor locations:

- background locations
- roadside locations (sites close to the façade of a building)

- other locations where potentially significant groups may be exposed, such as near schools or hospitals

For the *1-hour mean objective* (see 7.1.1), the focus of the review and assessment for sulphur dioxide shall include any non-occupational, near ground level outdoor locations (including kerbside sites), as short term exposures are likely at these sites. The *15-minute mean objective* is relevant to all outdoor locations where members of the public may be exposed for that period of time.

### 7.1.1 Standard and Objective for Sulphur dioxide

Pollutant	Concentration Limit	Measured as	Date to be achieved By
Sulphur Dioxide	266µg/m <sup>3</sup> (100ppb) not to be exceeded more than 35 times a year	15 minute mean	31 December 2005
	350µg/m <sup>3</sup> (132ppb) not to be exceeded more than 24 times per year	1-hour mean	31 December 2004
	125µg/m <sup>3</sup> (47ppb) not to be exceeded more than 3 times per year	24-hour mean	31 December 2004

### 7.1.2 The National 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 locally can be much more significant. Road transport currently accounts for less than 1% of emissions.

Local exceedances of the objectives (principally the 15-minute mean objective) may occur in the vicinity of small combustion plant (less than 20MW) which burn coal or oil, in areas where solid fuels are the predominant form of domestic heating, and in the vicinity of major ports.

There have been a small number of AQMAs declared from the first round of review and assessment. These relate to emissions from coal-fired boilers in hospitals and industrial sites, domestic coal burning, and shipping at a major port.



## 7.2 Sulphur Dioxide in North Devon

**Table 7.2.1 – Checklist for Sulphur Dioxide**

<b>Item</b>	<b>Response</b>
<i>Monitoring data outside an AQMA</i>	There is no Sulphur Dioxide monitoring data for North Devon from local or national monitoring programmes.
<i>Monitoring data within an AQMA</i>	There are no declared AQMAs within North Devon and therefore no monitoring data is available within an AQMA.
<i>New industrial sources.</i>	There are no new PPC Part B or A2 permitted processes in North Devon which will have an affect on Sulphur Dioxide levels, since the date of the last LAQM Progress report
<i>Industrial sources with substantially increased emissions, or new relevant exposure</i>	There are no substantially increased emissions from existing PPC Part B or A2 authorised processes in North Devon, since the date of the last LAQM Progress Report.
<i>Areas of domestic coal burning</i>	There are no new areas of domestic coal burning which have been identified since the date of the last LAQM Progress Report.
<i>Small Boilers &gt; 5 MW (thermal).</i>	There are no new installations of small boilers which have been identified since the date of the last LAQM Progress Report.
<i>Shipping</i>	Nearby ports are located at Ilfracombe, North Devon, and Appledore and Bideford in neighbouring Torridge District. There are no movements of large ships at these ports, and therefore no requirement for a detailed assessment of this source.
<i>Railway Locomotives</i>	Previous 2005 report concluded that a detailed assessment for the 15 minute Sulphur Dioxide objective is not required.

## 8 Particles (PM<sub>10</sub>)

### 8.1 Introduction

PM<sub>10</sub> is the name given to particulate matter below 10 µm in diameter. Particles below 10 µm have a larger probability of penetrating further into the delicate region of the lung where respiration occurs, where they may cause damage. Here the pollutant is described by its physical character rather than by its chemical composition, therefore this particulate matter can be derived from a wide variety of sources, and be either solid or liquid particles

The focus for a review and assessment for PM<sub>10</sub> are the following non-occupational outdoor locations:

- background locations
- roadside locations (sites close to the façade of a building)
- other locations where potentially significant groups might be exposed, such as schools or hospitals
- gardens of residential properties (24 hour mean only)

#### 8.1.1 Standard and Objective for PM<sub>10</sub>

Pollutant	Concentration Limit	Measured as	Date to be achieved by
PM <sub>10</sub>	50µg/m <sup>3</sup> not to be exceeded more than 35 times a year	24 hour mean	31 December 2004
	40µg/m <sup>3</sup>	annual mean	31 December 2004

#### 8.1.2 The National Perspective

There is a wide range of emission sources that contribute to PM<sub>10</sub> concentrations in the UK. These can usually be divided into 3 main source categories:

*Primary Combustion Particles* – particles emitted directly from combustion sources such as road traffic, power generation, industrial combustion processes etc. These particles are generally less than 2.5 µm and often well below 1 µm in diameter.

*Secondary Particles* – particles formed in the atmosphere following their release in the gaseous phase. These include sulphates and nitrates, formed from emissions of SO<sub>2</sub> and NO<sub>x</sub>; these particles are again generally less than 2.5 µm in diameter;

*“Coarse” or “Other” Particles* – the so-called “coarse” or “other” particles component comprises of emissions from a wide range of non-combustion sources. These include resuspended dust from road traffic, construction and mineral extraction processes, wind-blown dusts and soils, and sea salt. These particles are generally greater than 2.5 µm in diameter.

There are a number of reasons why it is important to bear in mind the different source categories and their respective contributions to PM<sub>10</sub> concentrations, within the review and assessment process, principally: -

The expected reduction in particle emissions in future years is different for each type of source e.g. emissions from road transport will be governed by new legislation on vehicle emission standards; secondary particles will be largely governed by controls on power generation, industrial and transport SO<sub>2</sub> and NO<sub>x</sub> emissions, both in the UK and Europe.

The principal focus of Local Air Quality Management is the control of emissions at a local level. It is therefore important that the review and assessment process identifies the contribution of local emission sources, so that the effectiveness of control policies or action plans can be evaluated.

A significant proportion of current annual mean PM<sub>10</sub> is derived from regional (including long distance transport from Europe) background sources. The exact regional background contribution at any site is variable, and is dependent upon the precise geographic location. Local authorities are therefore encouraged to focus their efforts on the identification of the contribution of local sources to overall PM<sub>10</sub> concentrations.

## 8.2 PM<sub>10</sub> in North Devon

**Table 8.2.1 – Checklist for PM<sub>10</sub>**

<b>Item</b>	<b>Response</b>
<i>Monitoring data outside an AQMA</i>	There is no PM10 monitoring data for North Devon from local or national monitoring programmes
<i>Monitoring data within an AQMA</i>	There are no declared AQMAs within North Devon and therefore no monitoring data is available within an AQMA
<i>Busy roads and junctions in Scotland</i>	Not applicable
<i>Junctions.</i>	There are 3 busy junctions in the District with road traffic flows greater than 10000 vehicles per day.
<i>Roads with high flow of buses and/or HGVs.</i>	Devon County Council data indicates that there are no roads in North Devon with a HGV flow of greater than 20%.
<i>New roads constructed or proposed since last round of R&amp;A</i>	The major new road scheme for Barnstaple identified in previous reports was completed in May 2007.
<i>Roads with significantly changed traffic flows, or new relevant exposure.</i>	The major new road scheme for Barnstaple identified in previous reports was completed in May 2007.
<i>Roads close to the objective during the second round of Review and Assessment</i>	No roads were considered to be close to exceeding the objective during the second round of review and assessment.
<i>New industrial sources.</i>	There are no new PPC Part B or A2 permitted processes in North Devon which will have an affect on PM10 levels, since the date of the last LAQM Progress Report
<i>Industrial sources with substantially increased emissions, or new relevant exposure</i>	There are no substantially increased emissions from existing EPA Part B or A2 authorised processes in North Devon, since the date of the last LAQM Progress Report.
<i>Areas of domestic solid fuel burning</i>	There are no new areas of domestic solid fuel burning which have been identified since the date of the last LAQM report. The calculated effective coal burning household densities in the previous report were significantly lower than the threshold densities.
<i>Quarries / landfill sites / opencast coal / handling of dusty cargoes at ports etc.</i>	There are 3 operational quarries in the North Devon District. Regular inspections of all sites are performed as part of the PPC regime, and as such, no concerns have been highlighted in relation to dust emissions from these sites that may lead to a breach of the concentration limit.
<i>Aircraft</i>	There are no major passenger or freight airports in the North Devon District, and the military airfield does not have substantial numbers of aircraft movements.

## **9. Summary of Assessment Conclusions**

### **Carbon Monoxide**

It is considered highly unlikely that the Air Quality Standard for Carbon Monoxide will be breached in North Devon, and therefore there a detailed assessment of this particular pollutant will not be necessary at this stage.

### **Benzene**

It is considered highly unlikely that the Air Quality Standard for Benzene will be breached in North Devon, and therefore there a detailed assessment of this particular pollutant will not be necessary at this stage.

### **1,3-Butadiene**

It is considered highly unlikely that the Air Quality Standard for 1,3-Butadiene will be breached in North Devon, and therefore there a detailed assessment of this particular pollutant will not be necessary at this stage.

### **Lead**

It is considered highly unlikely that the Air Quality Standard for Lead will be breached in North Devon, and therefore there a detailed assessment of this particular pollutant will not be necessary at this stage.

### **Nitrogen Dioxide**

3 of the 16 sites monitored in 2007 exceed the Air Quality Standard for Nitrogen Dioxide. The impact of the new Downstream Bridge and Western Bypass project will be assessed as part of next years Progress Report, and North Devon Council will consider whether or not a detailed assessment of this particular pollutant is appropriate, on completion of this assessment.

### **Sulphur Dioxide**

It is considered highly unlikely that the Air Quality Standard for Sulphur Dioxide will be breached in North Devon, and therefore there a detailed assessment of this particular pollutant will not be necessary at this stage.

### **PM<sub>10</sub>**

It is considered highly unlikely that the Air Quality Standard for Carbon PM<sub>10</sub> will be breached in North Devon, and therefore there a detailed assessment of this particular pollutant will not be necessary at this stage.

## **Appendix 1**

### **List of Consultees for the Purposes of Local Air Quality Management**

- DEFRA;
- Environment Agency Devon Area Office;
- Devon County Council;
- All neighbouring Local Authorities: -
  - Mid Devon District Council;
  - Torridge District Council;
  - West Somerset District Council;
- North Devon Primary Care Trust;
- Exmoor National Park Authority



## Appendix 2

### Results of Nitrogen Dioxide Monitoring

Site ID	Site Location	Annual Mean NO <sub>2</sub> Concentration 2007 (ug/m <sup>3</sup> )	Bias Adjusted Annual Mean NO <sub>2</sub> Concentration 2007 (ug/m <sup>3</sup> )	Collection efficiency over 12 months (%)
1	Pilton Causeway, Barnstaple	34.23	30.47	83
2	Rolle Street 1, Barnstaple	41.61	37.03	100
3	Rolle Street 2, Barnstaple	46.57	41.45	100
4	Lower Sticklepath Roundabout, Barnstaple	28.49	25.36	100
5	Sticklepath School, Barnstaple	11.71	10.42	100
6	Cedars Roundabout, Barnstaple	21.47	19.11	100
7	Newport Road, Barnstaple	38.23	34.03	100
8	South Street, Newport, Barnstaple	31.22	27.79	100
9	Castle Street, Barnstaple	27.34	24.34	100
10	Alexandra Road, Barnstaple	38.65	34.39	92
11	Belle Meadow Road, Barnstaple	37.56	33.43	92
12	The Square, Braunton	46.88	41.72	100
13	The London Inn, Braunton	48.17	42.87	92
14	Church Street, Ilfracombe	26.70	23.76	75
15	High Street, Ilfracombe	32.92	29.30	100
16	Broad Street, Ilfracombe	26.95	23.98	83