

# **Denbighshire** **County Council.**

## **Air Quality Review and** **Assessment.**

### **Stage 1. Review.**

**(Consultation copy)**

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## **EXECUTIVE SUMMARY**

The UK Government published its strategic policy framework for air quality management in 1995 establishing national strategies and policies on air quality which culminated in the Environment Act, 1995. As a requirement of the Act, the Secretary of State has prepared a National Air Quality Strategy. The National Air Quality Strategy provides a framework for air quality control through air quality management and air quality standards. National air quality standards have been proposed by the Expert Panel on Air Quality Standards (EPAQS) for the UK Government.

These air quality standards and their objectives have been enacted through the Air Quality Regulations in December 1997. The Environment Act requires local authorities to undertake an air quality review. In areas where air quality objectives may not be met by the year 2005 local authorities are required to establish Air Quality Management Areas.

The first step in this process is to undertake a review of current and potential future air quality. A minimum of two air quality reviews are recommended in order to assess compliance with air quality objectives, one to assess air quality at the outset of the National Air Quality Strategy and a second to be carried out towards the end of the policy timescale (2005). The number of reviews necessary depends on the likelihood of achieving the objectives.

This report is equivalent to a Stage One air quality review as outlined in the Government's published guidance. The air quality review investigates current and potential future air quality through an examination of the location and size of principal emission sources and by reference to monitored air quality data.

In Denbighshire, the Stage One review found that:-

- The air quality objectives for 5 of the 7 specified parameters namely benzene, 1,3-butadiene, carbon monoxide, lead, and PM10 are all likely to be achieved by 2005.
- There is insufficient information at this stage to conclude that the nitrogen dioxide objective will be achieved in the vicinity of a major road intersection at St Asaph or whether the sulphur dioxide objective will be achieved in the vicinity of part 'B' prescribed processes or in the central area of the town of Llangollen due to domestic and other solid fuel use.

Therefore Denbighshire County Council, Public Protection Department, will be progressing to a second stage review and assessment for nitrogen dioxide and sulphur dioxide.

## **1. INTRODUCTION.**

Denbighshire County Council is undertaking a review of local air quality in order to fulfil its obligations under the Environment Act 1995 Part IV. The Act requires the Local Authority to review the sources of pollution in its own and neighbouring areas, and to assess likely future concentrations of a number of pollutants.

This document presents the results of the initial review and assessment of air quality and makes recommendations for further investigation of certain pollutants.

There are two main objectives of a review and assessment of air quality:

- to identify those areas at a local level where national policies and measures appear unlikely to deliver the air quality objectives by a target date, typically 31.12.2003 - 31.12.2005.
- to ensure that air quality considerations are integrated into a local authorities decision making process.

### **1.1 National Targets**

1.1.1 In its National Air Quality Strategy (1997), the Government set a series of targets for concentrations of harmful pollutants in air, these are listed below:

The Air Quality Regulations (1997) made a statutory duty on local authorities to ensure that by the year 2005 air pollutant concentrations both in Denbighshire and nationally comply with the specific objectives. These original objectives have been revised and now new target dates have been set as noted in table 1.1 overleaf.

- for the above objectives with short averaging times (the sulphur dioxide objective and the hourly objective for nitrogen dioxide) reviews and assessments should be focused on any non-occupational, near ground level outdoor location given that exposures over such short averaging times are potentially likely;
- for objectives with longer averaging times (the objectives for benzene, 1,3 butadiene, carbon monoxide, PM10, lead and the annual objective for nitrogen dioxide) reviews and assessments should be focused on the following near ground level outdoor locations: background locations; roadside locations; and other areas of elevated pollutants concentrations where a person might reasonably be expected to be exposed (e.g. in the vicinity of housing, schools or hospitals etc.) over the relevant averaging time of the objective.

**Table 1.1 UK Air Quality Objectives.**

Pollutant	Air Quality Objective.		Date to be achieved by.
	Concentration	Measured as	
Benzene	16.25 µg/m <sup>3</sup> (5 ppb)	Running annual mean	31.12.2003
1,3,Butadiene	2.25 µg/m <sup>3</sup> (1 ppb)	Running annual mean	31.12.2003
Carbon monoxide	11.6 µg/m <sup>3</sup> ( 10 ppm)	Running 8 hour mean	31.12.2003
Lead	0.5 µg/m <sup>3</sup>	Annual mean	31.12.2004
	0.25 µg/m <sup>3</sup>	Annual mean	31.12.2008
Nitrogen dioxide	200 µg/m <sup>3</sup> ( 105 ppb) not to be exceeded more than 18 times a year.	1 hour mean	31.12.2005
	40 µg/m <sup>3</sup> ( 21 ppb)	Annual mean	31.12.2005
Particles (PM10)	50 µg/m <sup>3</sup> ( gravimetric) not to be exceeded more than 35 times a year.	24 hr mean	31.12.2004
	40 µg/m <sup>3</sup> ( gravimetric )	Annual mean	31.12.2004
Sulphur dioxide	350 µg/m <sup>3</sup> ( 132 ppb) not to be exceeded more than 24 times a year.	1 hour mean	31.12.2004
	125 µg/m <sup>3</sup> ( 47 ppb) not to be exceeded more than 3 times a year.	24 hour mean	31.12.2004
	266 µg/m <sup>3</sup> ( 100 ppb ) not to be exceeded more than 35 times a year.	15 minute mean	31.12.2005

1.1.2 Ozone was not included in the list of pollutants for local authority control, and is not therefore covered in the Air Quality Regulations. Due to the nature of ozone pollution, practical action at the local authority level will not be effective in tackling high concentrations. Action is therefore being taken by the National Government at International level to combat high concentrations of ozone, as part of this Denbighshire County Council is already enforcing the requirements of the Environmental Protection Act as it applies to companies emitting precursors of ozone.

1.1.3 The review and assessment has regard to the air quality objectives as laid down in the Regulations rather than the air quality standards. The recommended air quality standards from the Strategy are set purely with regard to scientific and medical evidence of the effects of that particular pollutant on health. As such, they represent minimum or no significant risk levels. The air quality objectives however, represent the Government's present judgement of achievable air quality by the year 2005 on the evidence of costs and benefits and technical feasibility, thus the objectives for PM10 and SO<sub>2</sub> are set at a level below that of the standard.

## 1.2 Review and Assessment Process

- 1.2.1 In order to determine compliance with these objectives, a process of air quality review and assessment has been recommended. To ensure that there is some consistency between local authorities, the Government has issued Guidance on how local authorities should carry out their reviews and assessments. The guidance notes issued are as follows:

### General Guidance

- Framework for Review and Assessment of Air Quality
- Developing Local Air Quality Strategies and Action Plans: The Principal Considerations
- Air Quality and Traffic Management
- Air Quality and Land Use Planning

### Technical Guidance

- Monitoring for Air Quality Reviews and Assessments
- Preparation and Use of Atmospheric Emission Inventories
- Selection and Use of Dispersion Models
- Review and Assessment: Pollutant Specific Guidance. (*LAQM TG4 (00)*)

- 1.2.2 This document has been prepared with regard to these guidance notes, most notably the Review and Assessment: Pollutant Specific Guidance which has been recently redrafted and republished in May 2000.
- 1.2.3 This Review has been prepared under the most recent version of the Pollutant Specific Guidance TG4(00) and therefore varies with the guidance given previously, notably in respect of PM10 particulate where thresholds values for the determination of any requirement to complete second stage assessments have generally been raised therefore no second stage review of PM10 produced by road traffic in Denbighshire is required, whereas many authorities completing reviews prior to May 2000 have decided that they are required to consider particulates from road traffic more closely.
- 1.2.4 This Guidance note breaks the review and assessment process down into three stages:
- 1.2.5 Stage I - Gather information about current and likely future sources of air pollution. The complexity and detail of a review and assessment should be consistent with the risk of air quality objectives not being achieved by the year 2005 or by the date stated in the objective

In the first instance the local authority should carry out initial screening of industrial, transport, and any other significant sources of pollution within their locality. This includes

levels of traffic on the road, industrial processes (large and small) and an examination of current air pollution monitoring data for the area. The sources of pollution are then examined to determine whether the general public are likely to be exposed to any pollution over the time scales of the air quality objectives, and to determine if either the operation (road or industry) will close before 2005, or whether new operations are planned.

If exceedances do, or are likely to exist, and there is the potential for human exposure over the specified averaging period for a pollutant, the authority should proceed to a second stage assessment.

In areas well within the air quality objective it may not be necessary to undertake any further investigation, except for a further assessment of air quality nearer the year 2005 to ensure that there has been no significant decline in air quality.

- 1.2.6 Stage II – This Stage involves the application of further screening techniques to determine both current and future levels of air pollution. A further examination of any current monitoring data should be carried out. If air quality on the date specified in the objective is predicted to be above any of the objectives above (over the specified averaging period for a pollutant), then a Stage III assessment will be required.
- 1.2.7 Stage III – In Stage III more complex techniques (dispersion modelling, real-time monitoring and emission inventories) are required, in order to determine the nature and size of any areas where the objectives are exceeded.
- 1.2.8 If at the end of Stage III air pollutant concentrations are predicted to be above any of the specific objectives (see above table) then an Air Quality Management Area must be declared. Flowing from this, an Air Quality Action Plan should then be prepared, detailing how the local authority proposes to introduce measures to reduce the concentrations of air pollutants in line with the Government objectives.
- 1.2.9 This report covers Stage I of this review and assessment process, and gives details of all those sources of pollution which are of concern in Denbighshire. As a result of this document further work will be carried out and a separate report produced on the second and, if necessary, the third stages of the review and assessment process.

## 2. THE POLLUTANTS OF CONCERN

### 2.1 Benzene.

*The Government and the devolved administrations have adopted a running annual mean of 16.25 µg/m<sup>3</sup> (5 ppb) as an air quality standard for benzene, with an objective for the standard to be achieved by the end of 2003. The focus of the authority's review and assessment for benzene should be the following locations:*

- *background locations;*
- *roadside locations (sites close to the facade of a building);*
- *other locations where potentially significant groups might be regularly exposed, such as schools or hospitals.* (LAQM TG 4(00))

- 2.1.2 Concerns: Benzene is a known human carcinogen (cancer causing substance), and also contributes to the formation of ozone (summer smog).
- 2.1.3 Sources: In the UK the main atmospheric source of benzene is the combustion and distribution of petrol, of which it is a minor constituent, currently comprising about 2% by volume in the UK, on average. Diesel is a relatively small source. Motor vehicle exhaust gases contain some of this unburned benzene, but they also contain benzene formed from the combustion of other aromatic components of petrol. Motor vehicles are the most important single source on a national basis, accounting in 1996 for 64% of the total UK annual emission of 41 ktonnes, with most of this total arising from petrol vehicles. Six tonnes, 15% of the total, were emitted from industrial processes. (LAQM.TG4)
- 2.1.4 Existing national policies are expected to deliver the prescribed air quality objective for benzene by the end of 2005. Roadside levels of benzene, next to even the most busy or congested roads are expected to be well below the objective by the year 2005. Only those authorities with major industrial processes which either handle, store or emit benzene, which have the potential, in conjunction with other sources, to result in elevated levels of benzene in relevant locations, are expected to need to undertake a second or third stage review and assessment. It is expected, for benzene, that most local authorities will not need to progress past the first stage.
- 2.1.5 Monitoring: No local monitoring for benzene is currently being carried out within Denbighshire. Limited monitoring carried out by another North Wales authority in highly trafficked areas shows average concentrations of 0.7 - 2.0 ppb.
- 2.1.6 Concentrations: Automatic national benzene monitoring data shows that recorded concentrations are all below the 5 ppb annual objective, even at the roadside in central London. (Broughton et al 1998). However (less accurate ) monitoring data, from London using diffusion tubes targeted at areas thought most likely to have high levels of Benzene shows that concentrations in excess of the 5 ppb objective were recorded close to certain roadside locations, and values of 5 ppb were recorded in the vicinity of petrol filling stations. (Stanger Science 1996). No locally based data derived from the Welsh Air Quality Forum

indicates any exceedances for this pollutant within any areas of Wales not affected by significant industrial sources.

- 2.1.7 Controls and Trends: Benzene monitoring data from London have shown declining concentrations over the past few years, and work by Imperial College London suggests that concentrations have been declining since the 1970's.

Since 1993 it has been effectively mandatory to fit three-way catalytic converters onto petrol fuelled vehicles under European Legislation. As more catalyst fitted vehicles come into the fleet on the road (due to the replacement of old vehicles) concentrations will continue to decline.

Controls are also being implemented at petrol filling stations to recover the vapour currently emitted during refilling of storage tanks at the station. Planned future controls on the refuelling of individual vehicles will add to this reduction. These existing controls are currently enforced by this department of the County Council.

- 2.1.8 The Government and the devolved administrations are currently finalising an investigation into ambient levels of benzene in the vicinity of petrol stations. Whilst there may be current exceedances of the objective in the vicinity of some large petrol stations in London (where background concentrations are higher), the expected reduction in emissions will ensure that there will be no exceedances due to petrol stations by 2003.

Authorities should therefore assume that petrol stations **do not** give rise to significant emissions of benzene. LAQM TG 4(00).

## 2.2 1,3-Butadiene

- 2.2.1 *The Government and the devolved administrations have adopted a maximum running annual mean of 2.25 µg/m<sup>3</sup> (1 ppb) as an air quality standard for 1,3 butadiene, with an objective for the standard to be achieved by the end of 2003. The focus of the authority's review and assessment for 1,3 butadiene should be at the following locations,*

- *background locations;*
- *roadside locations (sites close to the facade of a building);*
- *other locations where potentially significant groups might be regularly exposed, such as schools or hospitals. (LAQM TG4(00))*

- 2.2.2 Concerns: 1,3-butadiene is a probable human carcinogen, and as for benzene, no absolutely safe level can be defined.

- 2.2.3 Sources: 1,3- Butadiene in the atmosphere is mainly derived from the combustion of petrol and other materials. Although neither petrol nor diesel fuel contains 1,3-butadiene it is formed in the combustion process from olefins in the fuel. 1,3-Butadiene is also an important industrial chemical, and is handled in bulk at a small number of industrial locations

in the UK. Other than in the vicinity of such locations, the dominant source of 1,3-butadiene in the UK atmosphere is the motor vehicle. The UK national atmospheric inventory for 1,3-butadiene showed that, in 1995, 67% of national annual emissions arose from petrol vehicles and 13% arose from industrial processes.

- 2.2.4 Existing national policies are expected to deliver the prescribed air quality objective for 1,3-butadiene by the end of 2005. Roadside levels of 1,3-butadiene, next to even the most busy or congested roads are expected to be well below the air quality objective. Only those authorities with major industrial processes, which either handle, store or emit 1,3-butadiene and which have the potential, in conjunction with other sources, to result in elevated levels in relevant locations, are expected to need to undertake a second or third stage review and assessment. (LAQM.TG4)
- 2.2.5 Monitoring: No local monitoring of 1,3-butadiene is being carried out either in Denbighshire or other North Wales authorities..
- 2.2.6 Concentrations: National Monitoring of 1,3-butadiene has only been carried out on a systematic basis since 1992. and shows that recorded concentrations are all below the 1 ppb annual average objective, even at the roadside in central London.. (Broughton et al 1998).
- 2.2.7 Controls and Trends: As with benzene, the fitting of catalytic converters to petrol vehicles reduces their emissions of 1,3-butadiene. Concentrations of 1,3-butadiene in the atmosphere are also heavily dependent on the chemical composition of petrol. The new controls on the loading and dispensing of petrol at petrol stations will also have an effect on 1,3-butadiene concentrations.

## 2.3 Lead

*The Government and the devolved administrations have adopted an annual mean of 0.5  $\mu\text{g}/\text{m}^3$  as an air quality standard for lead, with an objective for the standard to be achieved by the end of 2004. In addition, a lower air quality objective of 0.25  $\mu\text{g}/\text{m}^3$  is to be achieved by the end of 2008. The focus of the authority's review and assessment for lead should be the following locations*

- *background locations;*
- *roadside locations (sites close to the facade of a building);*
- *other locations where potentially significant groups might be regularly exposed, such as schools or hospitals.(LAQM TG4(00))*

- 2.3.2 Concerns: Lead has been identified as causing acute and chronic damage to the nervous system, effects on the kidneys, joints and reproductive system. At extremely high concentrations lead is toxic.

2.3.3 Sources: 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 enhance the octane rating. With the recognition of the adverse effects of lead on human health and the growing use of catalytic converters, which are poisoned by lead, this use is declining rapidly. Most of the current emissions of lead in the UK arise from petrol-engined motor vehicles. A summary of the UK inventory of emissions of lead for 1996 is given in Table 2.1.

**Table 2.1 UK Emissions of Lead in 1996**

<b>Source Sector Emission</b>	<b>(tonnes)</b>
Road Transport	894
Non-ferrous Metal	191
Iron and Steel	65
Waste Treatment and Disposal	45
Public Power (waste)	35
Public Power (coal&oil)	34
Other Comb. in Industry	22
Residential Plant	17
Other Transport	17
Glass	14
Sinter Plant	10
Cement	6
Other	7
<b>Total</b>	<b>1357</b>

2.3.4 Existing national policies are expected to deliver the prescribed objective for lead at all rural, urban background sites and roadside locations by the year 2005. Only local authorities with significant industrial sources, which have the potential to result in elevated levels of lead in relevant locations, are expected to need to undertake a second or third stage review and assessment. (LAQM.TG4)

2.3.5 Monitoring: There is no local monitoring of lead. Historically, lead was more widely monitored, but concentrations declined dramatically in the late 1980's and early 1990's due to the introduction of unleaded petrol and the introduction of the catalytic converter.

2.3.6 Concentrations: National lead monitoring data shows that recorded concentrations are below the 0.5 µg/m<sup>3</sup> annual objective, except in the vicinity of very large lead smelters, such as those in Walsall which fall under Part A process control. (LAQM.TG4). The EC requires that monitoring be carried out in the vicinity of such large sources of lead, to determine whether the EC Directive lead levels are being breached.

2.3.7 Controls and Trends: A staged reduction of lead content of petrol over the last 20 years added to the fitting of catalytic converters to vehicles has meant that less four star leaded petrol was sold up until 1/1/2000. Catalytic converters could be "poisoned" by the lead in petrol, and had to therefore use unleaded fuel. There are also restrictions across the European community to limit the lead levels present in petrol, and the sale of leaded fuel ceased in the UK from the 1/1/2000.

## 2.4 Carbon Monoxide.

2.4.1 *The Government and the devolved administrations have adopted an 8-hour running mean of 11.6 µg/m<sup>3</sup> (10 ppm) as an air quality standard for carbon monoxide (CO), with an objective for the standard to be achieved as the maximum 8-hour running mean by the end of 2003. The focus of the authority's review and assessment for carbon monoxide should be at the following locations:*

- *background locations;*
- *roadside locations (sites close to the facade of a building);*
- *other locations where potentially significant groups might be exposed, such as schools or hospitals.(LAQM TG4(00))*

2.4.2 Concerns: Carbon monoxide affects the body by restricting the uptake of oxygen by carboxyhaemoglobin. At ambient levels, carbon monoxide may affect concentration, with higher levels leading to more serious nervous system effects.

2.4.3 Sources: The main source of CO in the United Kingdom is road transport which accounted for 71% of the total emission of 4.6 Mtonnes in 1996. Road transport sources will constitute a larger proportion of the total in most cities and maximum 8-hour concentrations are therefore expected near busy, especially congested, roads.

2.4.4 Existing national policies are expected to deliver the national air quality objective by the end of the year 2005 with the possible exception, in some years, of the near vicinity of heavily trafficked roads or in the vicinity of certain stationary sources. Only those authorities with such sources which have the potential to result in elevated levels of CO in relevant locations are expected to proceed to a second or third stage review and assessment. It is expected, for this pollutant, that most local authorities will not need to progress past the first stage. (LAQM.TG4)

2.4.5 Monitoring: No local monitoring of Carbon monoxide is being carried out in Denbighshire or other North Wales authorities.

2.4.6 Concentrations: National carbon monoxide monitoring data shows that recorded concentrations have exceeded the 10 ppm objective, especially in the vicinity of major roads in large urban areas. (LAQM.TG4). However the numbers of exceedances have declined greatly since the 1970's due to improvements in vehicle technology. In 1996 there were no measured exceedances and in 1997 only one ( Exeter roadside).

2.4.7 Controls and Trends: Improvements in vehicle technology and the fitting of catalytic converters has meant that concentrations of carbon monoxide have declined over recent years. These decreases are expected to continue.

## 2.5 Sulphur Dioxide.

2.5.1 *The Government and the devolved administrations have adopted a 15-minute mean of 266  $\mu\text{g}/\text{m}^3$  (100 ppb) as an air quality standard for sulphur dioxide ( $\text{SO}_2$ ), with the objective for the standard not to be exceeded more than 35 times in a year (approximately equivalent to the 99.9 th percentile) by the end of 2005. A new 1-hour mean objective of 350  $\mu\text{g}/\text{m}^3$  (132 ppb), to be exceeded no more than 24 times per year (approximately equivalent to the 99.7 th percentile), and a new 24-hour mean objective of 125  $\mu\text{g}/\text{m}^3$  (47 ppb), to be exceeded no more than 3 times per year (approximately equivalent to the 99th percentile), have been adopted as additional objectives to be achieved by the end of 2004.*

*The focus of the authority's review and assessment for the 24-hour objective for sulphur dioxide should be at the following locations*

- *background locations;*
- *roadside locations (sites close to the facade of a building);*
- *other locations (e.g. in the vicinity of housing, schools or hospitals etc.).*

*For the 1-hour and 15-minute mean objectives, the focus of the authority's review and assessment should be any location, where members of the public might be exposed over the relevant averaging. This might, for example include an area such as a playing field downwind of a point source.* (LAQM TG4(00))

2.5.2 Concerns: Sulphur dioxide is an acute respiratory irritant, hence the short averaging time for the standard. Sulphur dioxide may also be converted through chemical reactions in the atmosphere to secondary sulphate particulate matter ( $\text{PM}_{10}$ ).

2.5.3 Sources: Sulphur dioxide is emitted in the combustion of coal and oil. The total UK emission in 1996 was 2.0 million tonnes. The main sources were: power generation (65%), other industry (24%), commercial and domestic heating (6%) and road transport (2%). Many large point sources are regulated by the Environment Agency, who review emission limits for industrial plant on a four yearly basis.

2.5.4 Monitoring: No monitoring for Sulphur dioxide is carried out in Denbighshire. Limited monitoring by other North Wales authorities indicates that in those locations no exceedance of national objectives is expected.

2.5.5 Concentrations: National sulphur dioxide monitoring data shows that recorded concentrations have exceeded the 100 ppb objective, especially in the vicinity of large point sources of sulphur dioxide, such as power stations. Exceedances have also been recorded in domestic coal burning areas of the north-east, and in the East Thames Gateway. (Broughton et al 1998).

The 15-minute objective is currently widely exceeded in the UK, at both urban and rural sites. These exceedances are associated with emissions from both large and small

combustion plants, and domestic coal burning. Exceedances of the 1-hour and 24-hour objectives are confined to Belfast, and are associated with domestic coal burning which is still widespread in this area..

- 2.5.6 Controls and Trends: Discussions at European level on measures to combat acid rain will cut future sulphur dioxide concentrations, as will the introduction of low sulphur diesel and its derivatives.

## 2.6 Nitrogen Dioxide.

- 2.6.1 *The Government and the devolved administrations have adopted an annual mean of 40  $\mu\text{g}/\text{m}^3$  (21 ppb), and a 1-hour mean of 286  $\mu\text{g}/\text{m}^3$  (150 ppb), as the air quality standards for nitrogen dioxide. The objectives are for the annual mean standard to be achieved by the end of 2005, and a 1-hour mean of 200  $\mu\text{g}/\text{m}^3$  (105 ppb) not to be exceeded more than 18 times per year, to be achieved by the end of 2005 (approximately equivalent to the 99.8<sup>th</sup> percentile of hourly means).*

*The focus of the authority's review and assessment for the annual mean objective for nitrogen dioxide should be the following locations:*

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

*For the 1-hour mean objective, the focus of the authority's review and assessment for nitrogen dioxide should include any non-occupational, outdoor locations (including kerbside sites) given that short-term exposures are potentially likely at these locations. (LAQM TG4(00))*

- 2.6.2 Concerns: Nitrogen dioxide is a respiratory irritant, and is also thought to be a sensitiser, which may worsen other conditions such as hay fever. There are a number of oxides of nitrogen present in the atmosphere, but it is nitrogen dioxide which gives rise to health concerns.
- 2.6.3 Sources: Nitrogen dioxide ( $\text{NO}^2$ ) and nitric oxide (NO) are both oxides of nitrogen and together they are referred to as  $\text{NO}_x$ . All combustion processes produce some  $\text{NO}_x$ , but only  $\text{NO}^2$  is associated with adverse effects on human health. The main sources of  $\text{NO}_x$  in the United Kingdom are road transport, which, in 1996 accounted for about 47% of the emissions of 2.1 million tonnes per year as  $\text{NO}^2$ , power generation 22% and domestic sources 4%. In urban areas, the proportion of local emissions due to road transport sources is larger. (LAQM.TG4)

- 2.6.4 Monitoring: Nitrogen dioxide is the pollutant for which there is the most local monitoring. This is because cheap and relatively simple monitoring equipment is available to monitor nitrogen dioxide. Most districts have at least four sites, which participate in a national survey of nitrogen dioxide which has been running for a number of years. More sophisticated monitoring equipment is also in use, giving hourly readings of nitrogen dioxide concentration.
- 2.6.5 Concentrations: Existing monitoring that has been carried out in the Rhyl area as part of the UK Nitrogen Dioxide Survey show similar levels to other neighbouring authorities where roadside levels are at or close to the annual mean objective. The expected levels away from the kerbside can be considered to be similar in practice to the Intermediate sites as reported in the National survey indicated long term exposure to NO<sup>2</sup> as being well within the objective value. The results of the diffusion tube monitoring are included in appendix 1.
- 2.6.6 Controls and Trends: The introduction of catalytic converters into the vehicle fleet will lead to further reductions in nitrogen dioxide concentrations. However the Government acknowledges that, for Nitrogen Dioxide, reductions over and above that delivered by National measures will be required if the Objective is to be reached in all areas.

## **2.7 Particulate Matter (PM<sub>10</sub>).**

2.7.1 *The Government and the devolved administrations have adopted two air quality objectives for fine particles (PM<sub>10</sub>), which are equivalent to the EU Stage 1 Limit Values. The objectives are 40 µg/m<sup>3</sup> as the annual mean, and 50 µg/m<sup>3</sup> as the fixed 24-hour mean to be exceeded no more than 35 days per year, to be achieved by the end of 2004. The objectives are based on measurements carried out using the European gravimetric transfer reference sampler or equivalent.*

*The focus of the authority's review and assessment for PM<sub>10</sub> should be the following locations:*

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

- 2.7.2 Concerns: Particulate matter is a concern, as it has been linked with both increased morbidity and premature mortality, estimates have placed the figure as high as 10,000 excess premature deaths per year for the whole of the UK.
- 2.7.3 Sources: National UK emissions of primary PM<sub>10</sub> have been estimated as totalling 213,000 tonnes in 1996. Of this total, around 24 % was derived from road transport sources, 38% from industrial sources, 16% from power stations and 17% from domestic and other low-power combustion. It should be noted that, in general, the emissions estimates for PM<sub>10</sub> are less accurate than those for the other pollutants with prescribed

objectives, especially for sources other than road transport. (LAQM.TG4). These represent the primary PM<sub>10</sub> emissions.

Additional contributions to the atmosphere arise from secondary particles which are formed through chemical reactions involving nitrogen dioxide and sulphur dioxide in the atmosphere. Further significant sources of primary PM<sub>10</sub> include sea salt, road dust and wind blown soil.

- 2.7.4 **Monitoring:** Monitoring of PM<sub>10</sub> has only been carried out nationally since 1992, and there is currently no local monitoring in Denbighshire or other neighbouring authorities.
- 2.7.5 **Concentrations:** PM<sub>10</sub> is a major pollutant of concern as far as the National Air Quality Strategy is concerned, as monitoring data from the national networks show that the objective is currently exceeded at the vast majority of monitoring sites throughout the UK. These include both central urban sites and more remote monitoring in rural areas. (Broughton et al 1998).
- 2.7.6 **Controls and Trends:** Controls on PM<sub>10</sub> are expected to deliver reductions, but these may not reduce concentrations sufficiently to meet the NAQS objective by 2005. Low sulphur diesel fuels and controls on industrial emissions will reduce PM<sub>10</sub> concentrations, but the natural sources provide a background level which is always present onto which the vehicle and industrial emissions are added. Analysis of concentrations and meteorological data have suggested that long-range intercontinental transport can under certain conditions also provide a significant source of particles.

### **3. INFORMATION ABOUT DENBIGHSHIRE COUNTY COUNCIL.**

- 3.1 Denbighshire County Council covers an area which runs from the North Wales coastal resorts of Rhyl and Prestatyn down through the Vale of Clwyd, south as far as Corwen and the popular tourist town of Llangollen. Along the way it takes in the historic towns of Rhuddlan, Denbigh and Ruthin, each with its own castle, and the tiny cathedral city of St. Asaph.
- 3.2 Denbighshire has a population of approximately 90,400 with an estimated summer population in excess of 150,000, and covers an area of 83,872 hectares (323 square miles).
- 3.3 Denbighshire is largely a rural county with tourism and agriculture the main industries. The expanding St Asaph Business Park, on the edge of the A55, is the home to a number of companies and organisations.
- 3.4 The A55 expressway crosses north Denbighshire giving direct links to the national and European motorway network, whilst in the south the A5 crosses the county linking through to Snowdonia on a route designed by Thomas Telford. The A494, linking Chester to Dolgellau, also runs through the county.

#### **4. ROAD TRAFFIC AND TRANSPORT IN DENBIGHSHIRE.**

- 4.1 Denbighshire lies astride the main east-west routes in North Wales, the A55 trunk road and North Wales Coast Main Line, both of which form part of the Trans-European Network, and the A5 trunk road. The A55 is of dual carriageway standard and connects the north of the County with the motorway network in North-West England and the main towns of North-West Wales, including the port of Holyhead. The A5 trunk road crosses the south of Denbighshire and provides connections with the A483 and M54 to the east and Anglesey and Snowdonia to the west. The road offers a lower standard of route than the A55 and is seen by the National Assembly for Wales as catering for local and sub-regional traffic, and as a tourist/leisure route. A further route crossing the County is the A494 trunk road which connects Ruthin with the southern part of Gwynedd to the west and the A55 to the east.
- 4.2 The County has two main line railway stations on the North Wales Coast Line at Prestatyn and Rhyl. Direct train services operate to the rest of the North Wales coast, Chester, Manchester, Birmingham, Cardiff and London. Llangollen and the Dee Valley are served by stations outside Denbighshire at Ruabon and Chirk which are situated on the Chester-Wrexham- Shrewsbury-Birmingham railway line. In addition, there is a preserved railway line, the Llangollen Railway, which operates between Llangollen and Carrog. The low frequency of service and relatively high fares currently limit its use primarily to tourists. Some use is made by local residents who are eligible for passes which reduce travel costs to levels comparable with local bus fares.
- 4.3 The County Council is responsible for the entire highway network other than the A5, A55 and A494 trunk roads. The trunk roads are the responsibility of the National Assembly for Wales. The total length of roads in the County is 1,471 km, made up as follows:
- |                                        |        |
|----------------------------------------|--------|
| Trunk roads                            | 72 km  |
| Principal classified A roads           | 140 km |
| Non principal classified B and C roads | 655 km |
| Unclassified roads                     | 605 km |
- 4.4 The Council has defined a strategic highway network which includes the A5, A55 and A494 trunk roads and the following roads for which the Council is responsible:
- the A525 which runs north-south through the County connecting Rhyl, with the A55, St Asaph, Denbigh, Ruthin and continues outside the County to Wrexham;
  - the A548 coast road which runs between Pensarn in neighbouring Conwy County Borough (where it connects with the A55), Rhyl and Prestatyn to the Denbighshire/Flintshire boundary and then to the New Dee Crossing;
  - the A547 which runs between Abergele in neighbouring Conwy County Borough (where it connects with the A55), Rhuddlan, Dyserth and Meliden to Prestatyn;
  - the A5151 which connects the A525 at Rhuddlan, with Dyserth and the A55 near Holywell in Flintshire.
  - the A541 which connects the A525 at Trefnant with Mold in Flintshire;
  - the A539 which connects Llangollen with the A483 and Wrexham.

4.5 Denbighshire does not experience serious problems of traffic congestion. The congestion that does occur is principally during the summer months. Vehicles suffer delays and queuing along the A548 coast road, on the A547 within Prestatyn, the A525 within Rhyl and the B5118 West Parade and East Parade in Rhyl. This congestion reflects the Area's attraction to day-trippers and holidaymakers. Short term delays and queuing can also be experienced in Llangollen on days of peak visitor numbers. Localised congestion occurs at other times and locations often around schools at school start and finish times.

The traffic pressures associated with seasonal visitors also give rise to on-street parking particularly in the residential streets surrounding Rhyl Town Centre.

**Table 4.1. Daily Average Traffic Counts from strategic Roads within Denbighshire.**

<b>Road No.</b>	<b>Location</b>	<b>Ave Flow ( 24 hr.)</b>	<b>Predicted 2005 Flow *</b>
<b>A548</b>	<b>Wellington Road/ High St Junction, Rhyl.</b>	<b>13,000</b>	<b>13,450</b>
<b>A55 (T)</b>	<b>St. Asaph.</b>	<b>43,126</b>	<b>44,618</b>
<b>A5 (T)</b>	<b>East of Llangollen</b>	<b>8,616</b>	<b>8,914</b>
<b>A548</b>	<b>Near Rhyl Golf Course</b>	<b>19,640</b>	<b>20,320</b>
<b>A525</b>	<b>The Roe, St Asaph</b>	<b>15,696</b>	<b>16,239</b>
<b>A525</b>	<b>Rhyl Road, St Asaph</b>	<b>13,000</b>	<b>13,450</b>
<b>A543</b>	<b>Rhuddlan Road, Rhyl</b>	<b>14,170</b>	<b>14,660</b>
<b>A525</b>	<b>Vale Street, Denbigh</b>	<b>13,336</b>	<b>13,797</b>
<b>A541</b>	<b>Denbigh Bypass</b>	<b>7,199</b>	<b>7,448</b>
<b>A547</b>	<b>Nant Hall Road, Prestatyn</b>	<b>6,264</b>	<b>6,481</b>

\* Total Traffic Central Forecast. The growth factors are estimated as follows.

1996 to 2001 = 1.74%

2001 to 2005 = 1.69%

Source. Denbighshire County Council Highways and Transportation Section, Technical Services Directorate.

## **5. INDUSTRIAL AND DOMESTIC SOURCES OF POLLUTION.**

### **5.1 Industrial Sources.**

5.1.1 Most significant Industrial sources are currently controlled under the Environmental Protection Act 1990, and are classified into either;

Part A processes (large intensive industries such as power stations and chemical works)

Or

Part B processes (less intense and potentially polluting industries such as Quarrying and associated industries, vehicle respraying facilities and concrete batching plants) for guidance and control. Part A processes fall under the jurisdiction of the Environment Agency, whilst control of Part B processes is a duty carried out by local authorities. Each process receives an Authorisation to emit prescribed substances to the air.

5.1.2 Local exceedences of air quality objectives caused by a process may be grounds for the imposition of stricter conditions in an authorisation than would normally be the case. However, it will have to be clear that the industry alone is responsible for the exceedence, and not a combination of other factors. No such exceedences are expected in Denbighshire.

5.1.3 A table of Part A and Part B processes in Denbighshire together with their potentially significant emissions (if any) are given in appendix 2. Similar details have been obtained from neighbouring authorities for consideration in Denbighshires Review and Assessment.

Some small industrial processes and or combustion sources that fall outside of Part B Process control could also be of concern and these have been taken into account in the review and assessment.

### **5.2 Domestic and commercial sources.**

5.2.1 The area around Rhyl and Prestatyn in North Denbighshire is a relatively highly populated area when compared to the rest of the county however it can be considered less significant when considered regionally. It will naturally have higher concentrations of smaller sources such as domestic and commercial heating that that implies. Within the Review and Assessment these sources have been taken into account by the use of the national estimates of pollutant concentration available from National Environmental Technology Centre, (NETCEN). These are reproduced within the appendices. (See Appendix 3.) These indicate that the risk of exceedance of national air quality standards and objectives in Denbighshire due to these sources alone is negligible although pollutants emmitted from these sources also need to be considered in combination with other local sources of the same pollutant.

## **6. REVIEW AND ASSESSMENT**

### **6.1 Exposure.**

A key concept in review and assessment is that of exposure, with the DETR stating that:

"For the purposes of determining the focus of review and assessment local authorities should have regard to locations where individuals are likely to be exposed over the averaging time of the objective."

It is therefore recommended that:

- For objectives with short averaging times (e.g. sulphur dioxide and the hourly nitrogen dioxide objective) reviews and assessments should be focused on any non-occupational, near ground level outdoor location given that exposures over such short averaging times are potentially likely.
- For objectives with longer averaging times (from the carbon monoxide rolling 8 hour objective upwards), reviews and assessments should be focused on the following non-occupational, near ground level outdoor locations; background locations; roadside locations; and other areas of elevated pollutant concentrations where a person might reasonably be expected to be exposed (e.g. in the vicinity of housing, schools or hospitals etc) over the relevant averaging time of the objective.

These requirements have been taken into account in undertaking the review and assessments outlined below.

## 6.2 **Benzene.**

### 6.2.1 **Pollutant Specific Guidance.**

*'In compiling information for the first stage review and assessment, the authority should collated the following:'*

- *details of existing and/or proposed Part A authorised processes in the authority's area;*
- *details of existing and/or proposed Part B authorised processes in the authority's area;*
- *details of any significant sources of benzene in neighbouring areas which could impact within the authority's area.*

*It should be noted that emissions from road traffic are unlikely to be significant, and should not generally need to be considered by the authority.'*

*'The Government and the devolved administrations are currently finalising an investigation into ambient levels of benzene in the vicinity of petrol stations. Whilst there may be current exceedances of the objective in the vicinity of some large petrol stations in London (where background concentrations are higher), the expected reduction in emissions will ensure that there will be no exceedances due to petrol stations by 2003. Authorities should therefore assume that petrol stations **do not** give rise to significant emissions of benzene.'*

### 6.2.2 **Information reviewed.**

There are no Part A or B processes, or significant other sources, either within the borough or within neighbouring areas, that are potential significant sources (of a size likely to give rise to exceedances of the objective in Denbighshire) of this pollutant . *See appendix 2.*

There are no planned developments of such processes.

Estimated Background concentrations are well within the pollutant objective. *See appendix 3.*

Existing national policies are expected to deliver the objective for all areas by 2005.

### 6.2.3 **Conclusion.**

The risk of the Air Quality Objective being exceeded in the Denbighshire area either now or in the year 2005 is negligible.

## **6.3 1,3-Butadiene.**

### **6.3.1 Pollutant Specific Guidance.**

*To carry out the First Stage review and assessment, the authority should collate the following information:*

- *details of existing and/or proposed Part A authorised processes in the authority's area;*
- *details of existing and/or proposed Part B authorised processes in the authority's area;*
- *details of any significant sources of 1,3 butadiene in neighbouring areas which could impact within the authority's area.*

*It should be noted that emissions from road traffic are unlikely to be significant, and should not generally need to be considered by the authority.*

### **6.3.2 Information reviewed.**

There are no Part A or B processes, or significant other sources, either within the borough or within neighbouring areas, that are potential significant sources (of a size likely to give rise to exceedances of the objective in Denbighshire) of this pollutant . *See appendix 2.*

There are no planned developments of such processes.

Estimated Background concentrations are well within the pollutant objective. *See appendix 3.*

Existing national policies are expected to deliver the objective for all areas by 2005.

### **6.3.3 Conclusion.**

The risk of the Air Quality Objective being exceeded in the Denbighshire area either now or in the year 2005 is negligible.

## **6.4 Lead.**

### **6.4.1 Pollutant Specific Guidance.**

*To carry out the First Stage review and assessment, the authority should collate the following information:*

- *details of existing and/or proposed Part A authorised processes in the authority's area;*
- *details of existing and/or proposed Part B authorised processes in the authority's area;*
- *details of any significant sources of lead in neighbouring areas which could impact within the authority's area .*

*It should be noted that emissions from road traffic do not need to be considered by the authority.*

### **6.4.2 Information reviewed.**

The Pollutant Specific Guidance indicates types of industrial process that may give rise to significant emissions of lead. *See Appendix 2.* However from examination of the stack monitoring undertaken at those sites under requirements of their I.P.C and L.A.A.P.C. Authorisations, enforced by this authority and the Environment Agency the potential for exceeding the objective is considered negligible.

There are no other Part A or B processes, or significant other sources, either within the borough or within neighbouring areas, that are potential significant sources (of a size likely to give rise to exceedances of the objective in Denbighshire) of this pollutant. *See appendix 2.*

There are no planned developments of such processes.  
Estimated Background concentrations are well within the pollutant objective.  
*See appendix 3.*

Existing national policies are expected to deliver the objective for all areas by 2005.

### **6.4.3 Conclusion.**

The risk of the Air Quality Objective being exceeded in the Denbighshire area either now or in the year 2005 is negligible.

## 6.5 Carbon Monoxide.

### 6.5.1 Pollutant Specific Guidance.

*To carry out the First Stage review and assessment, the authority should collate the following information:*

- *information on existing and 2003 forecast annual average daily traffic flows for any existing or proposed roads in the authority's area, with traffic flows which could generate significant quantities of carbon monoxide (see below);*
- *details of existing and/or proposed Part A authorised processes in the authority's area;*
- *details of existing and/or proposed Part B authorised processes in the authority's area;*
- *details of any planned developments in the authority's area, particularly if they will affect traffic flows;*
- *details of any significant sources of carbon monoxide in neighbouring areas which could impact within the authority's area.*

*It is considered that the existing policy measures in place at a national level will be sufficient to lead to all concentrations of carbon monoxide at roadside locations falling below the air quality objective by 2003. It is considered very unlikely that authorities will need to proceed beyond the First Stage Review and Assessment.*

*To assist authorities in the identification of roads with the potential to emit significant quantities of carbon monoxide, a screening approach has been prepared using the methodology set out in the Design Manual for Roads and Bridges (DMRB). Based upon a knowledge of traffic flow and vehicle speed, it is possible to determine whether there is a risk of exceeding the air quality objective in 2003. Single carriageway roads are treated separately from dual carriageway roads and motorways.*

*It will only be necessary to proceed to the Second Stage review and assessment **in the following cases:***

- *for single carriageway roads, where the daily average traffic flow exceeds 80,000 vehicles per day (in practice such flows are highly unlikely to occur, and single carriageway roads can effectively be disregarded);*
- *for dual-carriageway (2 or 3 lane) roads, where the daily average traffic flow exceeds 120,000 vehicles per day;*
- *for motorways, where the daily average traffic flow exceeds 140,000 vehicles per day.*

## 6.5.2 Information Reviewed.

**Road Traffic.** Current, and forecast, annual average daily traffic flows. There are no forecast flows greater than 80,000 vehicles per day on any roads in Denbighshire by 2005.  
( *See table 4.1.*)

**Industrial Processes.** There are no Part A or B processes, or significant other sources, either within the borough or within neighbouring areas, that are potential significant sources (of a size likely to give rise to exceedances of the objective in Denbighshire) of this pollutant . *See appendix 2.*

There are no planned developments of such road traffic infrastructure or industrial processes.

Estimated Background concentrations are well within the pollutant objective.  
*See appendix 3.*

Existing national policies are expected to deliver the objective for all areas by 2005.

## 6.5.3 Conclusion.

The risk of the Air Quality Objective being exceeded in the Denbighshire area either now or in the year 2005 is negligible.

## **6.6 Sulphur Dioxide.**

### **6.6.1 Pollutant Specific Guidance.**

*To carry out the First Stage review and assessment, the authority should collate the following information:*

- *details of existing or proposed Part A authorised processes in the authority's area;*
- *details of existing or proposed Part B authorised processes in the authority's area;*
- *details of any small combustion plant (>5MW thermal) using solid fuels or fuel oil;*
- *these are likely to be associated with schools, hospitals, and other large commercial and institutional buildings;*
- *details of the density of houses burning coal or Solid Smokeless Fuel (if appropriate);*
- *details of any significant sources of SO<sub>2</sub> in neighbouring areas which could impact within the authority's area.*

### **6.6.2 Information reviewed.**

#### **Industrial Sources.**

There are a number of oil based combustion systems with an output greater than 5MW linked to the road stone coating plants located at four quarries in the local authority area which despite their rural location are indicated by the Pollutant Specific Guidance as having the potential to emit significant quantities of SO<sub>2</sub> and will warrant further consideration.

#### **Domestic Solid Fuel Use.**

A desk top study of the potential density of premises that will use coal as a significant part of their heating provision has been carried out which reveals the potential for an exceedance of the threshold figure in the Pollutant Specific Guidance of 300 properties per 1 square km using solid fuel. However the greatest density of coal usage was estimated to be from areas of Rhyl with a high proportion of local authority owned property and also from the central town area of Llangollen.

6.6.3 A programme is currently in place to ensure that all the existing local authority housing stock will have been covered by conversion programmes which offers occupants the chance to convert from coal to gas fired heating systems before 2005. Current uptake indicates that this will be sufficient to ensure that the density of coal usage of 300 properties per 1 square km will not be exceeded in predominantly Local Authority owned premises in Denbighshire.

- 6.6.4 Contact has been made with most of the Coal Merchants who make deliveries in the Llangollen area and from the information provided by them it is unlikely that national objectives for sulphur dioxide will be exceeded due to the burning of coal in domestic residential properties alone. However Llangollen lies in a steeply sided river valley and a preserved steam railway operates throughout the year from a main station in the centre of Llangollen which will add to any existing solid fuel usage and consequently sulphur dioxide emissions.
- 6.6.5 There are no other Part A or B processes, or significant other sources, either within the borough or within neighbouring areas, that are potential significant sources (of a size likely to give rise to exceedances of the objective in Denbighshire) of this pollutant . *See appendix 2.*

There are no planned developments of any further such processes.

#### **6.6.6 Conclusion.**

The Pollutant Specific Guidance issued by the DETR and our assessment suggests that there may be a risk of the Air Quality Objective being exceeded due to;

1. the presence prescribed Part 'B' processes requiring more detailed consideration,
2. unquantifiable emissions in and around Llangollen from domestic and other sources.

As a result a second stage review and assessment will be required to be completed for Sulphur dioxide.

## 6.7 Particulate Matter. (PM<sub>10</sub>).

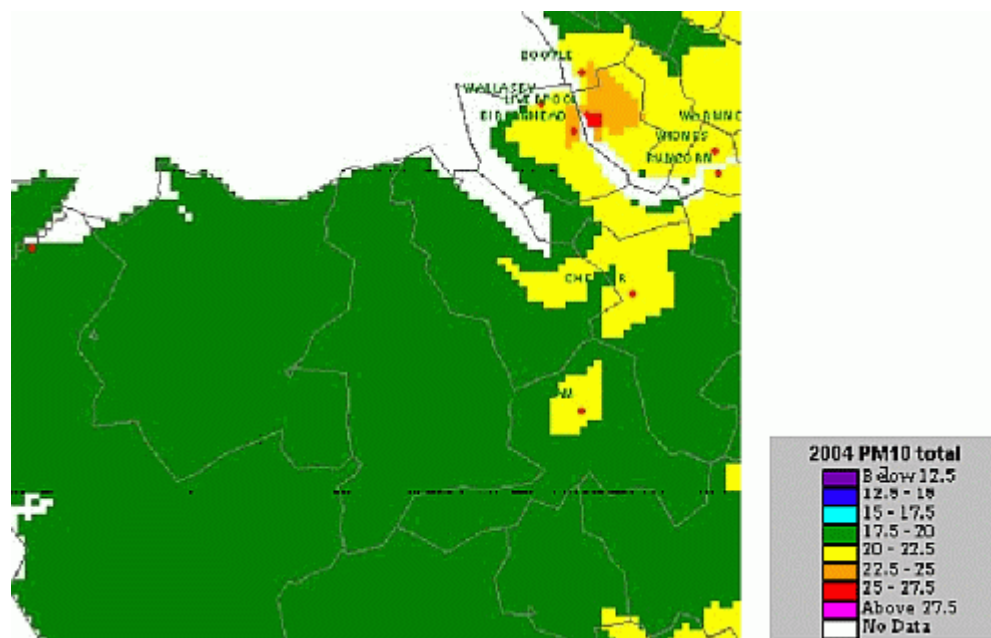
### 6.7.1 Pollutant Specific Guidance.

To carry out the First Stage review and assessment, the authority should collate the following information:

- estimated annual mean background PM<sub>10</sub> concentrations (gravimetric) for 2004;
- traffic data for existing or proposed roads (excluding those with daily average traffic flows of less than 5,000 veh/day);
- information on domestic solid fuel use (if applicable);
- information on existing and/or proposed Part A and Part B authorised processes;
- information on sources of uncontrolled or fugitive dust emissions, such as quarries,
- landfill sites, major construction works, coal and aggregate stock yards etc.;
- details of any planned developments in the area, particularly if they will affect traffic flows;
- details of any significant sources of PM<sub>10</sub> in neighbouring areas which could impact within the authority's area.

### 6.7.2 Information reviewed.

#### Annual Mean Background Concentrations.



As can be seen from the above map all parts of the authorities area are within the area shaded for expected total concentrations of 17.5 - 20 µg/m<sup>3</sup>. It is against this background level that all other additional sources must be considered.

### **6.7.3 Road Traffic.**

When the traffic data contained within table 4.1 above is considered against the guidance contained in LAQM TG4(00) for the Denbighshire locality, taking into account the relatively low background predicted concentrations expected for 2004, traffic using single carriageway roads would need to exceed 40,000 vehicles per day to require a second stage assessment for that location and dual carriageway roads would have to exceed 90,000 vehicles per day to trigger the second assessment. In no location in Denbighshire do any existing or expected traffic levels approach these figures.

### **6.7.4 Industrial Sources.**

There are no Part A processes, or significant other industrial sources, either within the borough or within neighbouring areas, that are potential significant sources (of a size likely to give rise to exceedances of the objective in Denbighshire) of this pollutant.

When considering the details of the Part B processes likely to give rise to significant quantities of particulate to the air both Quarry and Roadstone coating processes are identified. These processes are mainly found on the same site and are already the subject of further consideration for emissions of Sulphur dioxide.

### **6.7.5 Uncontrolled and Fugitive Emissions.**

There is the potential for dust emissions within the PM<sub>10</sub> size fraction to arise from a variety of uncontrolled and fugitive sources. These include, but are not limited to:

- quarrying and mineral extraction processes;
- landfill sites;
- coal and material stockyards, or materials loading / unloading;
- major construction works.

Emissions from these sources are not well quantified, and it is therefore difficult to predict PM<sub>10</sub> concentrations with any accuracy.

### **6.7.6 Quarrying, Stockpiles and Landfill Sites.**

The majority of dust emissions from quarrying and materials handling tend to be within the larger particle size fractions, and correspondingly fall out from the atmosphere rapidly with increasing distance from the source. A recent study by Newcastle University has reported a small increase (about 2µg/m<sup>3</sup>) to annual mean PM<sub>10</sub> concentrations at distances of up to about 750m from opencast coal mining operations. Monitoring studies completed by the First Phase authorities have indicated few, if any, exceedances of the objectives in the vicinity of quarrying activities, although the potential for problems does depend upon the type of material handled. Problems are also more likely to occur in areas of the UK where prevailing background PM<sub>10</sub> concentrations are high. Due to the uncertainties involved, where local monitoring data are available, it is recommended that authorities proceed to a Second Stage review and assessment. In the absence of any monitoring data, the following approach is suggested within the Pollutant Specific Guidance TG4 (00):

### 6.7.7 Specific Guidance on Particulate emissions from Quarrying, Stockpiles and Landfill sites.

- If there are no relevant locations for public exposure within 1000 metres of the dust emissions sources (e.g. a haul road, or a crusher etc) there should be no need to proceed further (the distance should be taken from the source, and not from the site boundary);
- If there are relevant locations within 400-1000 metres of the dust emissions sources, there should be no need to proceed further if the estimated 2004 annual mean background PM<sub>10</sub> concentration is below 26 µg/m<sup>3</sup>, gravimetric.
- If there are properties within 200-400 metres of the dust emissions sources, there should be no need to proceed further if the estimated 2004 annual mean background PM<sub>10</sub> concentration is below 25 µg/m<sup>3</sup>, gravimetric.
- Where properties lie closer than 200 metres to the source, authorities are advised to investigate whether any dust nuisance complaints have been reported, as this may give a guide to the potential problems. However, the absence of complaints in an area cannot be used as a definitive method of determining that the objective will not be exceeded, and authorities are advised to take account of local background levels and their own professional judgement based on a visual inspection of the operations.

The above general guidance contained within the LAQM TG4(00) regarding the location of such processes in relation to 'relevant locations', indicates that for areas with low 2004 expected background concentrations of particulates a second stage assessment may not be required unless properties are within 200- 400 metres of the actual site of the process.

The 2004 expected background levels of PM<sub>10</sub> for Denbighshire are between 17.5 and 20 µg/m<sup>3</sup> i.e. Significantly lower than either of the suggested limits in (6.7.7) above. In general all quarrying, screening and haul road activities within Denbighshire are significantly in excess of 200 metres from 'relevant locations'. However in these locations complaints of dust nuisance have not generally been received about these processes and in our judgement this coupled with the low background levels expected in 2004 exceedance of the objectives is not expected due to individual processes..

One particular Limestone Quarry is currently operating within 200 m of several residential properties however it is expected that this will have ceased operations by 2004.

The area surrounding Maeshafn and Llanarmon-yn-Ial contains a number of locations within a small geographic area where the major industry comprises of quarrying and the production of road stone. Sources of particulate naturally include those related activities such as soil stripping and the dust liberated from haul roads in addition to those primary activities highlighted above that have the potential to release uncontrolled and fugitive emissions. A first stage review and assessment must consider the potential for an additive effect due to the proliferation of mineral industries in the area.

Evidence of the monitoring of similar intensive mixed mineral processes in Derbyshire have indicated that there are few if any exceedances of the objectives in the vicinity of sites containing quarrying and other related activities. ( First Phase Assessment of PM<sub>10</sub>, High Peak Borough Council and Derbyshire Dales District Council.) This evidence together with the above details of our first stage review and assessment would tend to indicate that the air quality standards and objectives are not likely to be breached within Denbighshire before 2004, however as a precaution prior to the second review required to be completed around 2004 we intend to carry out investigations or monitoring similar to that expected in a second and or third stage review and assessment in the areas identified when resources are available.

There are no other industrial sources that are expected to cause significant releases of particulate ( of a quantity likely to cause exceedances of the objective) in Denbighshire.

#### **6.7.8 Domestic Solid Fuel Use.**

As identified in (6.6.2) above no significant areas of high solid fuel usage are expected to exist in Denbighshire in 2004 that would require a second stage assessment through this source alone.

#### **6.7.9 Conclusion.**

The Air Quality Objective is not expected to be exceeded in the Denbighshire area either now or in the year 2005. Second and third stage assessment could be considered solely on the basis of the Pollutant Specific Guidance, however there is no current means of calculating the emissions of particulate from fugitive sources and the costs of monitoring which would fall on the authority are prohibitive. Existing studies carried out in similar locations by first phase authorities indicate that no exceedance has been identified in those locations despite those locations being close to larger mineral processes than is present in Denbighshire. However should resources allow, further investigation of the presence of particulates in and around the area containing the mineral industries could be considered.

## 6.8 Nitrogen Dioxide.

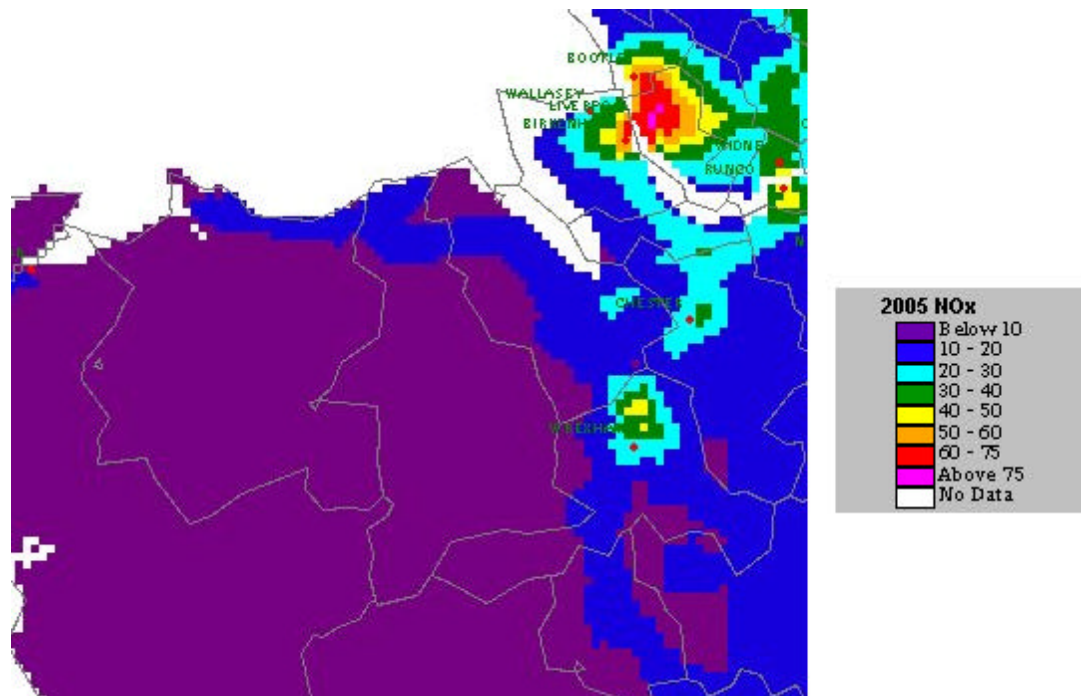
### 6.8.1 Pollutant Specific Guidance.

*To carry out the First Stage review and assessment, the authority should collate the following information:*

- *estimated 2005 annual mean background NO X concentrations from the Internet site ([www.aeat.co.uk/netcen/airqual/](http://www.aeat.co.uk/netcen/airqual/));*
- *information on existing and 2005 forecast annual mean traffic flows for any existing or proposed roads in the authority's area which could generate significant quantities of NO X ;*
- *details of existing and/or proposed Part A authorised processes in the authority's area;*
- *details of existing and/or proposed Part B authorised processes in the authority's area;*
- *details of any planned developments in the authority's area, particularly if they will affect traffic flows;*
- *details of any significant sources of NO X in neighbouring areas which could impact*

### 6.8.2 Information reviewed.

**Estimated Background NOx Concentrations (2005).**



Estimated background concentrations indicate that for the majority of the county levels are particularly low ( less than 10  $\mu\text{g}/\text{m}^3$ ) however the area around the coastal strip has a slightly elevated level of 10 - 20  $\mu\text{g}/\text{m}^3$ .

### 6.8.3 Road Traffic.

Traffic data in table 4.1 supplied by Denbighshire County Council Highways and Transportation section, when considered in conjunction with the nomograms provided in LAQM. TG4(00) indicates that for all single and dual carriageway roads south of St Asaph no exceedance of the objective is likely due to the low background concentrations and traffic levels.

In the area surrounding the A55 (T) at St Asaph the guidance indicates that there could be a potential for exceedance particularly when the added effect of the traffic using the A 525 (The Roe and Rhuddlan Road ) is added to the existing traffic on the A 55 (T).

The area surrounding Wellington Road in Rhyl contains significant traffic flows and some minor congestion particularly in the summer season due to incoming holiday traffic. However by use of the nomogram for single carriage way roads found in LAQM TG4(00) indicated that to need to proceed to a second stage assessment the average daily traffic count would need to exceed 17,000 vehicles.

In addition existing Nitrogen dioxide monitoring in this vicinity indicates that the concentrations of NO<sub>2</sub> in the air in this area is at or just below the annual average objective. Levels of NO<sub>x</sub> and NO<sub>2</sub> in particular are expected to decrease with time up until 2005 due to the increasing proportion of their vehicle fleet that is fitted with 3 way catalytic converters and with the progress afforded with new vehicle technology. In addition Transport Planners are considering methods that can be adopted for Traffic Reduction which will also improve air quality. The existing monitoring carried out in this area will continue to ensure that the air quality in this area is kept under review.

Additional monitoring points have been sited in the area around the St Asaph A 55 junction and also on the A 548 coast road between Rhyl and Prestatyn which will be of use to this department in considering a second stage review and assessment.

Guidance suggests that where the annual average objective is met the 1 hr objective is also likely to be achieved.

### 6.8.4 Industrial Processes.

There are no Part A or B processes, or significant other sources, either within the borough or within neighbouring areas, that are potential significant sources (of a size likely to give rise to exceedances of the objective in Denbighshire) of this pollutant . *See appendix 2.*

There are no planned developments of such processes.

## **7 Summary.**

- 7.1 The following sources within the borough may present significant sources of the chosen pollutants and therefore justify more detailed investigation into their likely levels in the year 2005.

Road traffic: Nitrogen dioxide.

Prescribed part B processes: Sulphur dioxide.

Solid Fuel Use. Sulphur dioxide.

- 7.2 Stage two assessments will now begin.

Readers are asked to note that the stage one process will be repeated in sufficient time to ensure that the air quality objectives for 2005 will be met. If that review reaches different conclusions to those in this document because of for instance unpredicted growth in traffic or the arrival of a new Part A or Part B processes within a significant distance of an exposed population further assessments will need to be carried out with respect to those pollutants identified.

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# Appendix 1.

## Results of Nitrogen dioxide monitoring in Rhyl.

Air Quality Monitoring Results 1996 - 2000							<u>Denbighshire</u>	<u>U.K.</u>
Site	Location	1996	1997	1998	1999	2000	5yr Ave 1996 - 2000	5 yr Ave 1994 - 1998
1	Wellington Road/High Street, Rhyl	54.2	45.4	40.5	41.6	41.7	<b>44.7</b>	45.5
2	Barclays Bank Car Park, Rhyl	28.7	29.8	25.8	23.3	21.6	<b>25.8</b>	31.7
3	St Georges Cres, Rhyl	13	10	19.5	15.6	17.6	<b>15.1</b>	25.6
4	Bryn Coed Park, Rhyl.	14.4	18.6	17.6	18.8	18.4	<b>17.6</b>	25.6
All values expressed as $\mu\text{g}/\text{m}^3$								
National Objective		40 $\mu\text{g}/\text{m}^3$ 21 ppb						

## ***Appendix 2(i).***

***Part A processes regulated by the Environment Agency.***

<b>Operators Name</b>	<b>Operators Address</b>	<b>Original Permission Number</b>	<b>Process Schedule Reference</b>
Caradon MK Electric Ltd.	Glascoed Road St Asaph Denbighshire LL17 0ER	AP4742	4.5 A (F) Inorganic Chemical Process
Pilkington Optronics	Glascoed Road St Asaph Denbighshire LL17 0LL	BC0693	4.5 A (F) Inorganic Chemical Process

## ***Appendix 2(ii).***

***Part B processes regulated by Denbighshire County Council, Public Protection Department.***

***See table over.***

**APPENDIX 2. EMISSIONS FROM PART 'B' INDUSTRIAL PROCESSES. ( From LAQM TG.4 (00))**

No	Company:	Address:	Section / Process:	Issued:	Carbon monoxide	Benzene	1.3 butadiene	Sulphur dioxide	Nitrogen oxides	Lead	PM10
1	White Bear Garage	Wrexham Rd., Ruthin	1.3 - Waste Oil Burner	17/05/93							
2	Kendrick Motors	Market St., Llangollen	1.3 - Waste Oil Burner	17/05/93							
3	G & G Motors	Chapel St., Denbigh	1.3 - Waste Oil Burner	17/05/93							
4	N.W. Agricultural Eng.	Trefnant	1.3 - Waste Oil Burner								
5	Loggerheads Garage	Loggerheads	1.3 - Waste Oil Burner	08/12/99							
6	Loggerheads Garage	Loggerheads	1.4b - Service Stations	22/12/98							
7	Beach SS	Victoria Rd., Prestatyn	1.4b - Service Stations	29/12/98							
8	Safeway SS	Smithfield Road, Denbigh	1.4b - Service Stations	30/12/98							
9	Seaview SS	Dyserth Road, Meliden	1.4b - Service Stations	30/12/98							
10	Shell Castleview	Rhyl Road, Denbigh	1.4b - Service Stations	08/01/99							
11	Shell Vale	193 Vale Road, Rhyl	1.4b - Service Stations	11/01/99							
12	Sainsbury's Supermarkets	Rhuddlan Road, Rhyl	1.4b - Service Stations	12/01/99							
13	Marina Service Station	Wellington Road, Rhyl	1.4b - Service Stations	14/01/99							
14	Esplanade SS	Coast Road, Rhyl	1.4b - Service Stations	20/01/99							
15	Kinmel Park SS (W)	A55 Westbound, Bodelwyddan	1.4b - Service Stations	21/01/99							
16	Kinmel Park SS (E)	A55 Eastbound, Bodelwyddan	1.4b - Service Stations	21/01/99							
17	Dytfryn SS	Denbigh Road, Ruthin	1.4b - Service Stations	22/01/99							
18	Prestatyn SS	Marine Road, Prestatyn	1.4b - Service Stations	29/01/99							
19	Rhyl SS	154 Vale Road, Rhyl	1.4b - Service Stations	28/01/99							
20	Bridge SS	Park Road, Ruthin	1.4b - Service Stations	02/02/99							
21	Seaways SS	The Roe, St. Asaph	1.4b - Service Stations	10/03/99							
22	Ffrith Filling Station	Victoria Road West, Prestatyn	1.4b - Service Stations	11/02/99							
23	Rhuddlan Foundry Ltd.	Rhuddlan	2.1 - Foundry Process								
24	Ifor Williams Trailers	Cynwyd	2.2 - Galvanising Steel	19/03/92							
25	Tarmac Topmix Ltd.	Graig Quarry, Denbigh	3.1 - Ready-Mix Concrete	29/04/93							
26	Hanson Quarry Products	Meliden Rd., Dyserth	3.1 - Ready-Mix Concrete	05/04/93							
27	Ruthin Pre-cast Concrete	Quarryfields, Ruthin	3.1 - Pre-cast Concrete Production	18/03/93							
28	J. Stoddard & Son.	Maes-y-Droel Quarry, Llanarmon	3.4 - Sand Drying	17/03/92							

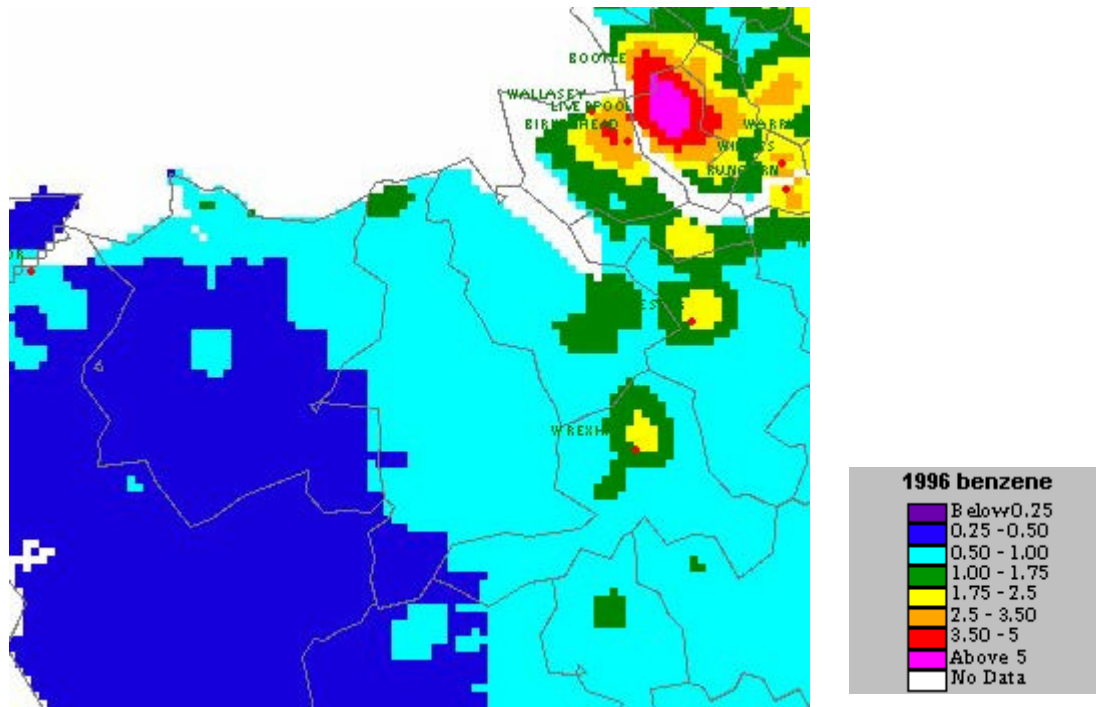
**APPENDIX 2. EMISSIONS FROM PART 'B' INDUSTRIAL PROCESSES. ( From LAQM TG.4 (00))**

No	Company:	Address:	Section/Process	Issued	Carbon monoxide	Benzene	1,3-butadiene	Sulphur dioxide	Nitrogen oxides	Lead	PM10
29	Hanson Quarry Products	Burley Hill Quarry, Eryrys.	3.4 - Roadstone Coating	08/03/93				*			*
30	Pioneer Asphalts (UK)	Aberduna Quarry, Maeshafn	3.4 - Roadstone Coating	10/03/93				*			*
31	Robert Hunter & Co.	Lon Parcwr, Ruthin	3.4 - Roadstone Coating	15/04/92				*			*
32	Tarmac Quarry Products	Graig Quarry, Denbigh	3.4 - C&S Limestone	28/05/93							*
33	Tilcon (SW) Ltd.	Burley Hill Quarry, Nercwys	3.4 - C&S Limestone	18/03/93							*
34	Pioneer Aggregates (UK)	Aberduna Quarry, Maeshafn	3.4 - C&S Limestone	04/03/93							*
35	Lafarge Redland Agg. Ltd.	Graig Quarry, Llanarmon-yn-Ial	3.4 - C&S Limestone, RCP	11/06/93							*
36	Jones Bros. C1	Denbigh Rd., Ruthin	3.4 - Mobile C&S Plant	21/05/97							
37	Jones Bros. C2	Denbigh Rd., Ruthin	3.4 - Mobile C&S Plant	07/10/99							
38	Jones Bros. C3	Denbigh Rd., Ruthin	3.4 - Mobile C&S Plant	15/10/99							
39	Jones Bros. C4	Denbigh Rd., Ruthin	3.4 - Mobile C&S Plant	03/03/00							
40	Roadrunner Waste Ltd.	Cambrian View, Rhualt	3.4 - Mobile C&S Plant	01/12/99							
41	Pilkington Special Glass	Glascoed Road, St. Asaph	3.5 - Specialised Glass Man.					*		*	
42	Smurfit Print UK	Berwyn Works, Llangollen	6.5 - Printworks	22/11/93							
43	Pilkington PE.	Glascoed Rd., St. Asaph	6.5 - Coating Solvent	03/12/99							
44	Conwy Timber Co.	Gwyddelwern Sawmills	6.7 - Softwood Sawmilling	29/09/91							
45	BOCM Pauls	Colomendy Ind. Est., Denbigh	6.9 - Animal Feed Compounding	21/10/93							

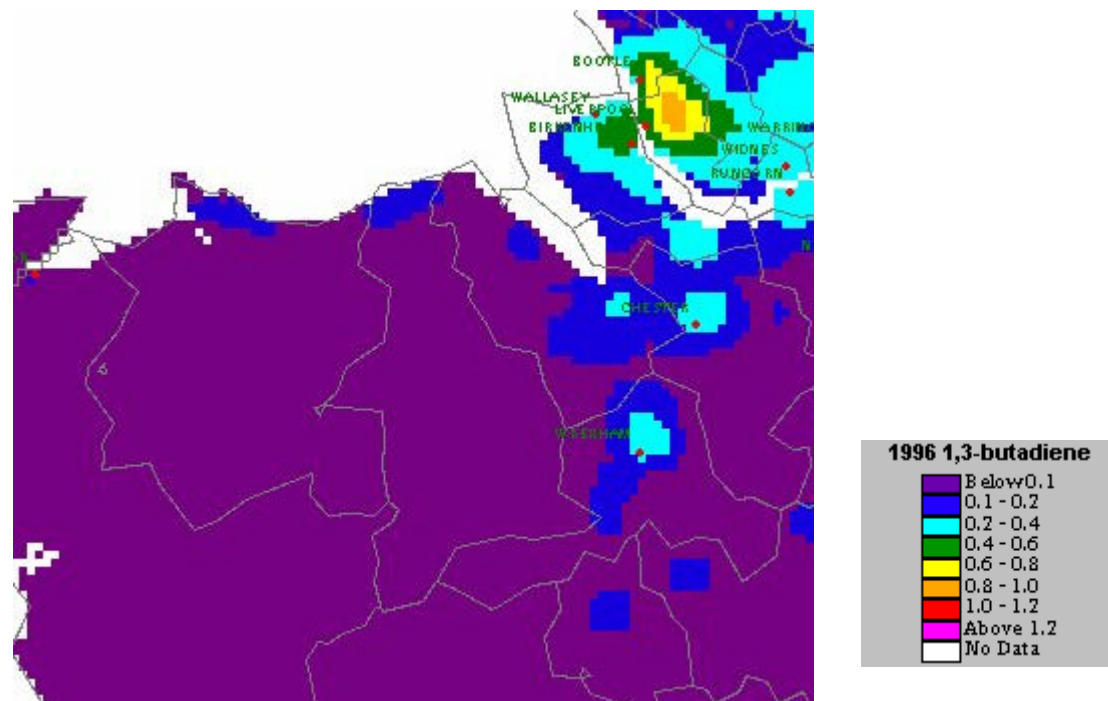
### Appendix 3.

#### Background Concentrations;

##### (i) Benzene. (1996)



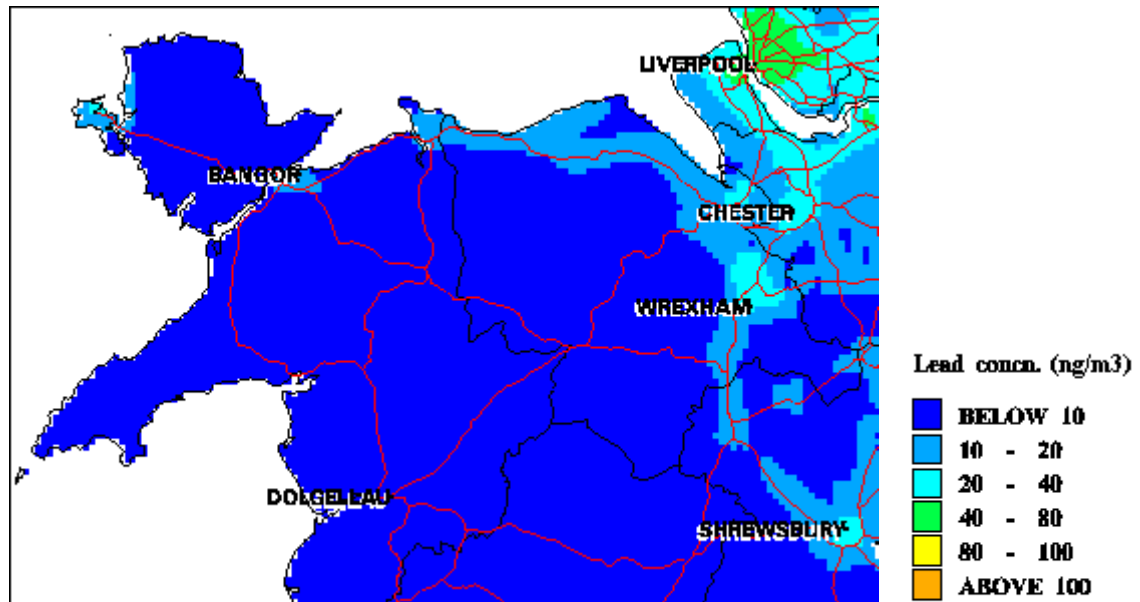
##### (ii) 1,3-Butadiene. (1996)



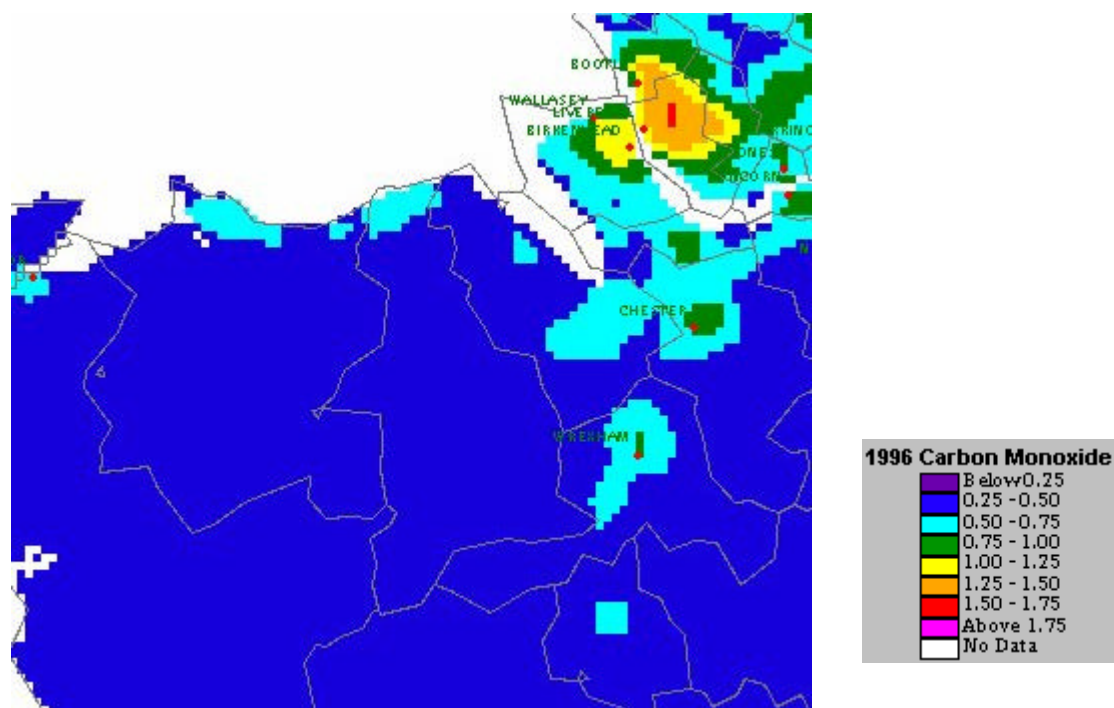
### Appendix 3.

#### Background Concentrations.

##### (iii) Lead (1996)



##### (iv) Carbon monoxide. (1996)



## **Appendix 4.**

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- *Broughton GFJ, Bower JS, Clark H and Willis PG (1998) Air Pollution in the UK: 1996, AEA Technology, AEAT 2238.*
- *Bush T, Mooney D and Stevenson K (1998) UK Nitrogen Dioxide Survey 1996, AEA Technology, AEAT-2779*
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- *DETR (1997) The United Kingdom National Air Quality Strategy, The Stationery Office*
- *Environment Act (1995) •SI (1997) No 3043, Environment Protection, The Air Quality Regulations 1997.*
- *Air Quality Monitoring Database for Wales. Annual Reports: Reports of the Welsh Air Quality Forum to The Society of Directors of Public Protection ( Wales) and Welsh Assembly.*

*The following are all published by the Stationery Office:*

- *LAQM.G1 Framework for Review and Assessment of Air Quality*
- *LAQM.G2 Developing Local Air Quality Strategies and Action Plans: The Principal Considerations*
- *LAQM.G3 Air Quality and Traffic Management*
- *LAQM.G4 Air Quality and Land Use Planning*
- *LAQM.TG1 Monitoring for Air Quality Reviews and Assessments*
- *LAQM.TG2 Preparation and Use of Atmospheric Emission Inventories*
- *LAQM.TG3 Selection and Use of Dispersion Models*
- *LAQM.TG4 Review and Assessment: Pollutant Specific Guidance*
- *Stedman (1998) Revised High Resolution Maps of Background Air Pollutant Concentrations in the UK: 1996, AEA Technology, AEAT-3133.*

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