

# Wrexham Air Quality Strategy



Local Air Quality Management  
Updating and Screening Assessment



Air Fit  
to Breathe

# **WREXHAM COUNTY BOROUGH COUNCIL**

## **LOCAL AIR QUALITY MANAGEMENT**

### **UPDATING AND SCREENING ASSESSMENT**

November 2003

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## 1 EXECUTIVE SUMMARY

Part IV of the Environment Act 1995 places a statutory duty on local authorities to review and assess the air quality within their area and take account of Government Guidance when undertaking such work.

The updating and screening assessment (USA) provides an update with respect to air quality issues within Wrexham County Borough. There have been a number of changes since the last round of review and assessment which have been taken into account in this assessment; including a revised National Air Quality Strategy (2000) and Addendum (2003), new Air Quality Regulations (2000 and 2002), new guidance documents LAQM.PG (03) and LAQM.TG (03) and new vehicle emissions factors (2002). The USA has included consideration of new emissions sources, in addition to all existing emission sources previously identified in the first round.

The USA considers the seven priority health based air quality objectives as laid down in Regulations and assesses the likelihood that the air quality objectives will be met by their target dates. If the air quality objectives are unlikely to be met, a detailed assessment will be required. It also considers the provisional particulate (PM<sub>10</sub>) objectives for 2010, although no detailed assessment of the 2010 PM<sub>10</sub> objectives is required at this stage, as the objectives have not been laid down in Regulation in England and Wales.

Having considered each pollutant and presented evidence to support the assessment of each, it is concluded that all air quality objectives will be met. There will be no requirement for Wrexham County Borough Council (WCBC) to undertake a detailed assessment.

The provisional annual PM<sub>10</sub> objective for 2010 is predicted to be exceeded at all busy roads and junctions assessed due to the high modelled background PM<sub>10</sub> for 2010. This will require further assessment in future air quality assessments once included in Regulations.

It is recommended that WCBC continue with its monitoring programme to confirm the findings of this report. It is also recommended that further work be undertaken with respect to the performance of diffusion tubes through the use of triplicate tubes at the continuous roadside monitoring site.

### Summary Table

Objectives	Detailed assessment required?
Benzene	No
1, 3 - butadiene	No
Carbon monoxide	No
Lead	No
Nitrogen dioxide	No
PM <sub>10</sub>	No
Sulphur dioxide	No

## 2 INTRODUCTION

### 2.1 Project Background

Casella Stanger was commissioned by Wrexham County Borough Council (WCBC) to carry out an Updating and Screening Assessment (USA) of air pollution sources that may affect local air quality within the area. The USA is required to be undertaken as part of the local authority's statutory duties as defined within Part IV of the Environment Act 1995.

WCBC undertook their first round of review and assessment, including Stage 1, 2 and 3 reports, during 1998 – 2002. The first round concluded that the air quality objectives should be met by their target dates. The main pollutant of concern was identified as particulates (PM<sub>10</sub>) (daily mean objective) in discreet areas of domestic coal burning, notably in Llay. An improvement programme to upgrade domestic heating systems in Llay to gas is underway and monitoring is ongoing. No Air Quality Management Area has been declared as it is expected that the objective will be met by 2004.

### 2.2 Legislative Background

Part IV of the Environment Act, 1995, places a statutory duty on local authorities to periodically review and assess the air quality within their area. This involves consideration of present and likely future air quality against air quality standards and objectives. Guidelines for the 'Review and Assessment' of local air quality were published in the 1997 National Air Quality Strategy (NAQS)<sup>1</sup> and associated guidance and technical guidance. In 2000, Government reviewed the NAQS and set down a revised Air Quality Strategy for England, Scotland, Wales and Northern Ireland<sup>2</sup> (AQS). This set down a revised framework for air quality standards and objectives for seven pollutants, which were subsequently set in Regulation in 2000 through the Air Quality (Wales) Regulations 2000<sup>3</sup>. These were subsequently amended in 2002<sup>4</sup>. More recently, (February 2003), Government published its Addendum to the AQS which proposed new objectives for PM<sub>10</sub> in 2010 whilst also setting down new objectives for benzene and carbon monoxide. The National Assembly for Wales has responsibility for meeting air quality objectives in Wales by their target dates.

New Technical Guidance (LAQM.TG(03))<sup>5</sup> and Policy Guidance (LAQM.PG(03))<sup>6</sup> were issued on behalf of DEFRA in January 2003. This guidance sets the framework for the requirements of review and assessment for future years, taking account of experiences from the previous rounds of review and assessment.

### 2.3 Scope of USA

The USA should be used to identify those matters that have changed since the first round of review and assessment and to identify those sources that may lead to an air quality objective being exceeded. A series of checklist for pollutants, and different screening tools for industrial and road traffic sources may be used in order determine

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<sup>1</sup> DoE (1997) The United Kingdom National Air Quality Strategy The Stationery Office

<sup>2</sup> DETR (2000) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland – Working together for Clean Air, The Stationery Office

<sup>3</sup> DETR (2000) The Air Quality Regulations 2000, The Stationery Office

<sup>4</sup> Defra (2002) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Addendum, The Stationery Office

<sup>5</sup> Defra (2003) Technical Guidance LAQM.TG(03), Part IV of the Environment Act 1995, Local Air Quality Management, The Stationery Office

<sup>6</sup> Defra (2003) Policy Guidance LAQM.PG(03), Part IV of the Environment Act 1995, Local Air Quality Management, The Stationery Office

those remaining sources that may have significant contributions to potential exceedences of the air quality objectives.

The USA should, if possible, determine what has changed since that last round of review and assessment, but where the information from the last round is not clear, or new information has become available, an additional screening of sources for significance can be carried out. In many cases it may also have been 3 years since information on sources was last collated and this could therefore be out of date.

It is important to recognise that during previous assessments, information such as road traffic data may only have been collated for those roads considered to be important at the time of the previous assessments, and in relation to the risk of exceedence of objectives set at the time. At the time, the focus was on motorways and roads with greater than 20,000 vehicles per day. However, the new technical guidance<sup>7</sup> indicates that in some cases, where there is relevant exposure, roads with approximately 10,000 vehicles per day may lead to exceedences of the objectives (particularly NO<sub>2</sub> and PM<sub>10</sub>).

Therefore Casella Stanger has approached the USA as an opportunity to collate a new set of baseline information for the major sources of air pollution within the authority's boundary. This includes identifying all Part A and Part B processes, re-collecting the information on the site locations and emissions data (where available), and reviewing all traffic data available for locations within the authority's boundary. This will therefore include all new and substantially changed sources.

Where a risk of exceeding an air quality objective at relevant exposure locations has been identified through the USA, a detailed assessment is required (due to be reported by April 2004). The detailed assessment should identify with reasonable certainty whether or not an exceedence is likely to occur.

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<sup>7</sup> Defra (2003) Technical Guidance LAQM.TG(03), Part IV of the Environment Act 1995, Local Air Quality Management, The Stationery Office

## 2.4 Assessment Criteria

The objectives included in the Air Quality (Wales) Regulations, 2000, and Air Quality (Wales) (Amendment) Regulations, 2002, provide the over-arching themes to which local air quality management and the process of review and assessment responds. These are summarised below in Table 2.1 for the seven pollutants of concern to health.

**Table 2.1**  
**Air Quality Standards and Objectives**

Pollutant	Air Quality Objective Concentration	Measured as	Date to be achieved by
<b>Benzene</b> All authorities	16.25 µg/m <sup>3</sup>	running annual mean	31.12.2003
Authorities in England and Wales only	5.00 µg/m <sup>3</sup>	annual mean	31.12.2010
<b>1,3 Butadiene</b> All authorities	2.25 µg/m <sup>3</sup>	running annual mean	31.12.2003
<b>Carbon monoxide</b> Authorities in England, Wales and Northern Ireland only <sup>a</sup>	10.0 mg/m <sup>3</sup>	maximum daily 8-hour mean	31.12.2003
<b>Lead</b> All authorities	0.5 µg/m <sup>3</sup> 0.25 µg/m <sup>3</sup>	annual mean annual mean	31.12.2004 31.12.2008
<b>Nitrogen dioxide</b> <sup>c</sup> All authorities	200 µg/m <sup>3</sup> not to be exceeded more than 18 times a year 40 µg/m <sup>3</sup>	1 hour mean annual mean	31.12.2005 31.12.2005
<b>Particles (PM<sub>10</sub>) (gravimetric)</b> <sup>d</sup> All authorities	50 µg/m <sup>3</sup> not to be exceeded more than 35 times a year 40 µg/m <sup>3</sup>	24 hour mean annual mean	31.12.2004 31.12.2004
<b>Sulphur dioxide</b> All authorities	350 µg/m <sup>3</sup> not to be exceeded more than 24 times a year 125 µg/m <sup>3</sup> not to be exceeded more than 3 times a year 266 µg/m <sup>3</sup> not to be exceeded more than 35 times a year	1 hour mean 24 hour mean 15 minute mean	31.12.2004 31.12.2004 31.12.2005

- In Northern Ireland none of the objectives are currently in regulation. Air Quality (Northern Ireland) Regulations are scheduled for consultation early in 2003.
- The Air Quality Objective in Scotland has been defined in Regulations as the running 8-hour mean, in practice this is equivalent to the maximum daily running 8-hour mean.
- The objectives for nitrogen dioxide are provisional.
- Measured using the European gravimetric transfer sampler or equivalent.
- These 2010 Air Quality Objectives for PM<sub>10</sub> apply in Scotland only, as set out in the Air Quality (Scotland) Amendment Regulations 2002.

The 2010 objectives for PM<sub>10</sub> are not currently included in the Regulations for the purposes of LAQM in England, Wales and Northern Ireland. Consequently, authorities outside of Scotland have no obligation to review and assess air quality against them but some consideration of these longer-term objectives will be given in order to assist in long term planning. Where potential problems with these objectives are highlighted,

they should be given additional consideration in future LAQM assessments and progress reports.

## 2.5 Reporting of USA

The USA is reported in the following order so that the data used for sources can be clearly identified, and the process of deciding and justifying the need for any further detailed assessment is set out clearly.

In general, the report has been set out for sets of source type. For each source type relevant pollutants have been highlighted and screened using technical guidance (LAQM.TG(03)).

The following sections provide further details with respect to the specific aspects of the USA highlighted below:

- 1) **Background Concentrations**
- 2) **Monitoring Data**
- 3) **Industrial Sources**
  - Part A Processes
  - Petrol Stations
  - Areas of Domestic Coal Burning
  - Shipping
  - Other Sources
  - Railways
  - Major Fuel Storage Depots
  - Part B Processes
- 4) **Road Traffic Sources**
  - Main Roads
  - Other roads
  - Bus Stations
  - Significant Junctions
- 5) **Areas with Combined Impacts**
- 6) **Conclusions and Recommendations**

### 3 LOCAL BACKGROUND CONCENTRATIONS

Background air quality data for Wrexham County Borough was obtained from NETCEN, made available through the Air Quality Information Archive located at [www.airquality.co.uk](http://www.airquality.co.uk) which allows the user to download information files containing background concentrations for individual authorities. The background concentrations are provided for certain base years, including 2001. Background concentrations are required to be projected for relevant assessment years, which, for the purposes of the LAQM USA are the same as the date by which objectives are required to be achieved. For the projection of background concentrations to other years the methodology described on the Dispersion Modelling Helpdesk has been used<sup>8</sup>.

Table 3.1 shows the range of background concentrations within Wrexham County Borough for each of the pollutants and relevant objective years. It is worthy of comment that changes have occurred in the background pollutant concentrations from those used in the previous round of review and assessment due to revisions of the national mapping exercise. For example, the background concentrations for NO<sub>x</sub> and NO<sub>2</sub> reported for the Stage 3 and Stage 4 of the last round are lower than the new updated maps (shown in Table 3.1).

Table 3.1

Background Concentrations in Wrexham County Borough based on National Archive Mapping

Benzene Background Concentrations ( $\mu\text{g}/\text{m}^3$ )			
	2001	2003	2010
Min	0.08	0.07	0.06
Max	0.59	0.54	0.42
Range	0.51	0.47	0.36

1,3-Butadiene Background Concentrations ( $\mu\text{g}/\text{m}^3$ )		
	2001	2003
Min	0.04	0.03
Max	0.18	0.15
Range	0.14	0.12

CO Background Concentrations ( $\text{mg}/\text{m}^3$ )			
	2001	2002	2003
Min	0.15	0.13	0.13
Max	0.33	0.27	0.27
Range	0.18	0.14	0.14

NO <sub>x</sub> Background Concentrations ( $\mu\text{g}/\text{m}^3$ )				
	2001	2002	2005	2010
Min	9.6	9.3	8.3	7.3
Max	75.3	72.4	73.9	65.0
Range	65.7	63.1	65.6	57.6

NO <sub>2</sub> Background Concentrations ( $\mu\text{g}/\text{m}^3$ )				
	2001	2002	2005	2010
Min	7.6	7.4	6.5	4.0
Max	37.9	36.9	37.4	34.2
Range	30.4	29.5	30.9	28.2

PM <sub>10</sub> Background Concentrations ( $\mu\text{g}/\text{m}^3$ , gravimetric)					
	2001	2002	2004	2010	Secondary PM <sub>10</sub> 2001
Min	14.6	14.5	14.2	13.8	13.4
Max	27.1	26.7	26.1	24.7	24.7
Range	12.5	12.2	11.9	10.8	11.3

SO <sub>2</sub> Background Concentrations ( $\mu\text{g}/\text{m}^3$ )		
	2001	2005
Min	1.87	1.4
Max	32.3	24.2
Range	30.4	22.8

## 4 MONITORING DATA

The following sub-sections provide further updates with respect to monitoring of air pollutants carried out within Wrexham County Borough. It draws upon existing local data sets and, where necessary, national data sets, which highlight the current monitoring position within the authority's area and whether there is evidence to show (through monitoring alone) whether there is a likelihood of exceeding any of the current national air quality objectives.

### 4.1 Benzene

Road traffic is the main source of benzene in the UK. However, the results from the first round of review and assessment have shown that emissions from petrol stations in the vicinity of residential properties should also be considered in closer detail. Consequently, it is these two sources that provide the focus of attention of the USA.

Benzene monitoring is carried out at two sites within Wrexham County Borough in order to check compliance with the current air quality standards and objectives. Grosvenor Road is a narrow, often congested, street in Wrexham Town Centre where monitoring has been carried out since 1996 as shown in table 4.1 and figure 4.1. The results show that the 2010 objective is already being met at these locations and the trend shows a continuing decline in ambient concentrations of benzene.

*Table 4.1*  
**Summary of benzene monitoring in Wrexham County Borough 1996 - 2002**

Benzene in $\mu\text{g}/\text{m}^3$				
Year	Grosvenor Road	No. months	Llwyneinion	No. months
1996	4.33	8	-	-
1997	3.79	12	-	-
1998	3.76	12	-	-
1999	3.44	12	-	-
2000	3.22	12	-	-
2001	2.96	10	-	-
2002	1.98	10	1.21	10

**Figure 4.1**  
**Benzene monitoring in Wrexham County Borough: 1996 - 2002**



At the local perspective, no AQMA has been declared within the first round of review and assessment on benzene. However, in order to dismiss benzene as a pollutant of concern in the USA, it is important to consider the relevant background concentrations across Wrexham County Borough in 2010. Table 3.1 shows the range of benzene concentrations across the area on a 1km x 1km resolution basis within Wrexham County Borough and shows that the 2010 background levels are less than  $2\mu\text{g}/\text{m}^3$  – the threshold levels for further consideration in the vicinity of ‘very busy’ roads and junctions.

#### 4.2 1, 3-Butadiene

There is no monitoring of 1, 3-butadiene undertaken in Wrexham County Borough. However, 1, 3-butadiene is monitored at a number of sites across the UK as part of the UK national network monitoring sites. The main source of 1, 3-butadiene in UK is emissions from motor vehicle exhausts and specific 1,3-butadiene handling industrial processes. There has been a substantial decrease in 1, 3-butadiene emissions from vehicles due to the fact that increasing number of vehicles are fitted with 3-way catalysts. The other source of 1, 3-butadiene is industrial processes that handle, store or emit it. There are no such industrial sources, which handle, emit or store this pollutant, in Wrexham County Borough.

Results for the period 1999 – 2001 of measured concentrations at urban and roadside sites throughout the UK show that levels of 1,3-butadiene were significantly below the 2003 maximum running annual mean objective of  $2.25\mu\text{g}/\text{m}^3$ . The latest results for monitoring (2001) show that Marylebone Road (a London kerbside site) is also below

the value at a measured annual mean of  $1.63\mu\text{g}/\text{m}^3$ . All other sites are well below that measured at this site.

### **4.3 Carbon Monoxide (CO)**

There is monitoring of Carbon Monoxide (CO) undertaken by WCBC at Victoria Road (part of the Automatic Urban and Rural Network (AURN)) roadside monitoring station ( $x=329000$ ,  $y=49900$ ). The annual mean for 2002 (based on 10 months data) was  $0.57\text{mg}/\text{m}^3$  and the maximum 8-hour mean was  $2.6\text{mg}/\text{m}^3$ . The data capture should be greater than 90% to demonstrate compliance with the 8-hour objective; however, the results are well below the objective level and the risk of exceedence is negligible.

Results of the national modelling work suggest that existing policies will be sufficient to reduce maximum daily running 8-hour mean concentrations to below the 2003 objective of  $10\text{mg}/\text{m}^3$ .

At the local perspective, no AQMA has been declared within the first round of review and assessment on CO. However, in order to dismiss CO as a pollutant of concern in the USA, it is important to consider the relevant background CO concentrations across the County Borough. Table 3.1 shows the range of CO concentrations across the area on a  $1\text{km} \times 1\text{km}$  resolution basis and shows that no concentrations are above the threshold limit of  $1\text{mg}/\text{m}^3$  in 2003.

### **4.4 Lead**

Since the banning of sales across Member States of the European Union on 1 January 2000 road traffic emissions are no longer considered as a significant source of lead in air. However, results from the first round indicate that it is likely to be certain hot-spot locations in the vicinity of industrial processes that would be the focus of attention for the second round - the single largest industrial source is from the manufacture of batteries. Other industrial sources include pigment for paints and glazing, in alloys and tank lining and piping.

Lead concentrations are unlikely to be a problem in future years while there are no major sources within Wrexham County Borough.

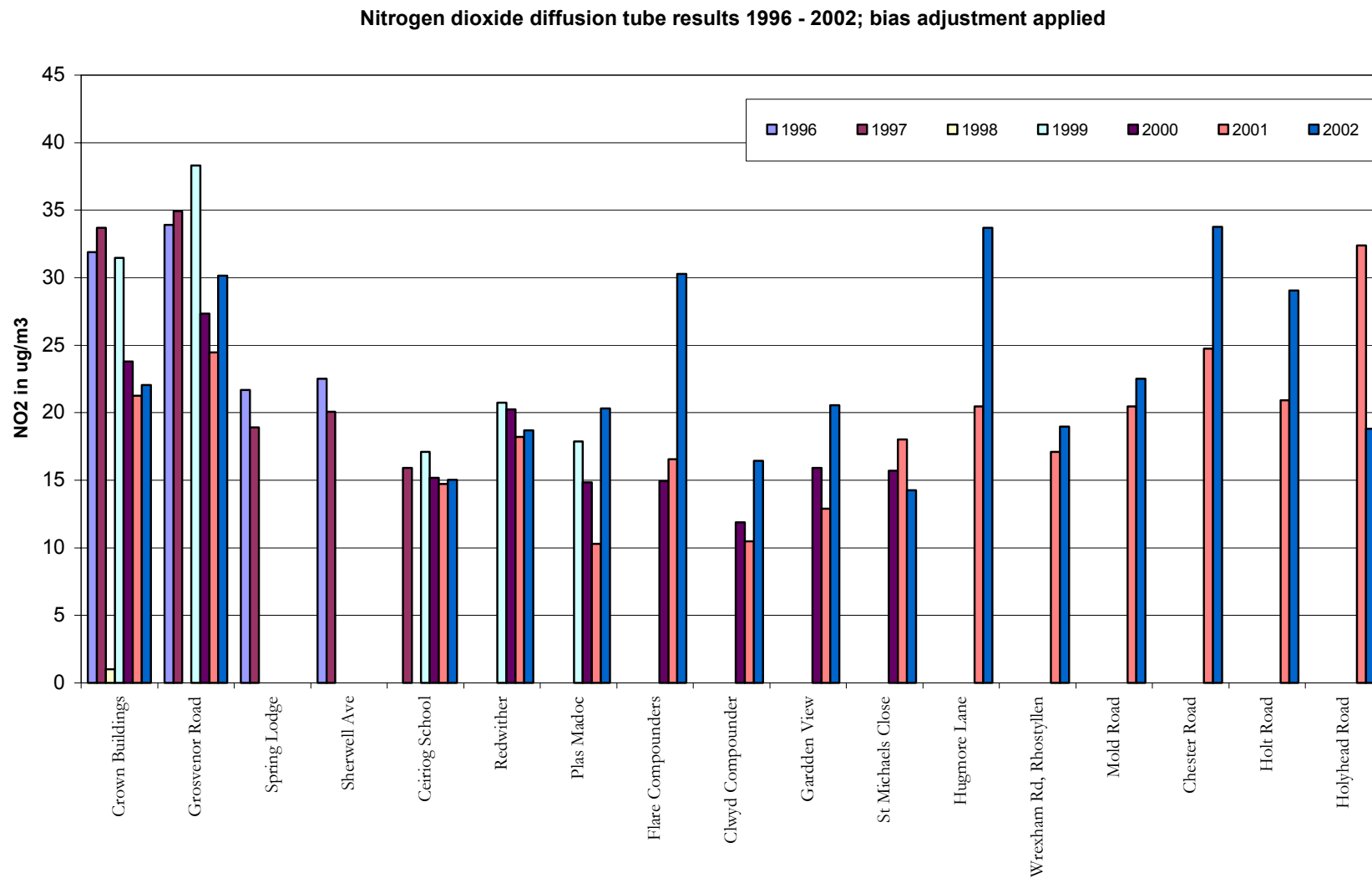
### **4.5 Nitrogen Dioxide**

Nitrogen Dioxide ( $\text{NO}_2$ ) is currently monitored at 15 sites throughout the County Borough using passive diffusion tubes. Continuous monitoring of  $\text{NO}_2$  is also undertaken at the Victoria Road AURN roadside site ( $x=329000$ ,  $y=49900$ ) in Wrexham.

#### **4.5.1 Passive diffusion tubes**

Location details and annual average  $\text{NO}_2$  concentrations for 1996 - 2002 and projected 2005 concentrations for kerbside sites are shown in Table 4.2. Figure 4.2 shows the trends in Nitrogen Dioxide concentrations in Wrexham County Borough from 1996 – 2002. Figure 4.3 shows the general locations of the diffusion tubes within the County Borough.

Figure 4.2 Trends in Nitrogen Dioxide in Wrexham County Borough 2000 - 2002 (bias adjustment x1.06)

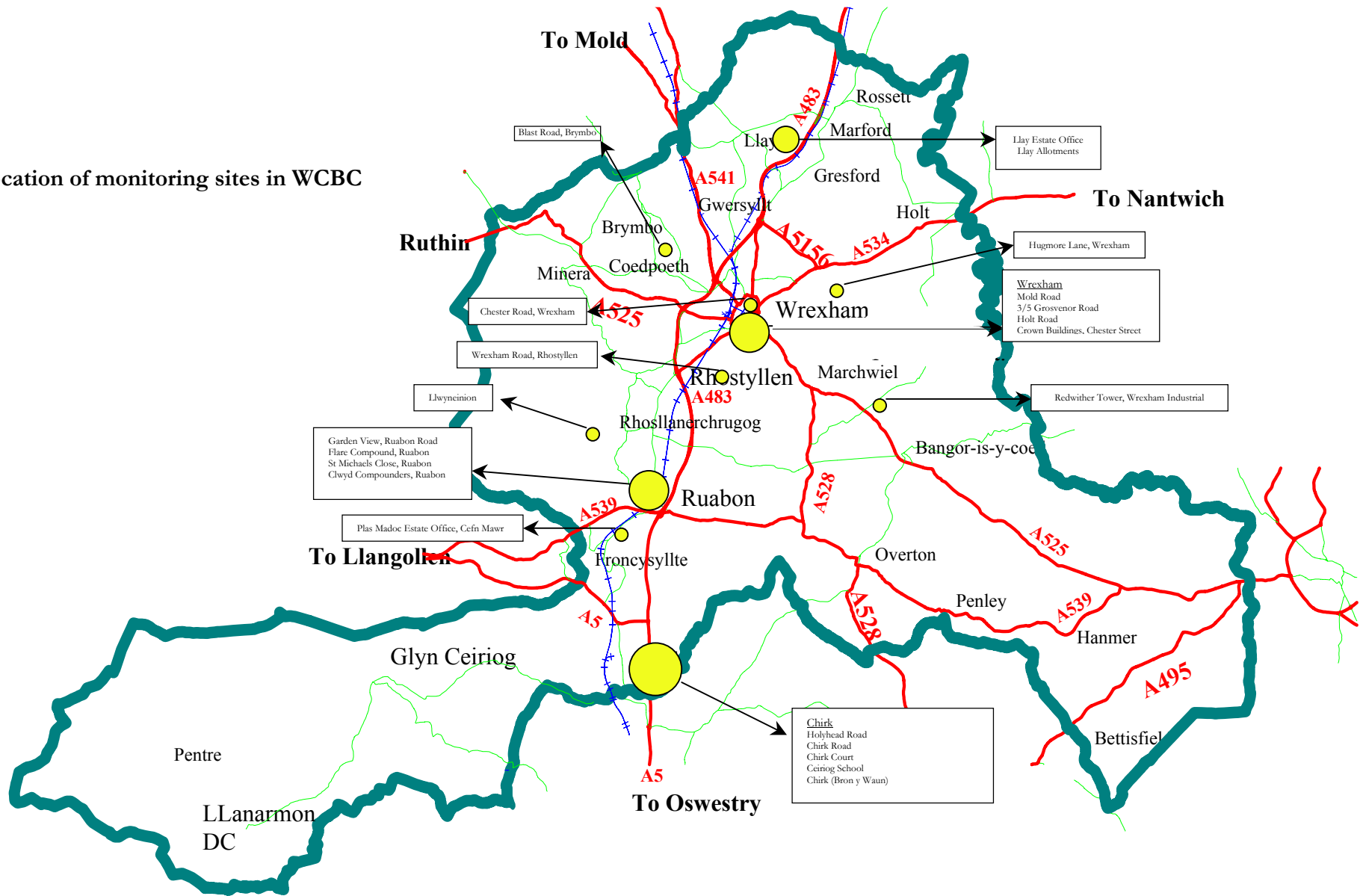


**Table 4.2** Locations and annual average NO<sub>2</sub> diffusion tube concentrations in 1996 - 2002 and 2005 (projected for kerbside sites using 2002 data); bias correction x1.06applied).

NO <sub>2</sub> in ug/m <sup>3</sup>											
Year	Type	X co-ord	Y co-ord	1996	1997	1998	1999	2000	2001	2002	Projected 2005
Crown Buildings	Intermediate	333636	350486	31.9	33.7	35.8	31.5	23.8	21.3	22.0	-
Grosvenor Road	Kerbside	333203	350577	33.9	34.9	39.6	38.3	27.3	24.5	30.2	27.8
Spring Lodge	Urban background	334417	350588	21.7	18.9	19.4	-	-	-	-	-
Sherwell Ave	Urban background	334419	352832	22.5	20.1	21.9	-	-	-	-	-
Ceiriog School	Urban background	329351	338312	-	15.9	21.9	17.1	15.2	14.7	15.0	-
Redwither	Intermediate	338566	343332	-	-	25.3	20.8	20.2	18.2	18.7	-
Plas Madoc	Urban background	328698	343332	-	-	24.3	17.9	14.8	10.3	20.3	-
Flare Compounders	Urban background	330200	344740	-	-	-	-	14.9	16.6	30.3	-
Clwyd Compounder	Urban background	330090	344380	-	-	-	-	11.9	10.5	16.4	-
Gardden View	Kerbside	330290	344630	-	-	-	-	15.9	12.9	20.6	18.9
St Michaels Close	Urban background	330390	344240	-	-	-	-	15.7	18.0	14.3	-
Hugmore Lane	Kerbside	337660	351760	-	-	-	-	-	20.5	33.7	31.0
Wrexham Road, Rhostyllen	Kerbside	332040	349000	-	-	-	-	-	17.1	19.0	17.5
Mold Road	Kerbside	332590	351000	-	-	-	-	-	20.5	22.5	20.7
Chester Road	Intermediate	333750	352870	-	-	-	-	-	24.7	33.8	-
Holt Road	Kerbside	334060	350680	-	-	-	-	-	20.9	29.0	26.7
Holyhead Road	Kerbside	328920	338710	-	-	-	-	-	32.4	18.8	17.3

Fig 4.3

General location of monitoring sites in WCBC



Diffusion tubes used by WCBC are supplied and analysed by GMSS Casella (Runcorn Laboratory) utilising the 10% TEA<sup>8</sup> with water preparation method. GMSS Casella participates in the Workplace Analysis Scheme for Proficiency (WASP) for NO<sub>2</sub> diffusion tube analysis and The Annual Field Inter-comparison Exercises. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO<sub>2</sub> concentrations reported are of a high calibre.

The Technical Guidance recommends co-location of diffusion tubes with an automatic analyser to ensure the accurate and representative reporting of NO<sub>2</sub> concentrations, with any positive or negative local bias taken into account. There are currently no co-location studies within Wrexham County Borough to derive a local bias adjustment factor. Field Inter-comparison Exercises indicate that tubes analysed by this laboratory and method will show a small under-read when compared with continuous analyser results. The recent Compilation of Diffusion Tube Co-location Study by AQC on behalf of DEFRA suggests that the under-read would give a bias adjustment factor of 1.06<sup>10</sup>, using 2001 data from a co-location study in Derby. This adjustment factor has been applied to diffusion tube data in the County Borough to take account of potential under-read. Co-location of triplicate tubes at the Victoria Road Air Quality Station will be initiated in 2003 so that a local bias adjustment factor can be derived and to assess the performance of the diffusion tubes.

The diffusion tube results show that there are no exceedences of the Nitrogen Dioxide annual mean objective, even at busy kerbside sites. The hourly NO<sub>2</sub> objective is easier to achieve and it is very unlikely that exceedences will occur at roadside sites where the annual mean objective has been met.

#### 4.5.2 Continuous monitoring

Continuous monitoring of NO<sub>2</sub> has been undertaken at the Victoria Road (AURN) roadside site since March 2002. The results for 2002 (10 months data) have been annualised using data from the nearest AURN site in Liverpool and are shown in Table 4.3. The annualised mean is well below the annual mean objective of 40µg/m<sup>3</sup>. There was one exceedence of the hourly objective (maximum 110µg/m<sup>3</sup>) during 2002 and the risk of exceeding the hourly objective is negligible.

**Table 4.3**  
**Summary of continuous Nitrogen Dioxide data 2002**

NO <sub>2</sub> in µg/m <sup>3</sup>					
	Period mean (03/02 - 12/02)	Period mean (03/02 - 03/09)	Annual mean (2001)	Ratio	Annualised mean (2002)
Victoria Road, Wrexham (AURN)	24.0	20.8	-	-	<b>23.6</b>
Liverpool AURN	-	33.8	38.4	1.14	-

#### 4.6 Particulates

There is currently no continuous roadside PM<sub>10</sub> monitoring undertaken in the County Borough. However, Partisol 2025 gravimetric analysers have been used to assess PM<sub>10</sub> concentrations in the villages of Llay and Chirk. The results are shown in Table 4.4. PM<sub>10</sub> concentrations were continuously monitored in two areas of Llay, the Allotments

and the Estate Office from November 2002 to present day. During that time period there have been exceedences at both sites. However, it is estimated that the particulate annual objective will not be breached in 2004 as the housing stock and private housing in Llay will be converted to gas thus reducing emissions from domestic coal burning, the primary source of PM<sub>10</sub> in Llay.

Particulate concentrations were recorded in the Bron y Waun area of Chirk during winter 2002/2003 and in the Chirk Green area of Chirk during spring/ summer 2003.

Whilst there were exceedences in the Bron y Waun area during the winter monitoring period this is thought to be attributable to high pollution episodes witnessed across the country and not local pollution sources in the Chirk area. As a precautionary measure, the Council will continue to monitor PM<sub>10</sub> levels in Chirk. It is anticipated that the 2004 objective will be met and no further assessment will be required.

**Table 4.4**  
**Summary of PM<sub>10</sub> results in WCBC**

PM <sub>10</sub> in µg/m <sup>3</sup>						
Start date	Finish date	X co-ord	Y co-ord	Mean	No. exceedences	%data capture
06/11/2002	12/08/2003	333110	355710	39.2	61	86
06/11/2002	12/08/2003	333040	355590	26.7	41	99
27/11/2002	14/05/2003	329290	337970	39.7	43	97
16/05/2003	20/08/2003	329040	338270	18.7	0	98

Partisol filter conditioning and weighing are carried out in house by the Council in accordance with QA/QC protocols based on BS EN12341 in a NAMAS accredited laboratory.

Results of the first round of review and assessment indicate that more than 50% of the Air Quality Management Areas (AQMAs) across the UK have included exceedences of the fixed 24-hour mean PM<sub>10</sub> objective. The majority of these have been declared as a consequence of roadside emissions, and are combined with exceedences of the annual mean objective for NO<sub>2</sub>, although the geographic extent to which the exceedence of the PM<sub>10</sub> objective occurs is much smaller than that of the exceedence of the NO<sub>2</sub> objective.

Where road traffic emissions are the main source of PM<sub>10</sub>, the highest levels will be close to the road. Where these correspond with relevant locations for public exposure, closer consideration is required. However, using the relationship between the geographic extent of any exceedences of the annual mean NO<sub>2</sub> objective as a 'marker' for PM<sub>10</sub> assessment, a local authority can elucidate the extent to which monitoring is required within its area.

In February 2003 the Government issued its Addendum to the Air Quality Strategy. Provisional objectives for PM<sub>10</sub> have been set, which mark a significant tightening of the existing 2004 objectives. A new annual mean objective of 20 µg/m<sup>3</sup> is proposed for England and Wales (excluding London). The 24 hour mean objective remains the

same at ( $50 \mu\text{g}/\text{m}^3$ ) but with only 7 allowable exceedence days (rather than the current 35). The new objectives have yet to be set in Regulation and are considered here only as a preliminary investigation into the possible problems faced by the authority in achieving compliance. It is known that, for much of the UK, existing background concentrations already approach and/or exceed the annual mean objective. Consequently, it is expected that widespread difficulties will arise in achieving the proposed objective.

Wrexham County Borough is no exception. With modelled predicted backgrounds of  $13.8 - 24.7 \mu\text{g}/\text{m}^3$  in 2010, exceedences of the 2010 Objective in close proximity to busy roadsides and localised sources are likely to occur.

Figure 4.4 Partisol PM<sub>10</sub> results for Llay and Chirk sites 2002 - 2003

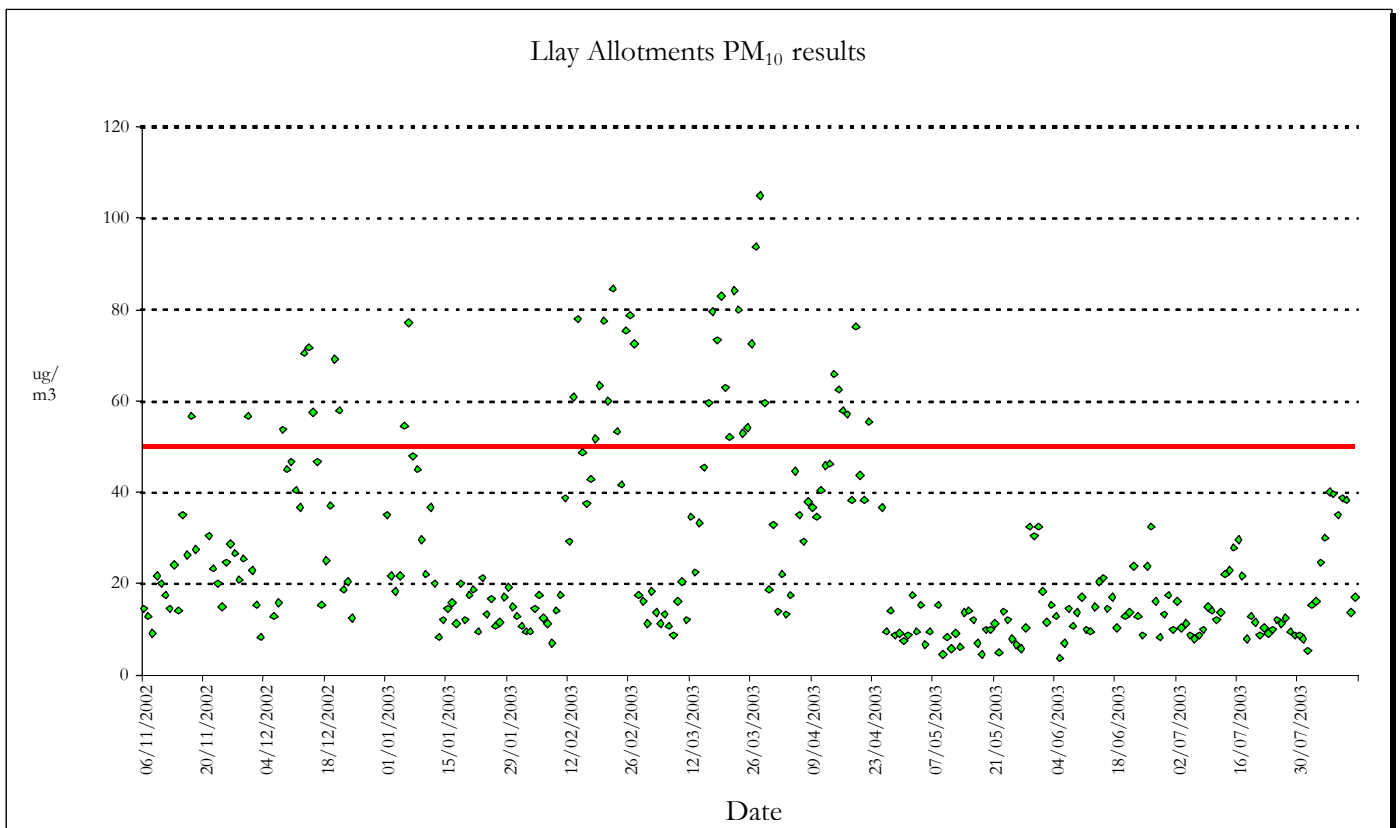
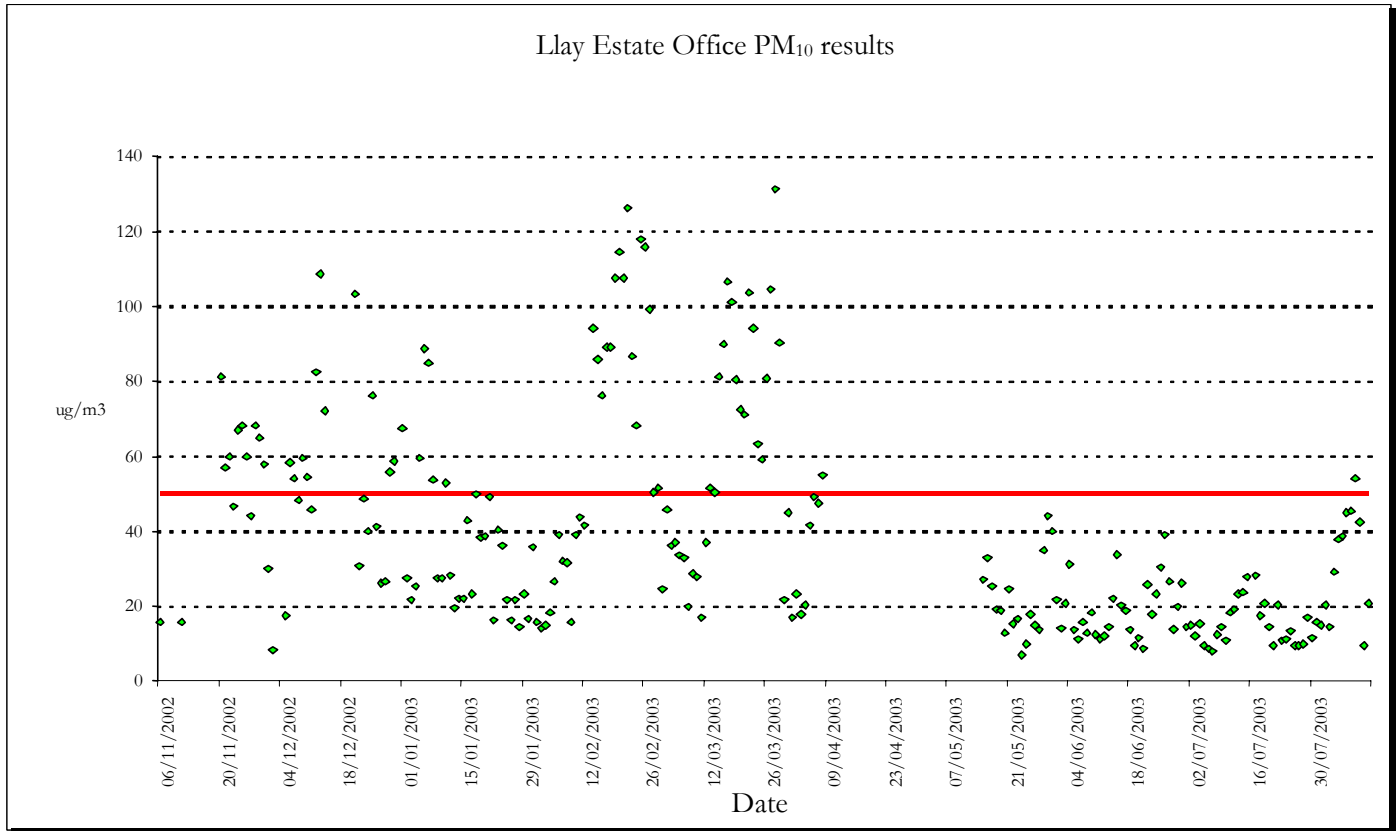
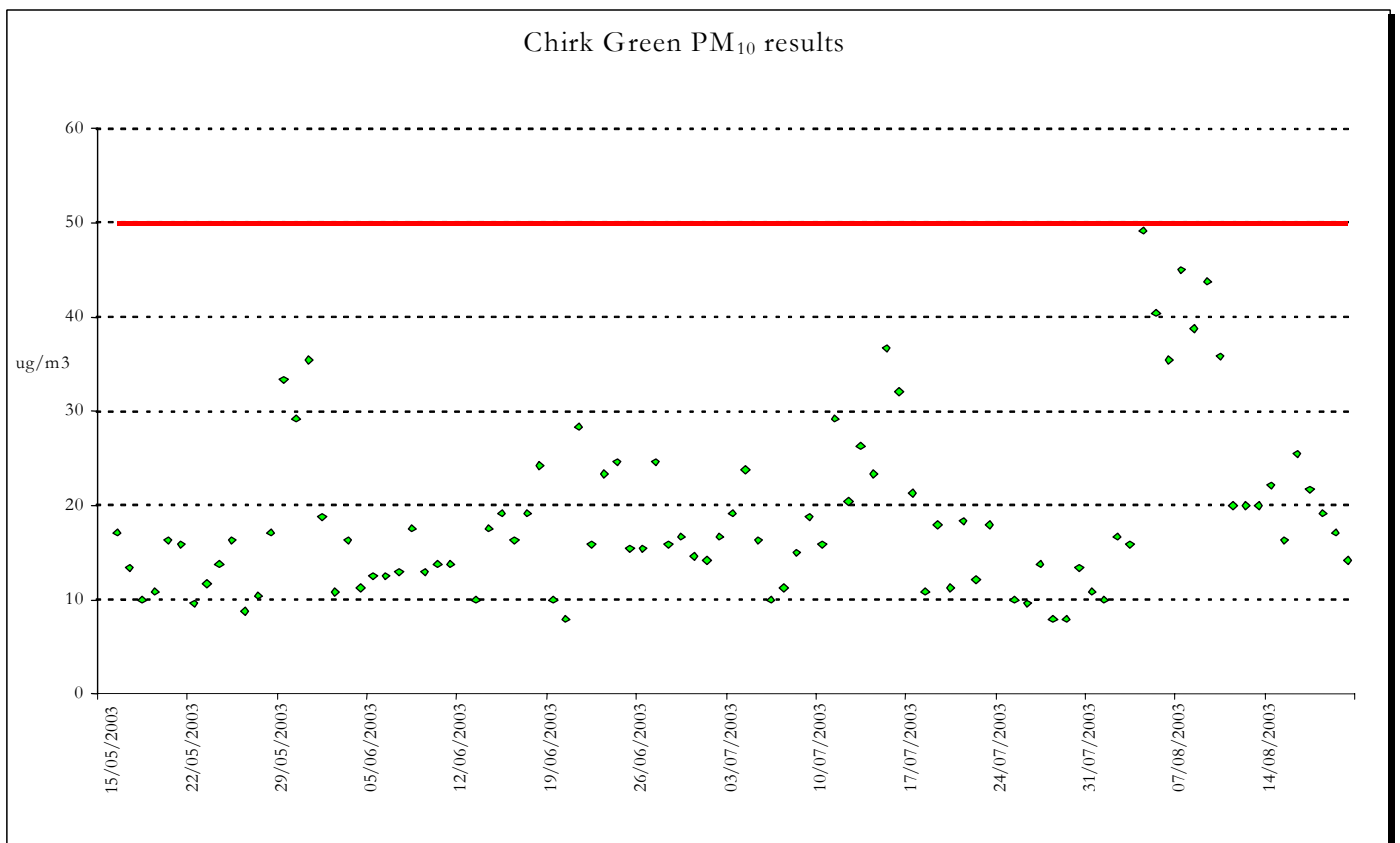
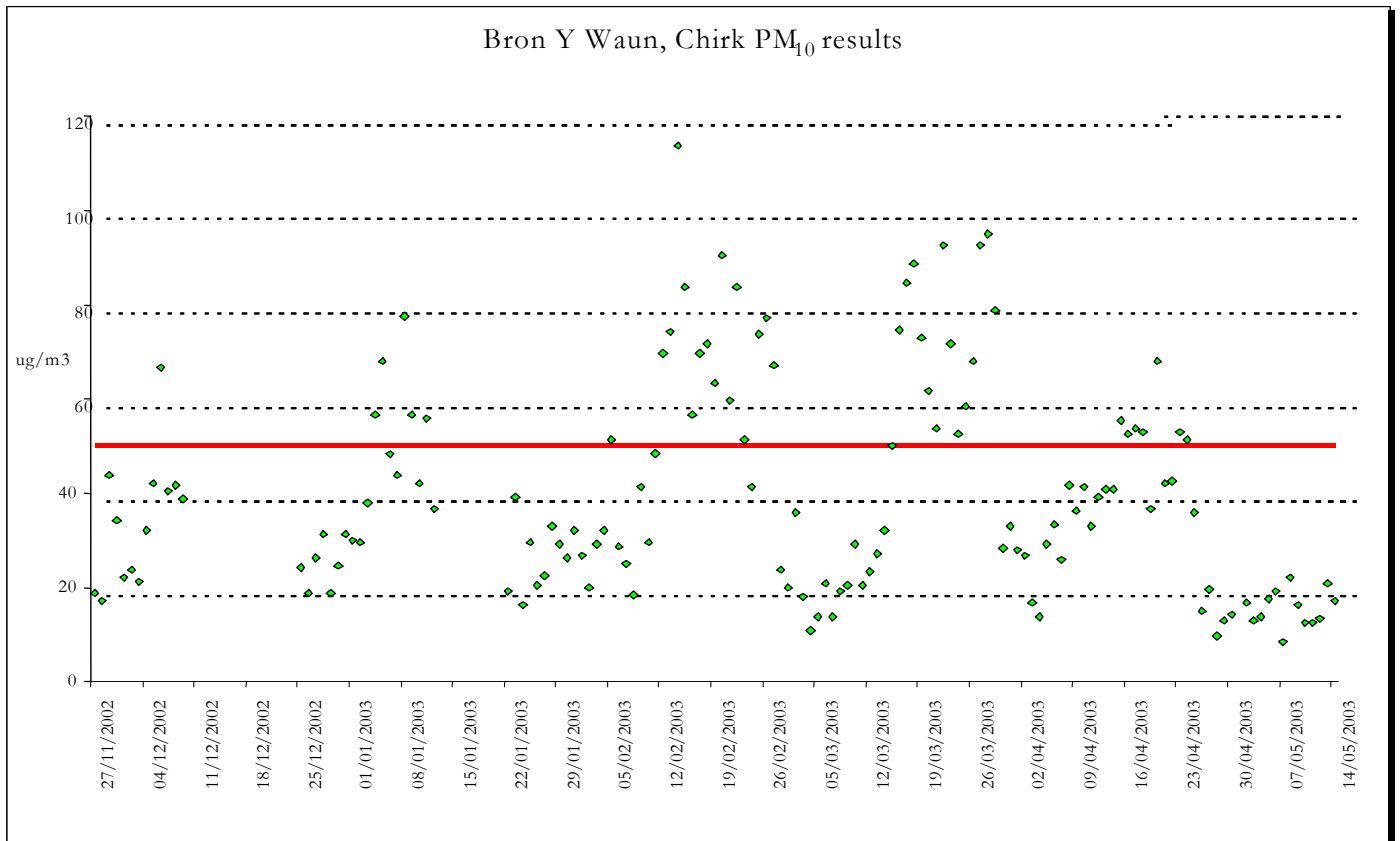


Figure 4.4 (cont.)

Partisol PM<sub>10</sub> results for Llay and Chirk sites 2002 – 2003



## 4.7 Sulphur Dioxide

The main source of SO<sub>2</sub> in the UK is power stations, which accounted for more than 71% of emissions in 2000. Other significant emissions include combustion sources, and on a local level, domestic sources where solid fuels may be used for heating purposes. Road transport is not considered a significant source of SO<sub>2</sub> emissions. Measured concentrations of SO<sub>2</sub> have been reducing across the UK over recent years and exceedences of the national objectives were only recorded at Belfast and are associated with significant levels of domestic coal burning.

Continuous monitoring of SO<sub>2</sub> is undertaken at the Victoria Road (AURN) site in Wrexham. The results are shown in table 4.5 for 2002. There are no exceedences of the SO<sub>2</sub> objectives. Continuous monitoring was undertaken in Chirk and Llay for 6 months (July 2001 – December 2001) in the previous round of review and assessment (Stage 3). The results showed there were no exceedences of SO<sub>2</sub> objectives.

Annual mean background levels in the County Borough modelled for 2001 (Table 3.1) are predicted to be in the range of 1.87 - 32.3 µg/m<sup>3</sup>, with an average of 3.33 µg/m<sup>3</sup>. The elevated SO<sub>2</sub> hotspots are shown in the centre of Wrexham and in Rhosllanerchrugog. There are no longer significant point sources of SO<sub>2</sub> which would lead to such high ambient levels and there is a smoke control area in Wrexham. As shown in Table 4.5, annual mean levels in Wrexham in 2002 were 4.6µg/m<sup>3</sup> and therefore the modeled results are misleading. The organisation responsible for national mapping has been informed of this discrepancy and it is expected that updated maps showing no SO<sub>2</sub> hotspots in the County Borough will be published soon.

Diffusion tube monitoring has been undertaken in Brymbo, where the former Brymbo Steelworks historically was a significant source of SO<sub>2</sub> emissions. The results (table 4.6) show no significant elevation above urban background levels. Monitoring has also been undertaken in Llay and Chirk using diffusion tubes. The concentrations in Chirk have decreased since 2000 and in 2002 are similar to annual mean concentrations in Wrexham (AURN site) where there are smoke control areas controlling domestic emissions. Concentrations in Llay are notably elevated above background levels and have increased between 2000 and 2002. Domestic coal burning is the major source contributing to these elevated levels and therefore levels will be reduced with the introduction of gas to the housing stock by the end of 2004.

**Table 4.5**  
**Summary of continuous SO<sub>2</sub> results 2002**

SO <sub>2</sub> 2002 (µg/m <sup>3</sup> )	
max (hourly)	103.4
No exceedences hourly	0
99.7th percentile (hourly)	39.8
Max (24 hour)	23.6
No. exceedences 24hr	0
99th percentile (24 hour)	17.0
Max (15min)	218.1
No. exceedences 15min	0
99.9th percentile 15 min	61.8
Mean	4.6
%Data capture	63

**Table 4.6**

**Summary of diffusion tube SO<sub>2</sub> annual mean ((µg/m<sup>3</sup>) results 2000 – 2002**

SO <sub>2</sub> annual mean ((µg/m <sup>3</sup> )						
Location	Site type	X co-ord	Y co-ord	2000	2001	2002
Llay Housing Office	Intermediate	333130	338106	12.19	16.89	21.60
Blast Lane, Brymbo	Intermediate	329444	353669	3.81	5.78	5.44
Maes-y-Waun, Chirk	Urban background	329142	338106	8.76	12.66	5.95

A smoke and SO<sub>2</sub> bubbler is located at the Trading Standards Department, Ruthin Road, Wrexham. The results for 2000 – 2002 in table 4.7 indicate that there are no exceedences of the objectives.

**Table 4.7**

**Summary of SO<sub>2</sub> Bubbler results ((µg/m<sup>3</sup>) 2000 - 2002**

SO <sub>2</sub> Bubbler results ((µg/m <sup>3</sup> )				
	Max daily SO <sub>2</sub>	max daily x1.25	99.9th%ile15min	99.7th%ile1 hour
2000	43	54	102	74
2001	42	53	100	72
2002	49	61	116	84

If max daily(\*1.25) is <80ug/m<sup>3</sup>, 15min & hourly objective likely to be met

A few AQMAs were declared during the last round based on emissions from coal-fired boilers and domestic coal burning, along with a few specific industry related sources. However, in Wrexham County Borough the objectives are expected to be met and no detailed assessment is required.

## 5. INDUSTRIAL SOURCES

### 5.1 Part A Processes

There is currently 18 Part A processes within Wrexham County Borough, as shown in table 5.2.

In addition, there is 17 Part A processes in the neighbouring authorities that are within 5km of the County Borough boundary (15 km for large combustion sources) and may impact on local air quality in WCBC, as listed in Table 5.1:

**Table 5.1**

**Part A Processes in neighbouring authorities within 5km of the boundary (15km for large combustion sources)**

Part A Processes						
Operator name	Local authority	Postcode	X co-ord	Y co-ord	EPA No.	Process description
Shotton Paper Co plc	Flintshire	CH5 2LL	330400	371400	AA6408	1.3 Combustion processes
Synthite Ltd	Flintshire	CH7 1BT	323200	364900	AG5641	4.2 Manufacture & use of organic chemicals
Corus UK Ltd	Flintshire	CH5 2NH	331000	370000	AG6389	1.3 Combustion processes
Knaufalcorp Ltd	Flintshire	CH5 2DB	332300	367800	AH4292	3.3 Other mineral fibres
Castle Cement Ltd	Flintshire	CH7 4HB	329100	362400	AI0349	3.1 Cement/lime manufacture
Deeside Power Development Co Ltd	Flintshire	CH5 2UL	329700	371400	AI5944	1.3 Combustion processes
Clariant Life Science Molecules (UK) Ltd	Flintshire	CH5 2PX	333700	367300	AK1665	4.2 Manufacture & use of organic chemicals
Clariant Life Science Molecules (UK) Ltd	Flintshire	CH5 2QZ	333700	367300	AK2327	4.2 Manufacture & use of organic chemicals
Clariant Life Science Molecules (UK) Ltd	Flintshire	CH5 2PX	333700	367300	AK4826	4.2 Manufacture & use of organic chemicals
Clariant Life Science Molecules (UK) Ltd	Flintshire	CH5 2PX	333700	367300	AK6322	4.2 Manufacture & use of organic chemicals
Synthite Ltd	Flintshire	CH7 1BT	323200	364900	AK8848	4.2 Manufacture & use of organic chemicals
Synthite Ltd	Flintshire	CH7 1BT	323200	364900	AK9054	4.2 Manufacture & use of organic chemicals
Clariant Life Science Molecules (UK) Ltd	Flintshire	CH5 2PX	333700	367300	AM4738	4.4 Processes involving halogens
Powergen UK plc	Flintshire	CH5 4BP	327900	371000	AP5790	1.3 Combustion processes
Dynea UK Ltd	Flintshire	CH7 1BT	323200	364900	AR9044	4.2 Manufacture & use of organic chemicals
Powergen UK plc	Flintshire	CH5 4BP	327900	371000	AU0198	1.1 Gasification processes
Calder Industrial Materials Limited	Chester	CH1 4EX	338410	366680	BK9423	Metal sector process

The general locations of the Part A processes are shown in Figure 5.1.

**Table 5.2**  
**Part A Processes in WCBC**

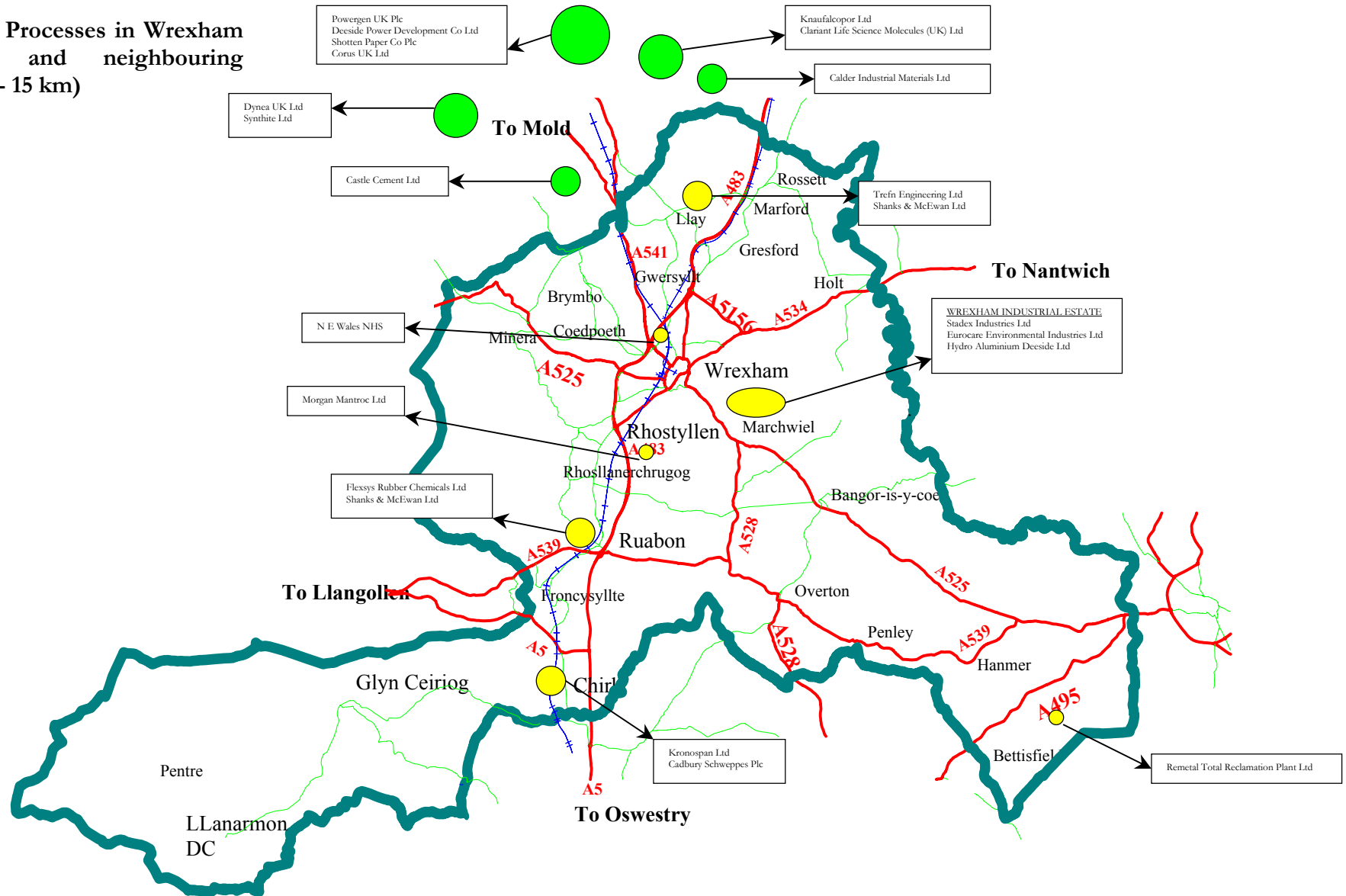
Site	X co-ord	Y co-ord	EPA No.	Process Type	Pollutant	1998	1999	2000	2001	2002	Comment
<i>Owens Corning Fiberglas (GB) Ltd</i>	338800	350500	AG1425	Other mineral fibres	carbon monoxide	<10 t	<10 t	<10 t	<10 t	<100 t	Closed
					lead	<10 kg		134.8 kg	91 kg	<100 kg	
					NO <sub>2</sub>	308.9 t	200.5 t	204.8 t	114 t	<100 t	
					PM <sub>10</sub> (particulates<10 micron)	37.4 t	26.83 t	26.42 t	14 t	<10t	
					sulphur dioxide	25.5 t	22.61 t	19.68 t	<10 t		
<i>Kronospan Ltd Formalin Plant</i>	328700	338200	AK4877	4.2 Manufacture & use of organic chemicals	carbon monoxide		110 t	6.4 t	<10 t	<100 t	Incinerator and wet scrubber abatement
<i>Owens Corning Fiberglas (GB) Ltd</i>	338800	350500	AK5407	4.2 Manufacture & use of organic chemicals	No relevant releases to air						Closed
<i>Flexsys Rubber Chemicals Ltd</i>	327650	342500	AK5750	4.2 Manufacture & use of organic chemicals	PM <sub>10</sub> (particulates<10 micron)	<1 t	<1 t	<1 t	<1 t	<10000 kg	
<i>Flexsys Rubber Chemicals Ltd</i>	327650	342500	AK5768	4.2 Manufacture & use of organic chemicals	carbon monoxide	<10 t	<10 t	<10 t	<10 t	<100 t	
					nitrogen dioxide	<10 t	<10 t	<10 t	<10 t	<100 t	
					PM <sub>10</sub> (particulates<10 micron)	<1 t	<1 t	<1 t	<1 t	<10000 kg	
<i>Flexsys Rubber Chemicals Ltd</i>	327650	342500	AK5784	4.2 Manufacture & use of organic chemicals	carbon monoxide	<10 t	<10 t	<10 t	<10 t	<100 t	
					nitrogen dioxide	<10 t	<10 t	<10 t	<10 t	<100 t	
					PM <sub>10</sub> (particulates<10 micron)	<1 t	<1 t	<1 t	<1 t	10000 kg	
<i>Flexsys Rubber Chemicals Ltd</i>	327650	342500	AK5792	4.2 Manufacture & use of organic chemicals	carbon monoxide				<10 t	<100 t	
					nitrogen dioxide				<10 t	<100 t	
					PM <sub>10</sub> (particulates<10 micron)	<1 t	<1 t	<1 t	<1 t	<10000 kg	
<i>Flexsys Rubber Chemicals Ltd</i>	327650	342500	AL7618	4.4 Process involving halogens	carbon monoxide	130 t	110 t		83 t		Sulpenamide plant now closed; emissions to air no longer relevant.
					nitrogen dioxide	<10 t	<10 t		<10 t		
					PM <sub>10</sub> (particulates<10 micron)	1 t	<1 t		<1 t		
					sulphur dioxide	25 t	50 t		100 t		
<i>Flexsys Rubber Chemicals Ltd</i>	327650	342500	AN9000	4.5 Inorganic chemical process	PM <sub>10</sub> (particulates<10 micron)	<1 t	<1 t	<1 t	<1 t	<10000 kg	
<i>Morgan Matroc Ltd</i>	330500	345600	AO0164	4.5 Inorganic chemical process	carbon monoxide	<10 t	<10 t	<10 t	<10 t	<100 t	
					lead	<10 kg	<10 kg	<10 kg	<10 kg	<100 kg	
					nitrogen dioxide	<10 t	<10 t	<10 t	<10 t		
					PM <sub>10</sub> (particulates<10 micron)					<10000 kg	
<i>Trefn Engineering (Metal Treatment Division) Ltd</i>	333000	356600	A06880	4.5 Inorganic chemical process	No relevant releases to air						
<i>Hydro Aluminium Deeside Ltd</i>	337760	349360	AS4117	2.2 Non ferrous metals	carbon monoxide	<10 t	<10 t	77 t	39 t		Bag filter abatement
					nitrogen dioxide	35 t	29 t	32 t	48 t		
					PM <sub>10</sub> (particulates<10 micron)	<1 t	<1 t	<1 t	<1 t		
					sulphur dioxide	<10 t	<10 t	<10 t	<10 t		

(Table 5.2 Continued)

Site	X co-ord	Y co-ord	EPA No.	Process Type	Pollutant	1998	1999	2000	2001	2002	Comment
<i>HH Wardle Metals Ltd</i>	350700	338800	AS6438	2.2 Non ferrous metals	carbon monoxide	<10 t	111.2 t				Closed
					nitrogen dioxide	26 t	69.9 t				
					PM <sub>10</sub> (particulates<10 micron)	<1 t					
					sulphur dioxide	12 t	22.9 t				
<i>Cadbury Schweppes Plc</i>	328600	338000	AY8492	6.9 Treatment/processing of animal or vegetable matter	1,3 Butadiene	<100 kg	n/a	n/a	n/a	n/a	Boiler house <20MW; natural gas firing.
					Benzene	<100 kg	<100 kg	<100 kg	<100 kg	<1000 kg	
					carbon monoxide	<10 t	15 t	16 t	<10 t	<100 t	
					lead	<10 kg	<10 kg	<10 kg	<10 kg	<100 kg	
					nitrogen dioxide		21 t	<10 t	<10 t	<100 t	
					PM <sub>10</sub> (particulates<10 micron)	15.4 t	18 t	18 t	5.3 t	<10000 kg	
<i>Stadex Industries Ltd</i>	337600	349700	BF1220	6.2 Di-isocyanate process	Benzene			<100 kg	<100 kg	<1000 kg	No relevant releases to air
<i>NE Wales NHS</i>	332400	350400	BF4768	Radioactive substances site							
<i>Eurocare Environmental Services Ltd</i>	339900	349300	BI1595	5.1 Incineration	Carbon monoxide			<10 t	<10 t	<100 t	
					Nitrogen dioxide			<10 t	<10 t		
					Sulphur dioxide			<10 t	<10 t		
<i>Hydro Aluminium Deeside Ltd</i>	337760	349360	BK3638	2.2 Non-ferrous metals	Carbon monoxide					<100 t	Air quality assessment for IPPC application predicted no exceedences
					PM <sub>10</sub> (particulates<10micron)					<10000 kg	
					1,3 butadiene					<1000 kg	
					benzene					<1000 kg	
<i>Shanks &amp; McEwan Ltd (formerly Caird Environmental Ltd)</i>	332741	356798	CA1002	Landfill site	Carbon monoxide					<100 t	Change of name. Active landfill. First year in Pollution Inventory.
					PM <sub>10</sub> (particulates<10micron)					<10000 kg	
					Sulphur dioxide					<100 t	
					1,3 butadiene					<1000 kg	
					benzene					<1000 kg	
<i>Shanks &amp; McEwan Ltd</i>	328957	341770	SHA004	Landfill site	Carbon monoxide					<100 t	Active landfill. First year in Pollution Inventory.
					Nitrogen dioxide					<100 t	
					PM <sub>10</sub> (particulates<10micron)					<10000 kg	
					Sulphur dioxide					<100 t	
<i>Remetal Total Reclamation Plant Ltd</i>	350700	338800	AZ1388	4.5 Inorganic chemical process	carbon monoxide					<100 t	
					PM <sub>10</sub> (particulates<10 micron)	<1 t				<10000 kg	
					sulphur dioxide	<10 t		<10 t	<10 t		

Figure 5.1

Locations of Part A Processes in Wrexham County Borough and neighbouring authorities (within 5- 15 km)



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A number of different tools are available to help assess the significance of industrial processes depending on the amount of available information, which includes details on stack height, stack diameter and building height information, as well as background levels. The Technical Guidance lists those processes likely to give rise to significant emissions and an assessment should be made of such processes where there are new significant processes or emissions have substantially increased (>30%) or particular issues/complaints have arisen from a process. The most up-to-date information from the Environment Agency Pollution Inventory Website has been used to determine whether emissions have substantially increased. It should be noted that 2002 data are reported differently by the Environment Agency than in previous years, with increased lower thresholds (e.g. <100t rather than <10t for gaseous pollutants NO<sub>2</sub> and carbon monoxide and <100kg rather than <10kg for lead), which may be misleading.

### **Part A Processes within WCBC**

Of the 18 Part A processes within the Borough, Trefn Engineering (Metal Treatments Division) Ltd (AO6880) and N E Wales NHS (BF4768) have no relevant releases to air. The 16 processes with relevant emissions to air shall be considered in more detail below. There are two new processes since the last review operated by Stadex Industries Ltd and Eurocare Environmental Services Ltd.

#### **Kronospan Limited**

Kronospan are authorised to operate a formalin plant. This has emissions abatement in the form of an incinerator and chemical wet scrubber. Reportable releases include formaldehyde and CO. The Pollution Inventory (table 5.2) shows that concentrations of CO have reduced since the last review with the result that the site requires no further consideration with respect to air quality.

#### **Flexys Rubber Chemicals Limited**

Flexys Rubber Chemical Limited operates six Part A processes. Four authorisations are for the manufacture and use of organic chemicals, one is for an inorganic chemicals process and one is for a process involving halogens. The Pollution Inventory (table 5.2) shows that emissions from five of these processes are below reporting thresholds. However, the inventory for the process involving halogens (AL7618) shows a substantial increase in SO<sub>2</sub> between 1998 and 2001. Information was sought from the Environment Agency with respect to emissions from this process and it has been confirmed that the sulpenamide plant, the source of the SO<sub>2</sub> emissions, is now closed and emissions to air are no longer relevant.

#### **Morgan Matroc Limited**

Morgan Matroc Limited operates an inorganic chemical process. The Pollution Inventory (table 5.2) shows that emissions of CO, lead, NO<sub>2</sub> and PM<sub>10</sub> are below reporting thresholds and there has been no substantial increase in any emissions since 1998. No further attention with respect to air quality impacts of the site is required.

#### **Hydro Aluminium Deeside Limited**

Hydro Aluminium Deeside Limited operates a non-ferrous metals process with bag filter abatement. The Pollution Inventory (table 5.2) shows that all reportable emissions in 2002 are below the lowest threshold for reporting. An air quality assessment for this process was carried out by Genesis Environmental Ltd in March 2003 and it concluded that no exceedences of the objectives are likely to occur as a result of emissions from this site.

### **Cadbury Schweppes Plc**

Cadbury Schweppes Plc operates a Part A process for the treatment/processing of animal or vegetable matter. The Pollution Inventory shows that all reportable emissions are below reporting thresholds and there have been no substantial increase since 1998. The boiler house with <20MW thermal capacity operates on natural gas thereby reducing any impacts relative to solid fuel burning such as coal.

### **Remetal Total Reclamation Plant Ltd**

Remetal Total Reclamation Plant Ltd operates an inorganic chemical process. Emissions of CO, PM<sub>10</sub> and SO<sub>2</sub> are all below reporting thresholds (table 5.2) and there have been no substantial increase in emissions since the last round. Consequently, no further work is required for this site.

### **Stadex Industries Ltd**

Stadex Industries Ltd operates a di-isocyanate process that has been newly authorised since the last review. The only relevant emission to air is benzene and this has been below the lowest reporting threshold (<100kg per annum) since 2000. The LAQM.TG(03) guidance Annex 2 does not consider di-isocyanate processes to be a significant source of benzene resulting in no further work required.

### **Eurocare Environmental Services Ltd**

Eurocare Environmental Services Limited operates an incineration process that has been newly authorised since the last review. The LAQM.TG(03) guidance Annex 2 suggests that such processes could have potentially significant sources of NO<sub>2</sub>. However, the Pollution inventory (table 5.2) shows that emissions of CO, NO<sub>2</sub> and SO<sub>2</sub> are below reporting thresholds (<10t per annum) and therefore are not considered to be significant with regard to local air quality objectives.

### **Shanks & McEwan Ltd**

Shanks & McEwan operate two landfill sites: Pen-Y-Bont Landfill site near Pentre and Astbury Landfill site, near Llay. Landfill sites have been included in the Pollution Inventory (table 5.2) for the first year. Emissions from these sites are shown to be below reporting thresholds. With regard to local air quality, the LAQM.TG(03) guidance recommends consideration of fugitive PM<sub>10</sub> from landfill sites and this will be considered further in section 5.9. The Environment Agency has undertaken PM<sub>10</sub> monitoring at the Astbury Site and the results showed that objectives are already being met.

It is therefore concluded that no detailed assessment is required for Part A Processes within Wrexham County Borough.

### **Neighbouring Part A Processes**

Seventeen neighbouring Part A processes (table 5.1, figure 5.1) are located north of Wrexham County Borough and within 5km (15km for large combustion sources) of the WCBC boundary and upwind of the prevailing wind direction. Sixteen of these processes are located within Flintshire and one (Calder Industrial Materials Ltd) is located within Chester City Council area.

Calder Industrial Materials Ltd is located 2km north of the Wrexham County Borough boundary. This is a newly authorised metals sector process. The Environment Agency Pollutant Inventory shows that reported emissions of CO, lead, NO<sub>2</sub> and PM<sub>10</sub> for 2002 are all below reporting thresholds and it is not considered that this process will have a significant impact on receptors within Wrexham County Borough.

Flintshire County Council completed its Updating and Screening Assessment in July 2003. All potentially significant Part A Processes within their area were assessed and no

exceedences of any objective were predicted as a result of emissions from industrial processes. There has been no substantial increase in emissions from these processes since the last review and assessment. Review of the results of monitoring of SO<sub>2</sub> and NO<sub>2</sub> at RAF Sealand in the vicinity of the two gas-fired power stations, Deeside and Powergen, showed that objectives are likely to be met. It is not considered that Part A processes in Flintshire will have a significant impact on local air quality in Wrexham County Borough and no further assessment is warranted.

## 5.2 Part B and A2 Processes (excluding petrol stations)

There are 35 Part B and A2 processes, excluding petrol stations, within Wrexham County Borough as listed in table 5.3. The locations of the processes are also shown in Figure 5.2.

The potential for each of the processes to emit pollutants that may lead to exceedences of the relevant air quality objectives have been assessed using the LAQM.TG(03) guidance. However, knowledge, based on experience of the types of processes, many of which are very small-scale operations, has also been drawn upon and whether there is any potential exposure in the vicinity.

There are two new processes since the last review, a waste oil burner and a concrete batching plant. Neither of these are listed in the guidance LAQM.TG(03) as having significant emissions likely to impact on air quality objectives and there have been no issues or complaints regarding these processes within their immediate areas. It is not considered that further assessment is warranted for these processes.

Three of the processes have been listed in Annex 2 of the guidance LAQM.TG(03) as being potentially significant:

### **Tritech Precision Products Ltd**

Tritech Precision Products Limited has been identified in LAQM.TG(03) guidance Annex 2 as being a potential source of lead and SO<sub>2</sub>. Tritech operates a small aluminium and steel foundry batch process with three electric melting furnaces and utilising bag filters for emissions arrestment. It was assessed in the first round of review and assessment as being an insignificant source of lead and SO<sub>2</sub> emissions. Heavy fuel oil or coal is not used as part of the process and therefore SO<sub>2</sub> does not require further assessment. Particulates from the three stacks are monitored annually and results are well within the emission limit. There have been no substantial changes to this process. During the last round of review and assessment, such small-scale processes were found to have negligible impacts on air quality objectives for lead and SO<sub>2</sub>. There have been no complaints or issues regarding this process. It is not considered that a detailed assessment is required for this process.

### **Dennis Ruabon Tiles Limited**

Dennis Ruabon Tiles Limited operate a ceramic process that has been identified in LAQM.TG(03) guidance Annex 2 as being a potential source of SO<sub>2</sub> if heavy fuel oil or coal is used. The fuel used at this site is gas and therefore no further assessment for SO<sub>2</sub> is warranted. There have been dust complaints regarding transfer of clay to the site, but these are occasional complaints of nuisance and are not considered significant in terms of exceedences of the PM<sub>10</sub> objective. Fugitive PM<sub>10</sub> will be considered further in section 5.9.

### **Clwyd Compounders Limited**

Clwyd Compounders Limited operate a rubber compounding process that has been identified in LAQM.TG(03) guidance Annex 2 as being a potential source of 1,3 – butadiene, if 1,3 – butadiene is used as part of the process, and PM<sub>10</sub>. There is no 1,3 – butadiene use during the operation of this process to warrant further assessment. PM<sub>10</sub> emissions were assessed during the first round of review and assessment and it was not considered that a second stage review was required. There have been no substantial changes to the process. The process is regularly inspected by Officers of the Council to check compliance with Authorisation conditions, and it is considered that there are no issues regarding PM<sub>10</sub> at this site or complaints.

### **Other Issues**

Complaints have been received regarding dust emissions from Hanson Concrete Products Ltd (Concrete batching plant) and Kronospan Limited (Manufacture of MDF and wood processing). Fugitive dust from Hanson Concrete Products Limited has been monitored using Frisbee dust deposit gauges that monitor deposited particulate matter as  $\text{mgm}^{-3}\text{day}^{-1}$ . This is used to assess nuisance dust deposits, as it is not considered that fugitive dust from this site would lead to exceedences of the PM<sub>10</sub> objectives (The modelled background level in 2004 is low -  $19.6\mu\text{g}/\text{m}^3$ ). Monitoring has been undertaken in Chirk opposite to the Kronospan site, using a Partisol PM<sub>10</sub> gravimetric analyser. The monitoring was undertaken in August 2001 – February 2002 as part of the Stage 3 review and assessment. The results showed that the PM<sub>10</sub> 24 hour objective would marginally be met. The filters were analysed to assess the source of PM<sub>10</sub> in the area and the majority was attributed to domestic coal burning. Very few wood particles were found and it was concluded that Kronospan, although being a source of nuisance dust, was not a significant source of PM<sub>10</sub>.

**Fig 5.2**  
**Location of Part B processes in**  
**Wrexham County Borough**

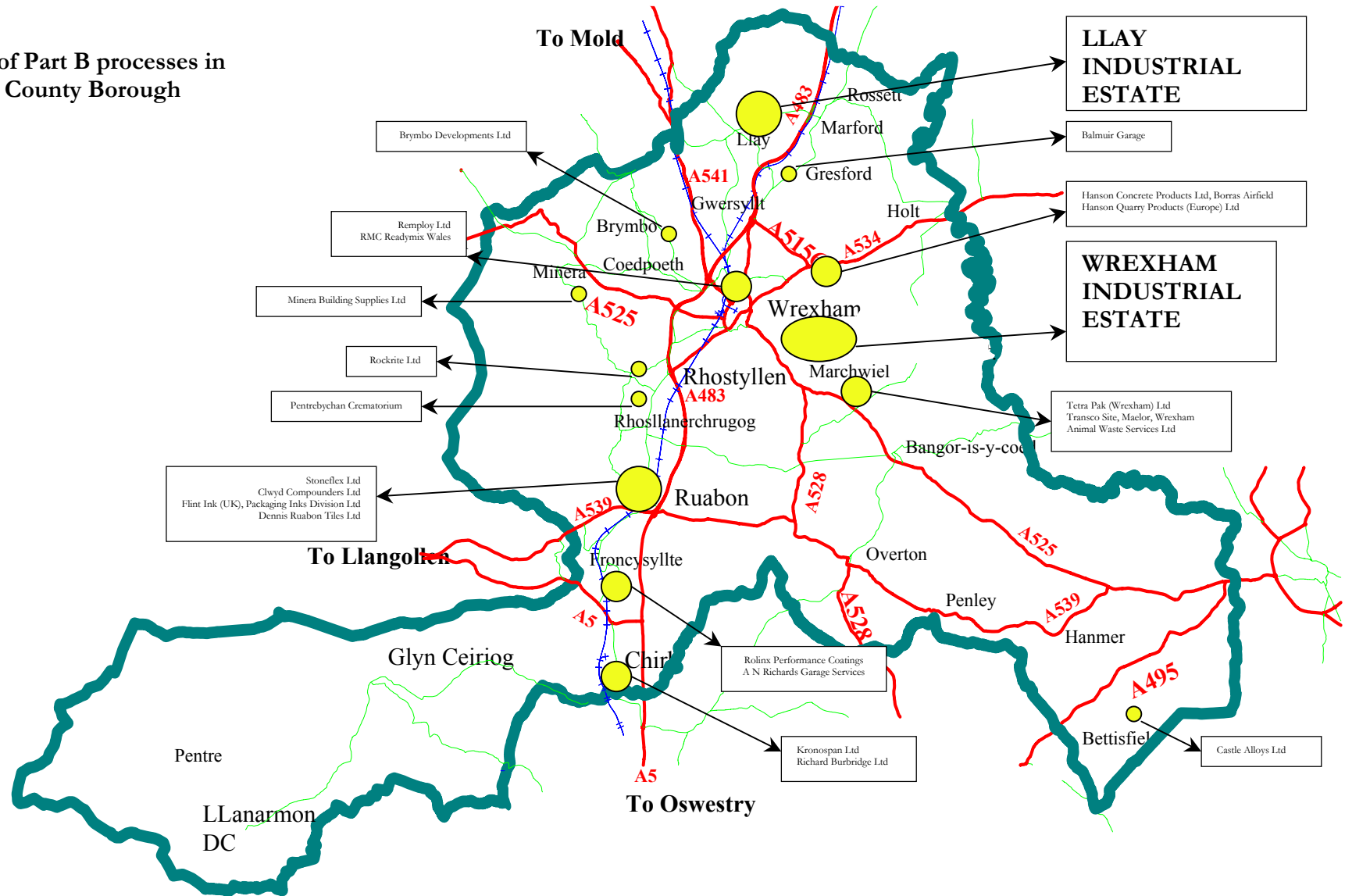


Table 5.3

Description of Part B Processes in Wrexham County Borough

Part B Processes											
ID	Name	X co-ord	Y co-ord	Process Type	PG Note	Identified in LAQM. TG (03) Annex 2	Potential Pollutants	New source?	Complaints (excluding odour & noise)?	Significant?	Comments
1	Clarks of Wrexham	333355	355382	Waste Oil Burner	PG1/1	No		Yes	No	No	
2	Balmuir Garage	334841	354610	Waste Oil Burner	PG1/1	No		No	No	No	
3	A N Richards, Garage Services	327360	341100	Waste Oil Burner	PG1/1	No		No	No	No	
4	Transco Site, Maelor, Wrexham	338400	347840	Gas Odourisation Process	PG1/15	No		No	No	No	
5	Castle Alloys Ltd	350790	338710	Foundry Process	PG2/1	No		No	No	No	
6	Tritech Precision Products Ltd	338220	349590	Metal Production & Processing	PG2/3, 2/4&2/6	Yes	lead, SO <sub>2</sub>	No	No	No	Bag filter arrestment
7	Marshalls	332760	356020	Mineral Process	PG3/1	No		No	No	No	
8	Hanson Quarry Products (Europe) Ltd	336530	351760	Mineral Process	PG3/1	No		No	No	No	
9	RMC Readymix Wales	332750	352470	Mineral Process	PG3/1	No		No	No	No	
10	Minera Building Supplies Ltd	327690	352060	Mineral Process	PG3/1	No		Yes	No	No	
11	Hanson Concrete Products Ltd, Borrass Airfield	336960	352470	Mineral Process	PG3/1	No		No	Yes (dust)	No	Frisbee dust monitoring being undertaken
12	Dennis Ruabon Tiles Limited	331060	346270	Ceramic Production	PG3/2	Yes	SO <sub>2</sub>	No	Yes (occasional dust)	No	Fuel is gas, not fuel oil.
13	Stoneflex Ltd	330509	345485	Manufacture of Fibre Reinforced Plastics		No		No	No	No	
14	Pentrebychan Crematorium	329970	347940	Crematoria	PG5/2	No		No	No	No	
15	Animal Waste Services Ltd	337382	347807	Animal Carcase Incinerators		No		No	No	No	
16	Remploy Ltd	332982	351652	Timber Process	PG6/ 2	No		No	No	No	

Table 5.3 Continued

ID	Name	X co-ord	Y co-ord	Process Type	PG Note	Identified in LAQM. TG (03) Annex 2	Potential Pollutants	New source?	Complaints (excluding odour & noise)?	Significant?	Comments
17	Westminster Bedsteads	337622	350691	Timber Process & Coating Process	PG6/2	No		No	No	No	
18	Richard Burbridge Limited	328332	338170	Timber Process	PG6/2	No		No	No	No	
19	K D Products Ltd	338276	350282	Timber Process	PG6/2	No		No	No	No	
20	Kronospan Limited	328680	338380	Manufacture of MDF and Wood Processing	PG6/4	No		No	Yes, particulate (PM <sub>10</sub> )	No	A2 Process. Partisol PM <sub>10</sub> monitoring undertaken.
21	Ball Packaging Europe Ltd	333908	353854	Coating of Metal Packaging	PG6/23	No		No	No	No	A2 Process
22	Flint Ink (UK) Ltd, Packaging Inks Division	330280	345460	Manufacture of Printing Inks	PG6/10 & 11	No		No	No	No	
23	Intelicoat Technologies	338020	350650	Coating Process	PG6/	No		No	No	No	A2 Process
24	Tetra Pak (Wrexham) Ltd	337443	348346	Coating of Flexible Packaging	PG6/17	No		No	No	No	A2 Process
25	JCB Transmissions	337800	350940	Coating Process	PG6/23	No		No	No	No	
26	Rolinx Performance Coatings	329300	343490	Coating Process	PG6/	No		No	No	No	
27	Meritor HVS Limited	332870	356578	Coating Process	PG6/	No		No	No	No	
28	Lloyds Animal Feeds (Western) Ltd	338186	349542	Animal Feed Compounding	PG6/26	No		No	No	No	
29	Cymru Country Feeds Limited	332854	356469	Animal Feed Compounding	PG6/26	No		No	No	No	
30	Clwyd Compounders Limited	330040	344900	Rubber Process	PG6/28	Yes	1,3 butadiene, PM <sub>10</sub>	No	No	No	No 1,3 - butadiene used
31	Hoya Lens UK Ltd	338171	350528	Di-isocyanate Process	PG6/29	No		No	No	No	
32	Cytec Engineered Materials Ltd	337573	350484	Coating Process	PG6/23	No		No	No	No	A2 Process
33	Trefn Engineering Metal Treatments Division Ltd	332308	356552	Coating of Aircraft and Aircraft Components	PG6/23	No		No	No	No	
34	Brymbo Developments Ltd	329420	353020	Mineral Process	PG3/1	No		No	No	No	
35	Rockrite Ltd	330350	349350	Mineral Process	PG3/1	No		No	No	No	

### 5.3 Petrol Stations

Petrol-engined vehicles, petrol refining, and the distribution and uncontrolled emission from petrol station forecourts without vapour recovery systems are the main sources of benzene emission in the UK.

Since January 2000, EU legislation has reduced the maximum benzene content of petrol from 5% to 1%, and the European Auto-Oil program will further reduce emissions from vehicles and due to the storage and distribution of petrol.

Technical guidance LAQM.TG(03) indicates that levels of benzene are significantly below the 2003 objective of  $16.25 \mu\text{g}/\text{m}^3$  at all urban background and roadside locations. The much tighter 2010 objective of  $5\mu\text{g}/\text{m}^3$  (for England and Wales) is also expected to be achieved at most urban locations, the main exception being at kerbside locations of very busy roads in central London (e.g. Marylebone Road data suggests it will not be achieved).

Petrol stations are sources of emissions of benzene during the filling of the storage tanks (Stage 1 emissions), and when petrol is pumped into vehicles during refuelling (Stage 2 emissions).

Petrol stations may be significant if:

- 1) They have a throughput of greater than 2000 m<sup>3</sup> per year; and
- 2) Are near a road with greater than 30,000 vehicles per day; and
- 3) There are residential properties within 10 metres.

These criteria have been used to determine the significance of petrol stations in WCBC.

Details of the 14 petrol stations in Wrexham County Borough are provided in Table 5.4.

**Table 5.4**

**Petrol Stations in Wrexham County Borough**

<b>Petrol Stations</b>										
<b>ID</b>	<b>Name</b>	<b>X co-ord</b>	<b>Y co-ord</b>	<b>Process Type</b>	<b>PG Note</b>	<b>Identified in LAQM.TG(03) Annex 2</b>	<b>New source?</b>	<b>Complaints?</b>	<b>Significant?</b>	<b>Comments</b>
1	Asda Stores Ltd	333950	350630	Petrol Filling Station	PG1/14	No	No	No	No	>2000m <sup>3</sup> ; no Stage 2
2	Ruabon Service Area, A483	330870	344520	Petrol Filling Station	PG1/14	No	No	No	No	>1000m <sup>3</sup> ; no Stage 2
3	Snax 24, Tan y Clawdd Service Station	330120	346600	Petrol Filling Station	PG1/14	No	No	No	No	>1000m <sup>3</sup> ; no Stage 2
4	Brooklands Garage	334995	351108	Petrol Filling Station	PG1/14	No	No	No	No	>1000m <sup>3</sup> ; no Stage 2
5	Premier Garage	328079	351440	Petrol Filling Station	PG1/14	No	No	No	No	>1000m <sup>3</sup> ; no Stage 2
6	Park Wall Service Station	331652	354044	Petrol Filling Station	PG1/14	No	No	No	No	>1000m <sup>3</sup> ; no Stage 2
7	Rhostyllen Service Station	331028	348313	Petrol Filling Station	PG1/14	No	No	No	No	>1000m <sup>3</sup> ; no Stage 2
8	Regent Service Station	332977	350678	Petrol Filling Station	PG1/14	No	No	No	No	>1000m <sup>3</sup> ; no Stage 2
9	Beechley Service Station	333752	349729	Petrol Filling Station	PG1/14	No	No	No	No	>1000m <sup>3</sup> ; no Stage 2
10	Gresford Service Station	334858	354599	Petrol Filling Station	PG1/14	No	No	No	No	>1000m <sup>3</sup> ; no Stage 2
11	Tesco Petrol Filling Station	333925	350507	Petrol Filling Station	PG1/14	No	No	No	No	>2000m <sup>3</sup> ; no Stage 2
12	Mold Road Service Station	332971	350669	Petrol Filling Station	PG1/14	No	No	No	No	>1000m <sup>3</sup> ; no Stage 2
13	Sainsbury's Supermarkets Ltd	332490	351420	Petrol Filling Station	PG1/14	No	No	No	No	>2000m <sup>3</sup> ; no Stage 2
14	Berwyn Garage	328920	338680	Petrol Filling Station	PG1/14	No	No	No	No	>1000m <sup>3</sup> ; no Stage 2

Petrol stations require no immediate assessment if they are below the threshold of 2000 m<sup>3</sup>/year fuel capacity. Petrol stations have been checked to determine whether they are close to roads with more than 30,000 vehicles per day, and have properties within 10m of the pumps.

There are no petrol stations that fulfil these criteria and therefore no further assessment is warranted.

#### **5.4 Major Fuel Storage Depots**

There are no major fuel storage depots within Wrexham County Borough that warrant further assessment.

#### **5.5 Areas of Domestic Coal Burning**

The most significant area of coal burning in the County Borough is Llay. Monitoring has been undertaken for PM<sub>10</sub> and SO<sub>2</sub> and the results have shown exceedences in the 24 hour objective for PM<sub>10</sub> in the winter months. An AQMA has not been declared for domestic coal burning in Llay as improvements to convert the housing stock and private housing in the area to gas will be completed by the end of 2004. It is expected that these measures will ensure that the PM<sub>10</sub> objective is met in Llay. Further PM<sub>10</sub> monitoring in Chirk is expected to conclude that the PM<sub>10</sub> objective will not be breached.

It can therefore be concluded that there will be no significant coal burning areas in Wrexham County Borough by the end of 2004 that will lead to exceedences of air quality objectives and no further assessment is warranted.

#### **5.6 Shipping**

There are no ports within Wrexham County Borough.

#### **5.7 Railways**

There are no locations in Wrexham County Borough where diesel locomotives spend 15-minutes, or more, close to relevant receptors.

#### **5.8 Airports**

There are no significant airports within or bordering Wrexham County Borough.

#### **5.9 Other Sources**

##### **Fugitive sources**

Quarries, landfill sites, opencast coal mines, major construction works, and areas where dusty cargos are handled may lead to significant emissions of dust, some of which will be emitted as PM<sub>10</sub>. These sources are often termed “fugitive” sources, as they often are

emitted over areas (as opposed to defined stack emissions) and may also be intermittent (depending on activities), uncontrolled, and/or affected by external conditions such as wind strength. Emissions from these sources are difficult to quantify and screening of these sources is based on an assessment of exposure, consideration of background concentrations and local knowledge.

Mineral extraction sites and landfill sites were considered during the first round of review and assessment for fugitive PM<sub>10</sub> emissions and no detailed assessment was required to be undertaken. LAQM.TG(03) guidance recommends consideration of sources of fugitive emissions which were not considered during the last round. The sources considered in the last round are listed below:

- Astbury landfill site, Llay
- Pen –Y – Bont landfill
- Llay main tip, Llay
- Hafod Clay Pit, Johnstown (clay extraction and proposed landfill)
- Ballswood Quarry, near Llay (sand and gravel extraction)
- Caia Farm, Gresford (mineral extraction)
- Borrass Hall Farm, Gresford (mineral extraction)

Since the last review, there have been no significant changes to the sites to suggest emissions have increased substantially. There have been no complaints regarding fugitive dust, except occasional complaints of nuisance dust from the movement of clay at Hafod Clay Pit. Monitoring has been undertaken at the Astbury landfill by the Environment Agency and the results showed that the PM<sub>10</sub> objectives are likely to be achieved.

There are no other fugitive sources of PM<sub>10</sub> in Wrexham County Borough that warrant further assessment.

#### **Small boilers >5MW**

The first round of review and assessment indicated that small boiler plants of >5MW (thermal rating) which burn heavy fuel oil or coal can potentially lead to exceedences of the short term (15 minute) objective for SO<sub>2</sub> if there are combined impacts of several sources. No boilers fitting these criteria have been identified within the County Borough and therefore no further assessment is required.

No other sources have been identified within Wrexham County Borough.

## 6 ROAD TRAFFIC SOURCES

### 6.1 Introduction

The assessment of road traffic sources has been carried out according to the guidance listed in the LAQM TG(03). The technical guidance LAQM TG(03) gives a checklist for assessment of all road traffic sources for PM<sub>10</sub> and NO<sub>2</sub>, the pollutants of most relevance for road traffic sources. The guidance indicates that in general, properties within 10 – 20m may need to be considered for further assessment, although it is expected that only properties within 5 – 10m may be of relevance. In addition, a more thorough consideration of junctions is required as an evaluation of previous review and assessments indicated that these were often not considered properly.

Predicted concentrations at relevant distances from roads are assessed against the current and future air quality objectives. Where exceedences of objectives are predicted, a further detailed assessment will be required and these locations are highlighted in the following sections.

However, further assessment has not been suggested for roads, which are only predicted to exceed an annual mean PM<sub>10</sub> concentration of 20µg/m<sup>3</sup> in 2010, although these roads have been highlighted. At this stage of the review and assessment process, 2010 concentrations of PM<sub>10</sub> are not required to be assessed further in Wales until more information is available from DEFRA and The National Assembly of Wales. Information is provided only as an indication of potential problems that may arise in the future. If none of the other objectives are predicted to be exceeded, no further assessment is required.

Modelled background concentrations, as shown in Table 3.1, across the County Borough are variable. To use the maximum background across the County Borough in the assessment would therefore be overly conservative and double count sources. The maximum background concentrations have therefore been selected as appropriate from the background maps for the area being modelled as shown in Table 6.1.

**Table 6.1**

**Modelled background concentrations used in the assessment of road traffic sources**

Modelled background concentrations							
All backgrounds as µg/m <sup>3</sup> , except CO (mg/m <sup>3</sup> )	Benzene 2003	Benzene 2010	CO 2001	NO <sub>x</sub> 2005	NO <sub>2</sub> 2005	PM <sub>10</sub> 2004	PM <sub>10</sub> 2010
Maximum background WCB*	0.535	0.446	0.329	34.9	22.3	21.2	20.2

\* Minus one non-representative grid square (336500, 351500) where elevated NO<sub>x</sub> and PM<sub>10</sub> indicates point source

Table 6.2 and 6.3 show the traffic flows (annual average daily traffic flows), speeds and percentage of vehicles assumed for main roads and junctions.

Figure 6.1 shows the locations of traffic count information for Wrexham County Borough.

Traffic flows have been forecast using the National Road Traffic Forecasts (NRTF). Table 6.4 shows the growth factors calculated for Wrexham County Borough allowing projection of different base year traffic flows to 2004, 2005 and 2010 as relevant for the USA assessment criteria. The base years of traffic flows are 2002 and 2003.

**Table 6.2**

**Available traffic information for main roads in Wrexham County Borough**

Traffic Information										
SITE No.	ROAD No.	LOCATION	X co-ord	Y co-ord	AADT	Year	%HGV	AADT (2004)	AADT (2005)	AADT (2010)
1	A483(T)	Rossett	332570	351260	37,011	2,003	14.1	37751	38121	41082
2	A483(T)	Gresford	335000	355400	36,656	2,003	12.8	37389	37756	40688
3	A483(T)	Wrexham North	332770	352020	47,117	2,003	9.8	48059	48531	52300
4	A483(T)	Wrexham Mid	331800	350650	45,022	2,003	9.6	45922	46373	49974
5	A483(T)	Wrexham South	330930	349400	42,637	2,003	10.9	43490	43916	47327
6	A483(T)	Ruabon North	331460	346760	35,853	2,003	10.0	36570	36929	39797
7	A483(T)	Ruabon South	331000	344700	35,069	2,003	10.0	35770	36121	38927
8	A483(T)	Newbridge	329900	342600	23,727	2,003	12.3	24202	24439	26337
9	A5(T)	Chirk	330000	338900	22,883	2,003	14.8	23341	23569	25400
10	A5(T)	Whitehurst Link	329500	339800	10,152	2,003	9.0	10355	10457	11269
11	A525	Kingmills	334300	349310	12,721	2,003	2.3	12975	13103	14120
12	A525	Wrexham - Ruthin Road	332460	350030	10,763	2,003	2.5	10978	11086	11947
13	A525	Coedpoeth	328200	351400	10,890	2,003	5.1	11108	11217	12088
14	A534	Wrexham - Holt Road	335530	351520	11,793	2,003	4.5	12029	12147	13090
15	A534	Llanypwll	337100	351900	16,401	2,003	13.9	16729	16893	18205
16	A541	Gwersyllt North	331540	354580	18,923	2,003	3.3	19301	19491	21005
17	A541	Gwersyllt South	332110	352260	20,170	2,003	2.6	20573	20775	22389
18	A541	Wrexham - Mold Road	332820	350840	20,128	2,003	2.3	20531	20732	22342
19	A5152	Wrexham- Chester Road	333810	353020	13,223	2,003	1.9	13487	13620	14678
20	A5152	Wrexham - Grosvenor Road	333320	350660	15,022	2,003	4.0	15322	15473	16674
21	A5152	Wrexham - Bradley Road	333050	350390	18,785	2,003	1.8	19161	19349	20851
22	A5152	Wrexham- Victoria Road	332860	349840	10,230	2,003	2.2	10435	10537	11355
23	A5152	Wrexham - Ruabon Road	333200	349800	14,157	2,003	1.7	14440	14582	15714
24	A5152	Rhostyllen	331960	348900	14,534	2,003	3.8	14825	14970	16133
25	A5152	Wrexham - Bodhyfryd	333800	350710	18,417	2,003	3.3	18785	18970	20443
26	A5152	Wrexham - Farndon Street	333840	350410	16,807	2,003	1.9	17143	17311	18656
27	A5152	Wrexham - Eagles Meadow	333810	350130	11,062	2,003	2.3	11283	11394	12279
28	A5156	Acton -Llanypwll link	335170	352320	16,671	2,003	13.9	17004	17171	18505
29	B5101	Wrexham- Plas Coch Road			21,911	2,003	5.0	22349	22568	24321
30	B5101	Wrexham - Berse Road	332310	351010	17,053	2,003	5.0	17394	17565	18929
31	B5425	Rhosrobin	332970	352810	10,464	2,003	7.7	10673	10778	11615
32	B5446	Wrexham - St Giles Way	333540	349970	18364	2,003	5.0	18731	18915	20384

**Table 6.3**

**Available traffic data for significant junctions in Wrexham County Borough**

Traffic Data									
Junction data	X co-ord	Y co-ord	Location	AADT	Year	%HDV	AADT (2004)	AADT (2005)	AADT (2010)
Location 1: A483/A5152/ A5156/B5445 junction	333990	353140	A483 Southbound slip	8207	2002	10.1	8453	8617	9274
			A483 Southbound main	16300	2002	10.1	16789	17115	18419
			A483 Northbound main	15254	2002	9.6	15712	16017	17237
			A483 Northbound slip	7356	2002	9.6	7577	7724	8312
			A5156	16338	2002	14	16828	17155	18462
			A5152 Chester Road	14137	2002	2	14561	14844	15975
			Total flow	77592	2002		79920	81472	87679
Location 2: A483/A541 Junction	332150	351380	A483 Southbound slip	8930	2002	9.5	9198	9377	10091
			A483 Southbound main	13733	2002	9.5	14145	14420	15518
			A483 Northbound main	13999	2002	9.7	14419	14699	15819
			A483 Northbound slip	8360	2002	9.7	8611	8778	9447
			B5101 Berse Road	16813	2002	2.3	17317	17654	18999
			A541 Mold Road	20713	2002	2.3	21334	21749	23406
			Total flow	82548	2002		85024	86675	93279
Location 3: A483/ A5152 Junction	330870	348200	A483 Southbound	21507	2002	11.5	22152	22582	24303
			A483 Northbound	21130	2002	10.3	21764	22187	23877
			A5152 Ruabon Road	14490	2002	3.5	14925	15215	16374
			Total flow	57127	2002		58841	59983	64554

Figure 6.1

Locations of roads with available road traffic information in Wrexham County Borough

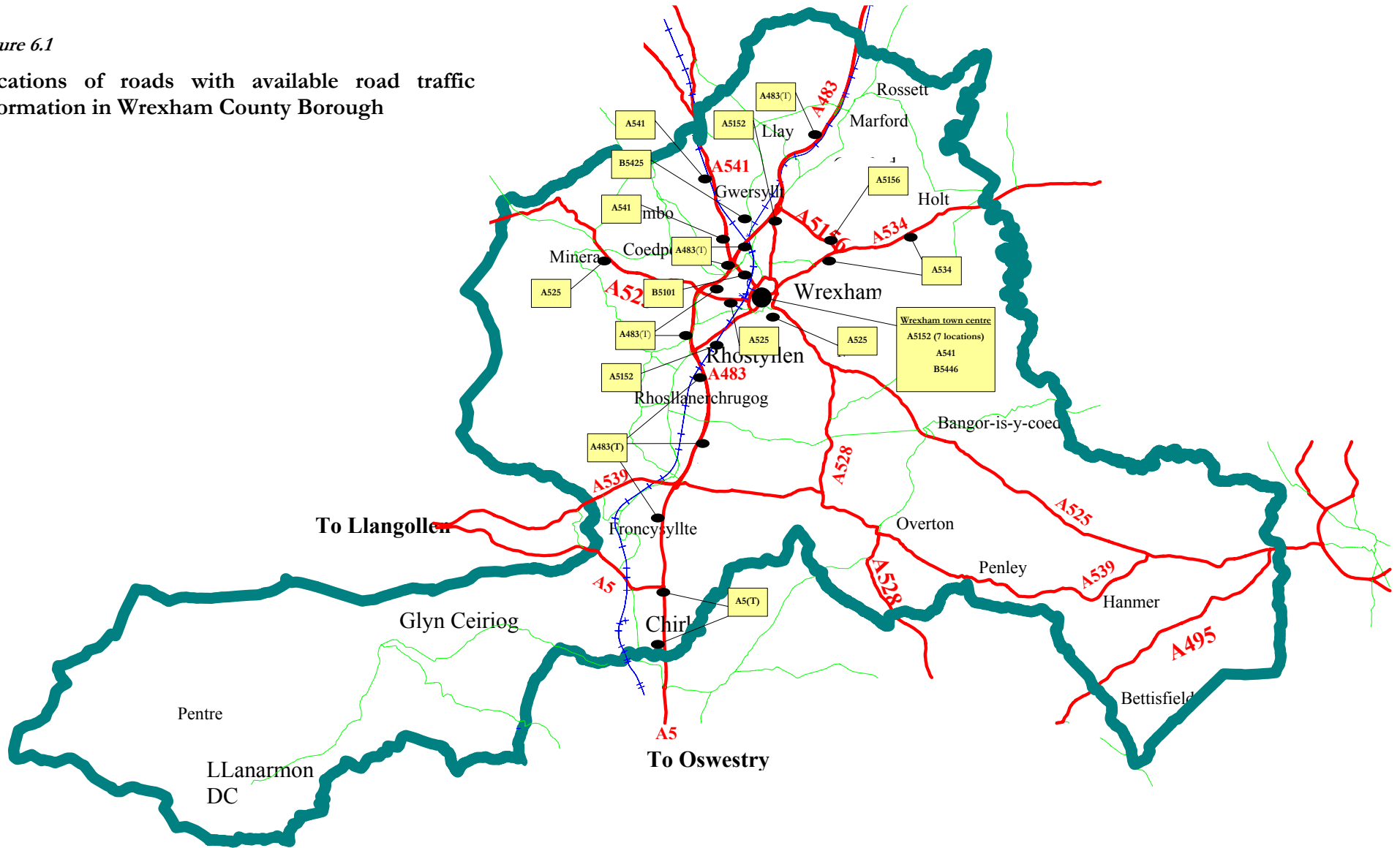


Table 6.4

**Tempo/NRTF<sup>8</sup> Traffic Growth Factors for Wrexham County Borough**

Wrexham	Base Years	
	2002	2003
To Project to 2004	1.03	1.02
To Project to 2005	1.05	1.03
To Project to 2010	1.13	1.11

## 6.2 Methodology

The methodology for the USA has been to gather and identify new and updated road traffic information including (where possible) speed and vehicle split information. The DMRB screening model was used to predict concentrations at a number of different distances from the centre of each road to determine what distances, if any, may need further assessment, where there is relevant exposure.

All roads have been assessed using the 2003 DMRB (Highways Agency v1.01) in order to assess the concentrations of NO<sub>2</sub>, PM<sub>10</sub>, CO and benzene in the relevant objective years. In addition, PM<sub>10</sub> concentrations have also been assessed for the year 2010, however the objective is not yet in regulations for England and only a small consideration has been given in this assessment. The following concentrations have been predicted:

- Annual mean CO for the year 2001 - emission rates for the year 2001 have been used along with background 2001 concentrations. Traffic flows for the year 2005 were used as a conservative approach.
- Annual mean benzene for the year 2003 - emission rates for the year 2003 have been used along with background 2003 concentrations. Traffic flows for the year 2005 were used as a conservative approach.
- Annual mean benzene for the year 2010 - emission rates for the year 2010 have been used along with background 2010 concentrations. Traffic flows for the year 2010 were used.
- Annual mean NO<sub>2</sub> for the year 2005 - emission rates for the year 2005 have been used along with background 2005 concentrations. Traffic flows for the year 2005 were used.
- 99.8<sup>th</sup> percentile NO<sub>2</sub> for the year 2005 - emission rates for the year 2005 have been used along with background 2005 concentrations. Traffic flows for the year 2005 were used.

There is no well-defined relationship between the numbers of exceedences of the hourly mean annual mean NO<sub>2</sub>, therefore the 99.8<sup>th</sup> percentile has been used as a rough estimate to allow comparison against the hourly objective. The 99.8<sup>th</sup> percentile has been derived based on the relationship between long term monitoring at sites in the UK AURN comparing the 99.8<sup>th</sup> percentile of hourly mean NO<sub>2</sub> and annual mean NO<sub>2</sub>. Figure 5.2 shows the derived relationship and the resulting trend line

$$99.8^{\text{th}} \text{ percentile hourly NO}_2 = 70.012 \times e^{(0.0141 \times \text{annual mean NO}_2)}$$

<sup>8</sup> NRTF = National Road Traffic Forecasts

- Annual mean PM<sub>10</sub> for the year 2004 - emission rates for the year 2004 have been used along with background 2004 concentrations. Traffic flows for the year 2004 were used.
- Annual mean PM<sub>10</sub> for the year 2010 - emission rates for the year 2010 have been used along with background 2010 concentrations. Traffic flows for the year 2010 were used.
- Number of exceedences of daily mean PM<sub>10</sub> concentration of 50 µg/m<sup>3</sup> based on relationship defined in LAQM.TG(03) whereby:

$$\text{Number of exceedences of } 50\mu\text{g}/\text{m}^3 \text{ daily mean} = \\ -18.5 + 0.00145 \times (\text{annual mean PM}_{10})^3 + (206/\text{annual mean PM}_{10})$$

### 6.3 Main Roads and Motorways (excluding junctions)

Pollutant concentrations at main roads have been predicted at the following distances from the centre of the road: 3m, 5m, 10m and 15m.

Speeds have been estimated based on information available from Department for Transport. Estimates of average speeds have been used for main roads - 30 mph has been assumed for urban roads and 60 mph for roads outside urban areas. Where particular congestion problems have been identified (Grosvenor Road) this has been reduced to 20mph.

The DMRB results for main roads are shown in Appendix 1.

#### Summary of Predicted Benzene Concentrations

The maximum predicted annual mean benzene concentration in 2010 from road traffic is 0.6µg/m<sup>3</sup>, which is well below the 2010 objective of 5µg/m<sup>3</sup>. The maximum predicted concentrations are predicted at the centre of the A483.

It can be concluded that exceedences of the 2010 benzene objective are very unlikely within Wrexham County Borough as a result of road traffic emissions from busy roads in the County and no further detailed assessment is required.

#### Summary of Predicted CO Concentrations

The maximum predicted annual mean CO concentration in 2001 from road traffic is 0.6 mg/m<sup>3</sup>, occurring at the centre of the A483.

Technical guidance indicates that further assessment of CO objective of 10 mg/m<sup>3</sup> as a maximum daily running eight hour mean may be required where predictions of annual mean CO are greater than 2mg/m<sup>3</sup>. The technical guidance also sets out the criteria for 'busy roads' likely to lead to exceedences of the CO objective – >80,000 vehicles per day for single carriageways, >120,000 vehicles per day for dual carriageways and >140,000 vehicles per day for motorways. No roads within Wrexham County Borough meet these criteria.

It can therefore be concluded that exceedences of the 2003 CO objective are very unlikely as a result of road traffic emissions from busy roads in the County Borough as maximum predictions are well below 2 mg/m<sup>3</sup> and no further detailed assessment is required.

## Summary of Predicted NO<sub>2</sub> Concentration

The maximum predicted annual mean NO<sub>2</sub> concentration in 2005 is 36.0 µg/m<sup>3</sup> which is below the annual average objective of 40 µg/m<sup>3</sup>. The maximum concentrations are predicted at the centre of the A483. There are no exceedences of the annual mean predicted for any main road in Wrexham County Borough.

An estimate of the 99.8<sup>th</sup> percentile of hourly mean NO<sub>2</sub> concentrations has been derived from the predicted annual mean concentration as described in section 6.2. The maximum predicted 99.8<sup>th</sup> percentile of hourly mean concentration is 116 µg/m<sup>3</sup>, which is below the short-term objective of 200µg/m<sup>3</sup>.

It is concluded that the annual mean NO<sub>2</sub> objective will be met for all main roads, where there is relevant exposure, and no detailed assessment is required for NO<sub>2</sub>.

## Comparison of NO<sub>2</sub> predictions against diffusion tube measurements

Table 6.5 summarises the modelled and monitored annual average NO<sub>2</sub> concentrations at diffusion tube sites.

*Table 6.5*

### Comparison of Diffusion Tube measurements and DMRB Modelled Annual Average NO<sub>2</sub> Concentrations

Annual Average NO <sub>2</sub> Concentration in 2005 (µg/m <sup>3</sup> )				
Diffusion Tube Site No.	Relevant Section of Road	Distance from Centre of Road (m)	Projected Diffusion Tube	DMRB Prediction
Wrexham Road, Rhostyllen	A5152	~5	17.5	28.4
Mold Road, Wrexham	A541	~5	20.7	27.2
Holt Road, Wrexham	A534	~5	26.7	26.7
Grosvenor Road	A5152	~5	27.8	28.0

Table 6.5 shows that there is generally good agreement between the projected diffusion tube measurements and the predictions from the DMRB. There is no large disparity between monitored and modelled results, except the Wrexham Road, Rhostyllen site where the model significantly over predicts NO<sub>2</sub> concentrations and therefore no adjustment factor has been applied to the modelled results. The comparison provides useful information as the reliability of the DMRB for predictions of NO<sub>2</sub> concentrations near to the roads in Wrexham County Borough, and indicates the method is reliable for determining potential exceedences of the NO<sub>2</sub> objective as the model over predicts and is therefore precautionary.

However, the last round of review and assessment highlighted the need to consider junctions more carefully, particularly for predictions of NO<sub>2</sub> concentrations and these are considered more fully in section 6.4.

## Summary of Predicted PM<sub>10</sub> Concentrations

The maximum predicted annual mean PM<sub>10</sub> concentration in 2004 is 27.4 µg/m<sup>3</sup>, which is below the annual average objective of 40 µg/m<sup>3</sup>. The estimated number of exceedences of the daily mean objective is 27, which is below the 35 exceedences allowed in a year. The daily mean objective is met at all roads, as shown in Appendix 1.

Exceedences of the 2004 PM<sub>10</sub> objectives are very unlikely as a result of road traffic emissions from busy roads in the County Borough and no further detailed assessment is required.

Some consideration has also been given to the 2010 PM<sub>10</sub> objective (not currently in air quality regulations for Wales). The annual mean objective is 20µg/m<sup>3</sup>. Exceedences of the longer-term annual objective have been predicted at all busy roadsides, due to maximum-modelled background concentrations for 2010, which are above the proposed objective. Close to localised sources such as busy roads and junctions, exceedences of the annual mean objective are likely to occur in 2010.

For the purposes of the USA, no further assessment of the PM<sub>10</sub> is required at this stage. However future progress reports should provide updates on predictions for comparison against the 2010 objective and take account of future advice from DEFRA in particular with respect to estimates of background concentrations of PM<sub>10</sub>.

## 6.4 Significant Junctions

Three potentially significant junctions have been highlighted in Wrexham County Borough as detailed in Table 6.6.

These junctions have daily flows of greater than 10,000 vehicles per day and relevant exposure within 20m of the junction. As speed data for junctions is not available, they have been estimated as 20mph to take account of junction delays through congestion. Table 6.7 shows the DMRB results for these junctions with an indication of whether a detailed assessment is required.

*Table 6.6*

### Significant junctions in Wrexham County Borough

Significant Junctions			
X co-ord	Y co-ord	Description of Junction	Diffusion Tube Reference
333990	353140	Location 1: A483/A5152/A5156/B5445	None
332150	351380	Location 2: A483/A541	None
330870	348200	Location 3: A483/A5152	None

There are no diffusion tube sites at junctions identified to verify the model predictions.

The DMRB predicted concentrations in Table 6.7 for Benzene and CO indicate that the objectives will be easily met at all locations assessed and are well below objective levels.

### **Summary of Predicted NO<sub>2</sub> Concentrations**

The maximum predicted concentration of NO<sub>2</sub> is 35.9 µg/m<sup>3</sup> at the A483/A5152/A5156/B5445 Junction, which is below the annual mean objective of 40 µg/m<sup>3</sup> for 2005. The maximum estimated 99.8<sup>th</sup> percentile is 116 µg/m<sup>3</sup>, which is well below the 200µg/m<sup>3</sup> objective, indicating that the hourly objective will easily be met.

The modelled predictions for all junctions assessed are below the annual objective for NO<sub>2</sub> and no further assessment is required at these junctions. In addition, it may be inferred that no other junction locations would be expected to exceed the NO<sub>2</sub> objectives as traffic flows are less on the other junctions in Wrexham County Borough or have no relevant exposure.

### **Summary of Predicted PM<sub>10</sub> Results**

The maximum predicted concentration of PM<sub>10</sub> in 2004 is 24.5 µg/m<sup>3</sup> which is below the annual mean objective of 40µg/m<sup>3</sup>. The maximum number of predicted exceedences of the daily mean of 50µg/m<sup>3</sup> is 11, within the 35 permitted by the 2004 objective.

The annual mean 2010 objective is predicted to be exceeded within 15 m of all junctions assessed. For the purposes of the USA, no further assessment of the 2010 PM<sub>10</sub> objective is required at this stage. However future progress reports should provide updates on predictions for comparison against the 2010 objective and take account of future advice from DEFRA in particular with respect to estimates of background concentrations of PM<sub>10</sub>.

It is therefore concluded that no further assessment is required for road traffic emissions at junctions in Wrexham County Borough.

Table 6.7

Predicted DMRB results at junctions in WCBC

Predicted DMRB Results									
Junction	Distance from centre junction (m)	Total NO <sub>2</sub>	NO <sub>2</sub> Estimate 99.8th %	CO	Benzene	PM <sub>10</sub>	PM <sub>10</sub> Exceedences > 50	PM <sub>10</sub>	PM <sub>10</sub> Exceedences > 50
Total Annual Mean Concentrations, including Background All results as ug/m <sup>3</sup> , except CO (mg/m <sup>3</sup> ) and number of exceedences				2001	2010	2004	2004	2010	2010
Location 1: A483/A5152/A5156/B5445 junction	3	35.9	116	0.79	0.98	28.8	23	24.5	11
	5	35.9	116	0.79	0.98	28.8	23	24.5	11
	10	34.9	114	0.75	0.93	28.0	21	24.1	10
	15	33.5	112	0.69	0.86	27.2	18	23.6	9
Location 2: A483/A541 Junction	3	34.0	113	0.81	1.03	27.8	20	24.1	10
	5	34.0	113	0.81	1.03	27.8	20	24.1	10
	10	33.0	112	0.76	0.97	27.2	18	23.7	10
	15	31.9	110	0.71	0.90	26.4	16	23.3	9
Location 3: A483/A5152 Junction	3	34.6	114	0.74	0.84	27.9	20	24.0	10
	5	34.6	114	0.74	0.84	27.9	20	24.0	10
	10	33.6	112	0.70	0.80	27.2	18	23.6	9
	15	32.3	110	0.65	0.75	26.4	16	23.2	8

## **6.5 Other Road Traffic Sources**

No other potentially significant transport sources have been identified such as bus lanes or bus stations.

There are no roads with unusually high proportions of heavy goods vehicles (>25%) or busy streets where people spend one hour or more close to traffic.

The results presented have taken into consideration revised traffic flows for all roads in WCBC >10000 AADT in current and projected years, which has, by default, taken into account all roads with any substantially increased traffic flows from the first round that would require further assessment and any new roads.

## **7 AREAS WITH COMBINED IMPACTS**

There are no significant industrial source emissions within Wrexham County Borough, which are likely to lead to exceedences of any air quality objectives and require detailed assessment. It is also unlikely that exceedences will occur where there are areas affected by both traffic and industrial sources. The areas of maximum impact of road traffic sources and industrial processes do not generally overlap as road traffic impacts more on the annual mean concentrations at the roadside; where as industrial sources tend to be more significant in their impacts on short-term concentrations.

It is therefore recommended that there is no need for further assessment of combined impacts of sources.

## 8 CONCLUSION

The current report provides an update with respect to air quality issues within Wrexham County Borough. It has taken into consideration changes and updates in recently released Technical Guidance and has included consideration to all existing emission sources previously identified in the first round of review and assessment. Moreover, the assessment has used the latest available tools for screening potentially significant emission sources within the County Borough made available to local authorities through the National Air Quality Information Archive.

The current work has highlighted that a number of potentially significant sources of pollution exist in and around Wrexham County Borough. These include industrial sites in the County Borough and bordering authorities, petrol stations and road traffic.

**Results of the screening assessment have shown that no detailed assessment is required with respect to emissions arising from all sources assessed - predictions of air quality in relevant future years indicate that the current air quality objectives will be met at all receptors in Wrexham County Borough.**

In the UK during the first 3 months of 2003 there were more exceedences of the AQS PM<sub>10</sub> Standard than in the whole of 2002 (*Met Office 2003*). Three pollution episodes caused by the long-range transport of polluted air from the continent, elevated PM<sub>10</sub> results for this period at monitoring stations across the County Borough. As a result further monitoring will be carried out in the Chirk area to obtain more representative PM<sub>10</sub> data and confirm that the 2004 objectives will be met.

The provisional annual PM<sub>10</sub> objective for 2010 is exceeded at busy roadsides and junctions. No detailed assessment of the 2010 PM<sub>10</sub> objectives is required at this stage, as the objectives have not been laid down in Regulations. However, future progress reports should provide updates on predictions for comparison against the 2010 objective and take account of future advice from DEFRA in particular with respect to estimates of background concentrations of PM<sub>10</sub>.

WCBC will continue with its monitoring programme to confirm the findings of this report. Further work will be undertaken with respect to the performance of diffusion tubes through the use of triplicate tubes at the continuous roadside monitoring site.

**APPENDIX 1      DMRB RESULTS FOR MAIN ROADS**

Road	Distance from centre road (m)	Total NO <sub>2</sub>	NO <sub>2</sub> Estimate 99.8th %	CO	Benzene	PM <sub>10</sub>	PM <sub>10</sub> Exceedences > 50	PM <sub>10</sub>	PM <sub>10</sub> Exceedences > 50
Total Annual Mean Concentrations, including Background All results as ug/m <sup>3</sup> , except CO (mg/m <sup>3</sup> ) and number of exceedences				2001	2010	2004	2004	2010	2010
A483(T) Rossett	3	36.0	116	0.57	0.58	27.4	19	<b>24.0</b>	<b>10</b>
	5	35.9	116	0.57	0.58	27.4	19	<b>24.0</b>	<b>10</b>
	10	34.9	114	0.55	0.57	26.8	17	<b>23.6</b>	<b>9</b>
	15	33.5	112	0.52	0.55	26.1	15	<b>23.2</b>	<b>8</b>
A483(T) Gresford	3	35.3	115	0.57	0.58	27.1	18	<b>23.9</b>	<b>10</b>
	5	35.3	115	0.57	0.58	27.1	18	<b>23.9</b>	<b>10</b>
	10	34.2	113	0.55	0.57	26.6	16	<b>23.5</b>	<b>9</b>
	15	33.0	111	0.52	0.55	25.9	15	<b>23.1</b>	<b>8</b>
A483(T) Wrexham North	3	34.8	114	0.60	0.62	27.2	18	<b>24.0</b>	<b>10</b>
	5	34.8	114	0.60	0.62	27.2	18	<b>24.0</b>	<b>10</b>
	10	33.8	113	0.57	0.61	26.6	17	<b>23.6</b>	<b>9</b>
	15	32.6	111	0.54	0.58	25.9	15	<b>23.2</b>	<b>8</b>
A483(T) Wrexham Mid	3	34.6	114	0.60	0.62	27.0	18	<b>23.9</b>	<b>10</b>
	5	34.5	114	0.60	0.62	27.0	18	<b>23.9</b>	<b>10</b>
	10	33.6	112	0.57	0.60	26.5	16	<b>23.5</b>	<b>9</b>
	15	32.3	110	0.54	0.58	25.8	14	<b>23.1</b>	<b>8</b>
A483(T) Wrexham South	3	35.0	115	0.59	0.60	27.2	18	<b>23.9</b>	<b>10</b>
	5	35.0	115	0.59	0.60	27.2	18	<b>23.9</b>	<b>10</b>
	10	34.0	113	0.56	0.59	26.6	16	<b>23.6</b>	<b>9</b>
	15	32.7	111	0.53	0.57	25.9	15	<b>23.1</b>	<b>8</b>
A483(T) Ruabon	3	33.9	113	0.57	0.58	26.6	17	<b>23.6</b>	<b>9</b>
	5	33.9	113	0.57	0.58	26.6	17	<b>23.6</b>	<b>9</b>
	10	32.9	111	0.55	0.57	26.1	15	<b>23.3</b>	<b>9</b>
	15	31.8	110	0.52	0.55	25.4	13	<b>22.9</b>	<b>8</b>

**Appendix 1 (continued)**

Road	Distance from centre road (m)	Total NO <sub>2</sub>	NO <sub>2</sub> Estimate 99.8th %	CO	Benzene	PM <sub>10</sub>	PM <sub>10</sub> Exceedences > 50	PM <sub>10</sub>	PM <sub>10</sub> Exceedences > 50
Total Annual Mean Concentrations, including Background All results as ug/m <sup>3</sup> , except CO (mg/m <sup>3</sup> ) and number of exceedences				2001	2010	2004	2004	2010	2010
A483(I) Ruabon South	3	33.8	113	0.57	0.58	26.6	16	<b>23.6</b>	<b>9</b>
	5	33.8	113	0.57	0.58	26.5	16	<b>23.6</b>	<b>9</b>
	10	32.8	111	0.55	0.56	26.0	15	<b>23.2</b>	<b>9</b>
	15	31.7	109	0.52	0.55	25.4	13	<b>22.8</b>	<b>8</b>
A483(I) Newbridge	3	33.4	112	0.53	0.53	26.1	15	<b>23.2</b>	<b>9</b>
	5	33.4	112	0.53	0.53	26.1	15	<b>23.2</b>	<b>9</b>
	10	32.5	111	0.51	0.52	25.6	14	<b>22.9</b>	<b>8</b>
	15	31.3	109	0.49	0.51	25.1	13	<b>22.6</b>	<b>7</b>
A5(I) Chirk	3	34.3	113	0.53	0.53	26.4	16	<b>23.4</b>	<b>9</b>
	5	34.2	113	0.53	0.53	26.4	16	<b>23.4</b>	<b>9</b>
	10	33.3	112	0.51	0.52	25.9	15	<b>23.1</b>	<b>8</b>
	15	32.1	110	0.49	0.51	25.3	13	<b>22.7</b>	<b>8</b>
A5(I) Whitehurst Link	3	28.3	104	0.45	0.48	23.7	10	<b>21.9</b>	6
	5	28.3	104	0.45	0.48	23.7	10	<b>21.9</b>	6
	10	27.7	104	0.44	0.48	23.5	9	<b>21.7</b>	6
	15	27.1	103	0.42	0.48	23.2	8	<b>21.5</b>	6
A525 Kingmills	3	27.2	103	0.48	0.50	23.6	9	<b>22.0</b>	6
	5	27.2	103	0.48	0.50	23.6	9	<b>22.0</b>	6
	10	26.7	102	0.47	0.49	23.4	9	<b>21.8</b>	6
	15	26.2	101	0.45	0.49	23.1	8	<b>21.6</b>	6
A525 Ruthin Road	3	25.7	101	0.48	0.51	22.9	8	<b>21.3</b>	5
	5	25.7	101	0.48	0.51	22.9	8	<b>21.3</b>	5
	10	25.4	100	0.46	0.51	22.7	8	<b>21.2</b>	5
	15	25.0	100	0.44	0.50	22.5	7	<b>21.1</b>	5

**Appendix 1 (continued)**

Road	Distance from centre road (m)	Total NO <sub>2</sub>	NO <sub>2</sub> Estimate 99.8th %	CO	Benzene	PM <sub>10</sub>	PM <sub>10</sub> Exceedences > 50	PM <sub>10</sub>	PM <sub>10</sub> Exceedences > 50
Total Annual Mean Concentrations, including Background All results as ug/m <sup>3</sup> , except CO (mg/m <sup>3</sup> ) and number of exceedences				2001	2010	2004	2004	2010	2010
A525 Coedpoeth	3	27.5	103	0.46	0.49	23.6	9	<b>21.8</b>	6
	5	27.4	103	0.46	0.49	23.6	9	<b>21.8</b>	6
	10	27.0	102	0.44	0.48	23.3	9	<b>21.7</b>	6
	15	26.4	102	0.43	0.48	23.0	8	<b>21.5</b>	5
A534 Holt Road	3	26.7	102	0.49	0.52	23.3	9	<b>21.5</b>	6
	5	26.7	102	0.49	0.52	23.3	9	<b>21.5</b>	6
	10	26.3	101	0.47	0.51	23.1	8	<b>21.4</b>	5
	15	25.9	101	0.46	0.50	22.8	8	<b>21.2</b>	5
A534 Llanypwll	3	32.7	111	0.51	0.51	25.7	14	<b>22.9</b>	<b>8</b>
	5	32.7	111	0.51	0.51	25.7	14	<b>22.9</b>	<b>8</b>
	10	31.8	110	0.49	0.50	25.2	13	<b>22.7</b>	<b>7</b>
	15	30.8	108	0.47	0.49	24.7	12	<b>22.3</b>	7
A541 Gwersyllt North	3	28.8	105	0.52	0.52	24.5	11	<b>22.4</b>	<b>7</b>
	5	28.8	105	0.52	0.52	24.5	11	<b>22.4</b>	<b>7</b>
	10	28.2	104	0.50	0.51	24.2	10	<b>22.2</b>	7
	15	27.6	103	0.48	0.51	23.8	10	<b>21.9</b>	6
A541 Gwersyllt South	3	28.6	105	0.53	0.53	24.4	11	<b>22.4</b>	<b>7</b>
	5	28.6	105	0.53	0.53	24.4	11	<b>22.4</b>	<b>7</b>
	10	28.1	104	0.51	0.52	24.1	10	<b>22.2</b>	7
	15	27.4	103	0.48	0.51	23.7	10	<b>21.9</b>	6
A541 Mold Road	3	27.2	103	0.56	0.57	23.8	10	<b>21.8</b>	6
	5	27.2	103	0.56	0.57	23.8	10	<b>21.8</b>	6
	10	26.8	102	0.53	0.56	23.5	9	<b>21.6</b>	6
	15	26.3	101	0.51	0.54	23.2	9	<b>21.4</b>	5

### Appendix 1 (continued)

Road	Distance from centre road (m)	Total NO <sub>2</sub>	NO <sub>2</sub> Estimate 99.8th %	CO	Benzene	PM <sub>10</sub>	PM <sub>10</sub> Exceedences > 50	PM <sub>10</sub>	PM <sub>10</sub> Exceedences > 50
Total Annual Mean Concentrations, including Background All results as ug/m <sup>3</sup> , except CO (mg/m <sup>3</sup> ) and number of exceedences				2001	2010	2004	2004	2010	2010
A5152 Chester Road	3	26.2	101	0.51	0.53	23.2	8	<b>21.5</b>	5
	5	26.2	101	0.51	0.53	23.2	8	<b>21.5</b>	5
	10	25.8	101	0.49	0.52	23.0	8	<b>21.4</b>	5
	15	25.4	100	0.47	0.51	22.8	8	<b>21.2</b>	5
A5152 Grosvenor Road	3	28.0	104	0.61	0.57	24.4	11	<b>22.1</b>	7
	5	28.0	104	0.61	0.57	24.4	11	<b>22.1</b>	7
	10	27.5	103	0.58	0.55	24.1	10	<b>21.9</b>	6
	15	26.8	102	0.55	0.54	23.7	10	<b>21.7</b>	6
A5152 Bradley Road	3	26.9	102	0.55	0.56	23.6	9	<b>21.7</b>	6
	5	26.9	102	0.55	0.56	23.6	9	<b>21.7</b>	6
	10	26.5	102	0.53	0.55	23.4	9	<b>21.6</b>	6
	15	26.0	101	0.50	0.54	23.1	8	<b>21.4</b>	5
A5152 Victoria Road	3	25.4	100	0.47	0.51	22.8	8	<b>21.2</b>	5
	5	25.4	100	0.47	0.51	22.8	8	<b>21.2</b>	5
	10	25.2	100	0.46	0.50	22.6	7	<b>21.1</b>	5
	15	24.8	99	0.44	0.50	22.4	7	<b>21.0</b>	5
A5152 Ruabon Road	3	26.3	101	0.52	0.53	23.3	9	<b>21.5</b>	6
	5	26.3	101	0.52	0.53	23.3	9	<b>21.5</b>	6
	10	26.0	101	0.50	0.52	23.1	8	<b>21.4</b>	5
	15	25.5	100	0.48	0.51	22.8	8	<b>21.2</b>	5
Rhostyllen	3	28.4	105	0.50	0.50	24.2	11	<b>22.2</b>	7
	5	28.4	105	0.50	0.50	24.2	11	<b>22.2</b>	7
	10	27.9	104	0.48	0.50	23.9	10	<b>22.0</b>	6
	15	27.2	103	0.46	0.49	23.5	9	<b>21.8</b>	6

**Appendix 1 (continued)**

Road	Distance from centre road (m)	Total NO <sub>2</sub>	NO <sub>2</sub> Estimate 99.8th %	CO	Benzene	PM <sub>10</sub>	PM <sub>10</sub> Exceedences > 50	PM <sub>10</sub>	PM <sub>10</sub> Exceedences > 50
Total Annual Mean Concentrations, including Background All results as ug/m <sup>3</sup> , except CO (mg/m <sup>3</sup> ) and number of exceedences				2001	2010	2004	2004	2010	2010
A5152 Bodhyfryd	3	27.6	103	0.55	0.56	23.9	10	<b>21.8</b>	6
	5	27.6	103	0.55	0.56	23.9	10	<b>21.8</b>	6
	10	27.1	103	0.53	0.55	23.6	9	<b>21.7</b>	6
	15	26.5	102	0.50	0.53	23.3	9	<b>21.5</b>	5
A5152 Farndon Street	3	26.8	102	0.54	0.55	23.5	9	<b>21.6</b>	6
	5	26.8	102	0.54	0.55	23.5	9	<b>21.6</b>	6
	10	26.4	102	0.52	0.54	23.3	9	<b>21.5</b>	5
	15	25.9	101	0.49	0.53	23.0	8	<b>21.3</b>	5
A5152 Eagles Meadow	3	25.7	101	0.48	0.51	22.9	8	<b>21.3</b>	5
	5	25.7	101	0.48	0.51	22.9	8	<b>21.3</b>	5
	10	25.4	100	0.47	0.51	22.7	8	<b>21.2</b>	5
	15	25.0	100	0.45	0.50	22.5	7	<b>21.1</b>	5
A5156 Llanypwll	3	32.8	111	0.51	0.51	25.7	14	<b>22.9</b>	<b>8</b>
	5	32.7	111	0.51	0.51	25.7	14	<b>22.9</b>	<b>8</b>
	10	31.9	110	0.49	0.50	25.3	13	<b>22.7</b>	<b>7</b>
	15	30.8	108	0.47	0.49	24.7	12	<b>22.4</b>	<b>7</b>
B5101 Plas Coch Road	3	28.8	105	0.56	0.58	24.4	11	<b>22.1</b>	6
	5	28.8	105	0.56	0.58	24.4	11	<b>22.1</b>	6
	10	28.2	104	0.54	0.56	24.1	10	<b>21.9</b>	6
	15	27.5	103	0.51	0.55	23.7	9	<b>21.7</b>	6
B5101 Berse Road	3	28.2	104	0.54	0.55	24.1	10	<b>21.9</b>	6
	5	28.2	104	0.54	0.55	24.1	10	<b>21.9</b>	6
	10	27.7	103	0.52	0.54	23.8	10	<b>21.7</b>	6
	15	27.1	103	0.49	0.53	23.5	9	<b>21.5</b>	6

**Appendix 1 (continued)**

Road	Distance from centre road (m)	Total NO <sub>2</sub>	NO <sub>2</sub> Estimate 99.8th %	CO	Benzene	PM <sub>10</sub>	PM <sub>10</sub> Exceedences > 50	PM <sub>10</sub>	PM <sub>10</sub> Exceedences > 50
Total Annual Mean Concentrations, including Background All results as ug/m <sup>3</sup> , except CO (mg/m <sup>3</sup> ) and number of exceedences				2001	2010	2004	2004	2010	2010
B5425 Rhosrobin	3	28.0	104	0.45	0.49	23.7	9	<b>21.9</b>	6
	5	28.0	104	0.45	0.49	23.7	9	<b>21.9</b>	6
	10	27.5	103	0.44	0.48	23.4	9	<b>21.7</b>	6
	15	26.9	102	0.43	0.48	23.2	8	<b>21.5</b>	6
B5446 St Giles Way	3	28.4	104	0.55	0.56	24.2	10	<b>22.0</b>	6
	5	28.4	104	0.55	0.56	24.2	10	<b>22.0</b>	6
	10	27.9	104	0.52	0.54	23.9	10	<b>21.8</b>	6
	15	27.2	103	0.50	0.53	23.5	9	<b>21.6</b>	6

## **REPORT STATEMENT**

Casella Stanger completed this report on the basis of a defined programme of works and within the terms and conditions agreed with the Client. This report was compiled with all reasonable skill and care, bearing in mind the project objectives, the agreed scope of works, prevailing site conditions and degree of manpower and resources allocated to the project as agreed.

Casella Stanger cannot accept responsibility to any parties whatsoever, following issue of this report, for any matters arising which may be considered outside the agreed scope of works.

This report is issued in confidence to the Client and Casella Stanger cannot accept any responsibility to any third party to whom this report may be circulated, in part or in full, and any such parties rely on the contents of the report at their own risk. (Unless specifically assigned or transferred within the terms of the contract, Casella Stanger asserts and retains all copyright, and other Intellectual Property Rights, in and over the report and its contents).

Any questions or matters arising from this report may be addressed in the first instance to the Project Manager.