NORWICH
City Council

ENVIRONMENT ACT 1995 PART IV

LOCAL AIR QUALITY MANAGEMENT

Air Quality Updating and Screening Assessment

City of Norwich

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Executive Summary

The UK Government published its strategic policy framework for air quality management in 1995 establishing national strategies and policies on air quality which culminated in the Environment Act, 1995. The Air Quality Strategy[1] provides a framework for air quality control through air quality management and air quality standards. These and other air quality standards[1] and their objectives have been enacted through the Air Quality Regulations in 1997, 2000 and 2002[2]. The Environment Act 1995 requires Local Authorities to undertake air quality reviews. In areas where an air quality objective is not anticipated to be met, Local Authorities are required to establish Air Quality Management Areas and implement action plans to improve air quality.

The first round of air quality review and assessments has now been now completed for Norwich City Council. The Local Authority are now required to proceed to the second round of review and assessment in which sources of emissions to air are reassessed to identify whether the situation has changed since the first round, and if so, what impact this may have on predicted exceedences of the air quality objectives.

The second round of review and assessment is to be undertaken in two steps. The first step is an Updating and Screening Assessment, which updates the Stage 1 and 2 review and assessment previously undertaken for all pollutants identified in the Air Quality Regulations. Where a significant risk of exceedence is identified for a pollutant it will be necessary for the local authority to proceed to a Detailed Assessment, equivalent to the previous Stage 3 assessments. Where a local authority does not need to undertake a Detailed Assessment, a progress report is required instead.

This report is equivalent to an Updating and Screening Assessment for Norwich City Council as outlined in the Government's published guidance.

[1] Refers to standards recommended by the Expert Panel on Air Quality Standards. Recommended standards are set purely with regard to scientific and medical evidence on the effects of the particular pollutants on health, at levels at which risks to public health, including vulnerable groups, are very small or regarded as negligible.

In the last round of the review and assessment process Norwich City Council completed a Stage 3 Air Quality Review and Assessment. The results of this indicated that there are areas of Norwich almost certain to exceed the annual mean objective for nitrogen dioxide (NO_2). As a result of this air quality review and assessment, Norwich City Council has declared three Air Quality Management Areas (AQMAs) within the city at Grapes Hill, the Castle area and St Augustines Street.

A Stage 4 review and assessment was then completed which further assessed the monitoring and modelling data in these AQMAs. Results from this work concluded that while the three AQMAs should be retained, two of these , Grapes Hill and the Castle area AQMAs, could be decreased in area.

The general approach taken to this Updating and Screening Assessment was to:

- **Identify the conclusions of the last round of review and assessment for each of the seven pollutants included in the air quality regulations;**
- **Identify significant sources of emissions to air for the seven pollutants included in the air quality regulations, including major roads and industrial plant;**
- **Identify new sources not previously considered in the first round of review and assessment;**
- **Identify any sources for which emissions have changed significantly since the last round of review and assessment;**
- **Identify and interpret the significance of air quality monitoring data made available since the last round of review and assessment;**
- **Assess the risk of exceedences of the air quality objectives in locations where relative public exposure may exist using screening models and nomograms; and**
- **Where necessary, identify locations and pollutants for which further detailed assessment of air quality will be required.**

A checklist identifying the considerations in this report is shown in Appendix 5.

What are the conclusions of this report for Norwich City Council?

This updating and screening assessment for Norwich City Council has concluded that a detailed assessment is not required for NO_2, PM_{10}, Benzene, Carbon Monoxide, Lead, 1,3 – butadiene or sulphur dioxide.

What does Norwich City Council need to do now?

A Stage 3 review and assessment was completed in July 2003. Following this Norwich City Council need to produce an Action Plan. In addition, Norwich City Council need to complete a Progress Report and submit to DEFRA by April 2004. This could include the annual progress on the Action Plan for the three declared AQMAs.

Acronyms and definitions used in this report

AADTF	**Annual Average Daily Traffic Flow**
ADMS	**an atmospheric dispersion model**
AQDD	**an EU directive (part of EU law) - Common Position on Air Quality Daughter Directives, commonly referred to as the Air Quality Daughter Directive**
AQMA	**Air Quality Management Area**
AQS	**Air Quality Strategy**
AP	**Action Plan**
AUN	**Automatic Urban Network (DEFRA funded network)**
Base case	**in the context of this report, the emissions or concentrations predicted at the date of the relevant air quality objective (2005 for nitrogen dioxide)**
CO	**Carbon monoxide**
d.f.	**degrees of freedom (in statistical analysis of data)**
DETR	**Department of the Environment Transport and the Regions (now DEFRA)**
DEFRA	**Department of the Environment, Food and Rural Affairs**
DMRB	**Design Manual for Roads and Bridges**
EA	**Environment Agency**
EPA	**Environmental Protection Act**
EPAQS	**Expert Panel on Air Quality Standards (UK panel)**
EU	**European Union**
GIS	**Geographical Information System**
HA	**Highways Agency**
HDV	**Heavy Duty Vehicles**
kerbside	**0 to 1 m from the kerb**
LADS	**Urban background model specifically developed for Stage 3 Review and Assessment work by netcen. This model allowed contributions of the urban background and road traffic emissions to be calculated**
Limit Value	**An EU definition for an air quality standard of a pollutant listed in the air quality directives**
NAEI	**National Atmospheric Emissions Inventory**
NO_2	**Nitrogen dioxide**
NO_x	**Oxides of nitrogen**
NRTF	**National Road Traffic Forecast**
ppb	**parts per billion**
r	**the correlation coefficient (between two variables)**
receptor	**In the context of this study, the relevant location where air quality is assessed or predicted (for example, houses, hospitals and schools)**
roadside	**1 to 5 m from the kerb**
SD	**standard deviation (of a range of data)**
SO_2	**Sulphur dioxide**
TEMPRO	**A piece of software produced by the DEFRA used to forecast traffic flow increases**

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APPENDICES

1 Introduction to the Updating and Screening Assessment

This section outlines the purpose of this Updating and Screening Assessment and the scope of the assessment.

1.1 PURPOSE OF THE UPDATING AND SCREENING ASSESSMENT

The first round of air quality review and assessments is now complete and all local authorities should have completed all necessary stages. Where the likelihood of exceedences of air quality objectives have been identified in areas of significant public exposure, an air quality management area should have been declared, followed by a further Stage 4 review and assessment, and the formulation of an action plan to eliminate exceedences. Local authorities are now required to proceed to the second round of review and assessment in which sources of emissions to air are reassessed to identify whether the situation has changed since the first round of review and assessment, and if so, what impact this may have on predicted exceedences of the air quality objectives. Such changes might include significant traffic growth on a major road, which had not been foreseen, construction of a new industrial plant with emissions to air, or significant changes in the emissions of an existing plant.

The second round of review and assessment is to be undertaken in two steps. The first step is an Updating and Screening Assessment, which updates the Stage 1 and 2 review and assessments previously undertaken for all pollutants identified in the Air Quality Regulations. Where a significant risk of exceedence is identified for a pollutant it will be necessary for the local authority to proceed to a Detailed Assessment, equivalent to the previous Stage 3 assessments. Where a local authority does not need to undertake a Detailed Assessment, a progress report is required instead.

1.2 OVERVIEW OF APPROACH TAKEN

The general approach taken to this Updating and Screening Assessment was to:

- **Identify the conclusions of the last round of review and assessment for each of the seven pollutants included in the air quality regulations;**
- **Identify significant sources of emissions to air for the seven pollutants included in the air quality regulations, including major roads and industrial plant;**
- **Identify new sources not previously considered in the first round of review and assessment;**
- **Identify any sources for which emissions have changed significantly since the last round of review and assessment;**
- **Identify and interpret the significance of air quality monitoring data made available since the last round of review and assessment;**
- **Assess the risk of exceedences of the air quality objectives in locations where relative public exposure may exist using screening models and nomograms; and**
- **Where necessary, identify locations and pollutants for which further detailed assessment of air quality will be required.**

1.3 RELEVANT DEFRA DOCUMENTATION USED

This report takes into account the guidance in LAQM.TG(03)[3], published January 2003.

1.4 POLLUTANTS CONSIDERED IN THIS REPORT

All pollutants included in the Air Quality Regulations[1] for the purposes of Review and Assessment have been considered in this report.

1.5 STRUCTURE OF THE REPORT

The report is structured as follows:

- **Chapter 1** **summarises the aims of the updating and screening assessment, the approach adopted for the assessment, as well as relevant background information for Norwich City Council, and relevant emissions-to-air sources;**
- **Chapter 2** **summarises the information used to support this assessment. identifies data used in support of this assessment and highlights significant changes in emissions to air within the City since the first round of review and assessment;**
- **Chapters 3-9** **present the review and assessment for each of the seven pollutants included in the Air Quality Regulations;**
- **Chapter 10** **presents conclusions and recommendations for further work, where required, for each of the seven pollutants;**
- **Chapter 11** **presents the references**
- **Chapter 12** **details the UK Air Quality Strategy and the function of an updating and screening assessment.**

The Objectives of the Air Quality strategy are shown in Table 1.1. Further details of the Air Quality Strategy are given in chapter 13.

Table 1.1 Objectives included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the purpose of Local Air Quality Management

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene			
All authorities	16.25 μg/m^3	running annual mean	31.12.2003
Authorities in England and Wales only	5.00 μg/m^3	annual mean	31.12.2010
Authorities in Scotland and Northern Ireland only[a]	3.25 μg/m^3	running annual mean	31.12.2010
1,3-Butadiene	2.25 μg/m^3	running annual mean	31.12.2003
Carbon monoxide Authorities in England, Wales and Northern Ireland only[a]	10.0 mg/m^3	maximum daily running 8-hour mean	31.12.2003
Authorities in Scotland only	10.0 mg/m^3	running 8-hour mean	31.12.2003
Lead	0.5 μg/m^3	annual mean	31.12.2004
	0.25 μg/m^3	annual mean	31.12.2008
Nitrogen dioxide[b]	200 μg/m^3 not to be exceeded more than 18 times a year	1 hour mean	31.12.2005
	40 μg/m^3	annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)[c] All authorities	50 μg/m^3 not to be exceeded more than 35 times a year	24 hour mean	31.12.2004
	40 μg/m^3	annual mean	31.12.2004
Authorities in Scotland only[d]	50 μg/m^3 not to be exceeded more than 7 times a year	24 hour mean	31.12.2010
	18 μg/m^3	annual mean	31.12.2010
Sulphur dioxide	350 μg/m^3 not to be exceeded more than 24 times a year	1 hour mean	31.12.2004
	125 μg/m^3 not to be exceeded more than 3 times a year	24 hour mean	31.12.2004
	266 μg/m^3 not to be exceeded more than 35 times a year	15 minute mean	31.12.2005

a. In Northern Ireland none of the objectives are currently in regulation. Air Quality (Northern Ireland) Regulations are scheduled for consultation early in 2003.
b. The objectives for nitrogen dioxide are provisional.
c. Measured using the European gravimetric transfer sampler or equivalent.
d. These 2010 Air Quality Objectives for PM_{10} apply in Scotland only, as set out in the Air Quality (Scotland) Amendment Regulations 2002.

1.5.1 The difference between 'standards' and 'objectives' in the UK AQS

Air quality *standards* (in the UK AQS) are the concentrations of pollutants in the atmosphere that can broadly be taken to achieve a certain level of environmental quality. The standards are based on assessment of the effects of each pollutant on human health including the effects on sensitive subgroups. The standards have been set at levels to avoid significant risks to health.

The *objectives* of the UK air quality policy are framed on the basis of the recommended standards. The objectives are based on the standards, but take into account feasibility, practicality, and the costs and benefits of fully complying with the standards.

Specific objectives relate either to achieving the full standard or, where use has been made of a short averaging period, objectives are sometimes expressed in terms of percentile compliance. The use of percentiles means that a limited number of exceedences of the air quality standard over a particular timescale, usually a year, are permitted. This is to account for unusual meteorological conditions or particular events such as November 5th. For example, if an objective is to be complied with at the 99.9th percentile, then 99.9% of measurements at each location must be at or below the level specified.

2 Information used to support this assessment

This section lists the key information used in this review and assessment.

2.1 CONCLUSIONS FROM THE FIRST ROUND OF REVIEW AND ASSESSMENT OF AIR QUALITY FOR NORWICH CITY COUNCIL

Norwich City Council has completed the following review and assessments of air quality to date:

- **Stage 1 & 2. Some traffic and industrial sources identified as potential sources of exceedences.**
- **Stage 3. Modelling suggested that The City of Norwich need to declare an Air Quality Management Area (AQMA) for nitrogen dioxide. The extent of the predicted exceedences has been considered based on modelling and traffic growth scenarios. Norwich City Council have considered the likelihood of receptor exposure to exceedences and decided the appropriate locations of AQMAs in the city. Three AQMAs were proposed, Castle, Grapes Hill and St Augustines.**
- **AQMA. 3 AQMAs were declared as a result of predicted exceedences at relevant receptors in 3 areas.**

2.2 PROPOSED DEVELOPMENTS WHICH MAY AFFECT AIR QUALITY

Any new developments in the local authority area, or outside the LA that may impact on local air quality need to be considered. Key considerations should include

- **Industry**
- **Housing and redevelopment**
- **Road Network changes**

There are no significant industrial developments planned in Norwich City.
There are no significant housing and redevelopment schemes planned in Norwich City.
There are no significant road transport development schemes planned in Norwich City.

2.3 MAPS AND DISTANCES OF RECEPTORS FROM ROADS

Norwich City Council provided electronic OS LandLine™ which was used in a Geographical Information System (GIS) for the assessment. Individual buildings or groups of buildings (receptors) were identified from the electronic OS Landline maps of the areas. The distances of these receptors from the road, and the widths of the roads, were accurately determined from the maps.

2.4 ROAD TRAFFIC DATA

This section summarises the information used in this report; more detailed information is given in Appendix 2. Appendix 2 lists the locations of the traffic flow and speed measurement points, flow and speed data and other relevant traffic statistics.

Data were collated from a range of sources, including:

- **data provided by Norwich City Council (DETR link based census and High growth traffic scenarios have been used from Tempro 3.1.)**
- **data held in the National Atmospheric Emissions Inventory (NAEI, 2000) (where no other data were available from either Norwich City Council or the Highways Agency).**

Where no average speed data were available, estimated speeds were used near receptors and junctions. Speeds slower than the national speed limits have been assigned to sections of roads in areas close to junctions and adjustments made to take account of congestion.

2.4.1 Fraction of HGVs

Percentages of Cars, LGVs, HGV and buses were available from Norwich City Council for many roads. For other road links, the percentage of HGVs was calculated from the data held in the 2000 National Atmospheric Emissions Inventory.

2.4.2 Traffic growth

Norwich City Council provided the traffic projections for both 2004 and 2005 (from Norfolk County Council).

2.4.3 Distance from the centre of the road to the kerbside and to the receptors

Initially a minimum distance for the receptor to the road was assumed. This therefore tests the road contribution to receptors as a worst case scenario. Where any problems were identified the distances of receptors from the road were then taken from the electronic OS Landline™ of the Council area. This strategy is a conservative approach.

2.5 PART A AND B PROCESSES

There are many Part A and Part B Industrial processes in Norwich City Council. A full list is given in Appendix 3.

2.6 AMBIENT MONITORING

Norwich City Council have undertaken monitoring of the following pollutants in their area:

- **Nitrogen dioxide**
- **Sulphur dioxide**
- **Carbon monoxide**
- **Particles (PM_{10})**

Full details of the type, locations, and concentrations recorded by the monitors (diffusion tubes and continuous monitors) are given in Appendix 1.

2.6.1 Diffusion tubes

Diffusion tube monitoring is carried out at numerous locations in Norwich City Council and analysed by Gradko Laboratories. Some of the NO_2 diffusion tubes are co-located with the continuous monitor.

2.6.2 Continuous monitoring

There is continuous monitoring for NO_2 SO_2 PM_{10} and CO.

3 Updating and Screening Assessment for Carbon Monoxide

3.1 THE NATIONAL PERSPECTIVE

The main source of carbon monoxide in the United Kingdom is road transport, which accounted for 67% of total releases in 2000. Annual emissions of carbon monoxide have been falling steadily since the 1970s, and are expected to continue to do so. Current projections indicate that road transport emissions will decline by a further 42% between 2000 and 2005. Existing policies will be sufficient to reduce maximum daily 8-hour mean concentrations of carbon monoxide below 10 mgm^{-3} by about 2003.

3.2 STANDARD AND OBJECTIVE FOR CARBON MONOXIDE

The Government and the Devolved Administrations have adopted an 8-hour running mean concentration of 11.6 mgm^{-3} as the air quality standard for carbon monoxide. The new objective has been set at a slightly tighter level of 10 mgm^{-3} as a maximum daily running 8-hour mean concentration to be achieved by the end of 2003, bringing it into line with the second Air Quality Daughter Directive limit value.

3.3 CONCLUSIONS OF THE FIRST ROUND OF REVIEW AND ASSESSMENT FOR CARBON MONOXIDE

The following conclusions were given for carbon monoxide in the earlier stages of Review and Assessment for Norwich City Council

- **Stage 3 Assessment of any sources for CO was not required.**

3.4 SCREENING ASSESSMENT OF CARBON MONOXIDE

The Technical Guidance LAQM TG (03) requires assessment of carbon monoxide to consider the following sources, data or locations:

- **Monitoring Data**
- **Very Busy Roads**

These are described in the following sections.

3.5 BACKGROUND CONCENTRATIONS FOR CARBON MONOXIDE

The average background annual mean carbon monoxide concentration estimated from the UK background maps (http://www.airquality.co.uk/archive/laqm/tools.php) was 0.4 mgm^{-3}in 2001 with maximum concentration of 0.5 mgm^{-3} in 2001.

3.6 SCREENING ASSESSMENT OF MONITORING DATA

Monitoring for carbon monoxide is available from the Norwich City Area (Appendix 1).

The maximum running 8-hour mean monitored at Norwich airport in 2002 was 1.3 mg m^3 which was within the 10mg m^3 objective.
The maximum running 8-hour mean monitored at Norwich centre in 2002 was 2.5 mg m^3 which was within the 10mg m^3 objective.

The maximum running 8-hour mean monitored at Norwich Golding Place in 2002 was 4.6 mg m^3 which was within the 10mg m^3 objective.

3.7 SCREENING ASSESSMENT OF VERY BUSY ROADS/JUNCTIONS

The guidance document LAQM TG (03) requires assessment of CO only at 'very busy roads' and junctions (Appendix 2). Traffic flow data were supplied by Norwich City Council and from the NAEI. Based on these data, there are no roads in Norwich City Council that can be classified as 'very busy' according to the criteria in the guidance (see Box 2.2) i.e. >80,000.

3.8 CONCLUSIONS FOR CARBON MONOXIDE CONCENTRATIONS IN NORWICH CITY DISTICT COUNCIL AREA

There are no roads in Norwich City Council that can be classified as 'very busy' according to the criteria in the guidance. Monitoring data suggest an exceedence of the objective is unlikely. A detailed assessment is not required for carbon monoxide in Norwich City Council.

4 Updating and Screening Assessment for Benzene

4.1 THE NATIONAL PERSPECTIVE

The main sources of benzene emissions in the UK are petrol-engined vehicles, petrol refining, and the distribution and uncontrolled emissions from petrol station forecourts without vapour recovery systems. A number of policy measures already in place, or planned for future years, will continue to reduce emissions of benzene. Since January 2000, EU legislation has reduced the maximum benzene content of petrol to 1%, from a previous upper limit of 5%. The European Auto-Oil programme will further reduce emissions for cars and light-duty vehicles, and emissions of benzene from the storage and distribution of petrol are controlled by vapour recovery systems. Forecasts based on national mapping suggest that the policy measures currently in place will achieve the 2003 objective at all urban background and roadside/kerbside locations. Whilst the 2010 objectives are expected to be met at all urban background, and most roadside locations, there is the possibility for some remaining exceedences which will require additional measures at a local level.

4.2 STANDARD AND OBJECTIVE FOR BENZENE

The Government and the Devolved Administrations have adopted a running annual mean concentration of 16.25 μgm^{-3} as the air quality standard for benzene, with an objective for the standard to be achieved by the end of 2003. However, in light of the health advice from EPAQS and the Department of Health's Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment (COC) to reduce concentrations of benzene in air to as low a level as possible, additional tighter objectives have also been set. The additional objective is for an annual mean of 5 μgm^{-3} to be achieved by the end of 2010 in England and Wales. In Scotland and Northern Ireland, a running annual mean of 3.25 μgm^{-3} has been adopted as an additional objective, to be achieved by the end of 2010.

4.3 CONCLUSIONS OF THE FIRST ROUND OF REVIEW AND ASSESSMENT FOR BENZENE

The following conclusions were given for benzene in the earlier stages of Review and Assessment for Norwich City Council.

- **Stage 3 Assessment of any sources for Benzene was not required.**

Emissions from vehicles are expected to decrease over the relevant period and national policies are expected to ensure that there will be no exceedences due to petrol stations by 2003;
Current levels of benzene are estimated to be already below the objective of 16.25 μgm^{-3} in Norwich City Council. National policy measures are expected to deliver the national air quality objective for benzene by the end of 2003.

4.4 SCREENING ASSESSMENT OF BENZENE

The Technical Guidance LAQM TG (03) requires assessment of benzene to consider the following sources, data or locations:

- **Monitoring Data**
- **Very Busy Roads or Junctions in Built-up Areas**
- **Industrial Sources**
- **Petrol Stations**
- **Major Fuel Storage Depots (Petroleum only)**

These are described in the following sections.

4.5 BACKGROUND CONCENTRATIONS FOR BENZENE

The average annual mean background benzene concentration estimated from the UK background maps (http://www.airquality.co.uk/archive/laqm/tools.php) was 0.7 μgm^{-3} in 2001 with maximum concentration of 0.9 μgm^{-3} in 2001. 2003 concentrations are 0.6 μgm^{-3} average and 0.8μgm^{-3} maximum and in 2010 an average of 0.5μgm^{-3} and maximum of 0.6μgm^{-3}.

4.6 SCREENING ASSESSMENT OF MONITORING DATA

There is no monitoring of benzene within or near to the Norwich City Council area.

4.7 SCREENING ASSESSMENT OF VERY BUSY ROADS/JUNCTIONS

The guidance document LAQM TG (03) requires assessment of benzene only at 'very busy roads' and junctions (Appendix 2). Traffic flow data were supplied by Norwich City Council and from the NAEI. Based on these data, there are no roads in Norwich City Council, which can be classified as 'very busy' according to the criteria in the guidance (Box 3.2).

4.8 SCREENING ASSESSMENT OF INDUSTRIAL SOURCES

The Guidance LAQM TG (03) lists the following processes as significant potential sources of benzene:

Part A (percentage of total emissions from all UK plant in this sector to the UK total in brackets)
Petroleum processes (73)
Petrochemical processes (2)
Carbonisation processes (12)
Cement/lime manufacture (7)
Gasification processes (5)

Part B
Processes for the storage and unloading of petrol at terminals

The part B processes have been checked against Table in A2.182 of the Technical guidance and none of the processes in the authorisation list have the potential to emit significant quantities of benzene. None of the Part A or Part B industrial processes in Norwich City Council area (Appendix 3) operate these processes or have the potential to emit benzene.

4.9 SCREENING ASSESSMENT OF PETROL STATIONS

There are petrol stations in Norwich City Council authorised as Part B processes (Appendix 3). The guidance requires petrol stations to be considered only if they are near a busy road, i.e with more than 30,000 vehicles per day and have a throughput greater than 2 million litres. There are no petrol stations that meet those criteria. There are no buildings other than those of the petrol station with 10m of the pumps and there are no places where members of the public might regularly be exposed within 10m of the pumps. A detailed assessment for benzene is not required based on petrol station emissions.

4.10 SCREENING ASSESSMENT OF FUEL STORAGE DEPOTS

There are no major fuel storage depots in Norwich City Council.

4.11 CONCLUSIONS FOR BENZENE CONCENTRATIONS NORWICH CITY COUNCIL

There are no roads in Norwich City Council that can be classified as 'very busy' according to the criteria in the guidance. There are no petrol stations with a throughput greater than 2 million litres and with relevant exposure within 10m of the pumps.

A detailed assessment is, therefore, not required based for benzene in Norwich City Council.

5 Updating and Screening Assessment for 1,3-Butadiene

5.1 THE NATIONAL PERSPECTIVE

The main source of 1,3-butadiene in the United Kingdom is emissions from motor vehicle exhausts. 1,3-butadiene is also an important industrial chemical and is handled in bulk at a small number of industrial premises. Maximum running annual mean concentrations of 1,3-butadiene measured at all urban background/centre and roadside locations in the national network are already well below the 2003 objective of 2.25 µgm^{-3}. The increasing numbers of vehicles equipped with three way catalysts will significantly reduce emissions of 1,3-butadiene in future years. Recently agreed further reductions in vehicle emissions and improvements to fuel quality are expected to further reduce emissions of 1,3-butadiene from vehicle exhausts. These measures are expected to deliver the air quality objective by the end of 2003.

5.2 STANDARD AND OBJECTIVE FOR 1,3-BUTADIENE

The Government and the Devolved Administrations have adopted a maximum running annual mean concentration of 2.25 µgm^{-3} as an air quality standard for 1,3-butadiene. The objective is for the standard to be achieved by the end of 2003.

5.3 CONCLUSIONS OF THE FIRST ROUND OF REVIEW AND ASSESSMENT FOR 1,3-BUTADIENE

The following conclusions were given for 1,3-butadiene in the earlier stages of Review and Assessment for Norwich City Council

- **Stage 3 Assessment of any sources for 1,3-Butadiene was not required.**

Emissions from vehicles are expected to decrease over the relevant period. National policy measures are expected to deliver the national air quality objective for 1,3-butadiene by the end of 2003.

5.4 SCREENING ASSESSMENT OF 1,3-BUTADIENE

The Technical Guidance LAQM.TG(03) requires assessment of 1,3-butadiene to consider the following sources, data or locations:

- **Monitoring Data**
- **New Industrial Sources**
- **Existing Industrial Sources with Significantly Increased Emissions**

These are described in the following sections.

5.5 BACKGROUND CONCENTRATIONS FOR 1,3-BUTADIENE

The average background 1,3-butadiene concentration estimated from the UK background maps (http://www.airquality.co.uk/archive/laqm/tools.php) 0.3µgm^{-3} in 2001 with maximum concentration of 0.3µgm^{-3} in 2001. In 2003 the average was 0.2µgm^{-3} and the maximum 0.3µgm^{-3}.

5.6 SCREENING ASSESSMENT OF MONITORING DATA

No monitoring of 1,3-butadiene has been undertaken by Norwich City Council.

5.7 SCREENING ASSESSMENT OF INDUSTRIAL SOURCES

The Guidance LAQM TG (03) lists the following processes as significant potential sources of 1,3-butadiene:

Part A (percentage of total emissions from all UK plant in this sector to the UK total in brackets)
Petroleum processes (2)
Petrochemical processes (95)
Organic chemical manufacture (3)

Part B
Rubber processes

The part B processes have been checked against Table in A2.182 of the Technical guidance and none of the processes in the authorisation list have the potential to emit significant quantities of 1,3-butadiene. None of the Part A or Part B industrial processes in Norwich City Council (Appendix 3) operate these processes or have the potential to emit 1,3-butadiene.

There are no industrial processes, current or proposed, in neighbouring areas that have the potential to emit 1,3-butadiene.

5.8 CONCLUSIONS FOR 1,3-BUTADIENE CONCENTRATIONS IN NORWICH CITY COUNCIL AREA

Estimated background concentrations and data from national monitoring stations indicate that the objective for 1,3-butadiene is likely to be achieved by the end of 2003. There are no industrial processes, current or proposed, in Norwich City Council which have the potential to emit 1,3-butadiene. A detailed assessment is not required for 1,3-butadiene in Norwich City Council.

6 Updating and Screening Assessment for Lead

6.1 THE NATIONAL PERSPECTIVE

The agreement reached between the European Parliament and the Environment Council on the Directive on the Quality of Petrol and Diesel Fuels (part of the Auto-Oil Programme) has led to the ban on sales of leaded petrol in the United Kingdom with effect from 1 January 2000. Emissions of lead are now restricted to a variety of industrial activities, such as battery manufacture, pigments in paints and glazes, alloys, radiation shielding, tank lining and piping.

Detailed assessments of the potential impact of lead emissions from industrial processes have been undertaken by the Government and the Devolved Administrations, based upon both monitoring and sector analysis studies. The former has included a 12-month monitoring survey in the vicinity of 30 key industrial sites in the UK, which has been used to supplement information already provided from the non-automatic monitoring networks. These monitoring data have generally indicated no exceedences of the 2004 or 2008 objectives, although locations in proximity to non-ferrous metal production and foundry processes were deemed to be at risk.

6.2 STANDARD AND OBJECTIVE FOR LEAD

The Government and the Devolved Administrations have adopted an annual mean concentration of 0.5 μgm^{-3} as the air quality standard for lead, with an objective for the standard to be achieved by the end of 2004. In addition, a lower air quality objective of 0.25 μgm^{-3} to be achieved by the end of 2008 has also been set.

6.3 CONCLUSIONS OF THE FIRST ROUND OF REVIEW AND ASSESSMENT FOR LEAD

The following conclusions were given for lead in the earlier Stages of Review and Assessment Norwich City Council.

- **Stage 1 Review and assessment found one potential source of exceedence, Anglia Lead. However this was screened out at Stage 2.**
- **Stage 3 Assessment of any sources for lead was not required.**

6.4 SCREENING ASSESSMENT OF LEAD

The Technical Guidance LAQM TG (03) requires assessment of lead to consider the following sources, data or locations:

- **Monitoring Data outside an AQMA**
- **New Industrial Sources**
- **Existing Industrial Sources with Significantly Increased Emissions**

These are described in the following sections.

6.5 SCREENING ASSESSMENT OF MONITORING DATA

No monitoring of lead has been undertaken by Norwich City Council.

6.6 SCREENING ASSESSMENT OF INDUSTRIAL SOURCES

The Guidance LAQM TG (03) lists the following processes as significant potential sources of lead:

Part A (percentage of total emissions from all UK plant in this sector to the UK total in brackets)
Iron and steel (37)

Non-ferrous metals (23)
Manufacture of organic chemicals (35)

Part B
Non-ferrous metal furnaces
Electrical furnaces
Blast cupolas
Aluminium processes
Zinc Processes
Copper processes
Lead glass manufacture

The part B processes have been checked against Table in A2.182 of the Technical guidance and there are no processes in the authorisation list that have not already been assessed and have the potential to emit significant quantities of lead.
No newly identified Part A or Part B industrial processes in Norwich City Council (Appendix 3) operate these processes or have the potential to emit lead.
There are no industrial processes, current or proposed, in neighbouring areas that have the potential to emit lead.

6.7 CONCLUSIONS FOR LEAD CONCENTRATIONS IN NORWICH CITY COUNCIL

Emissions of lead from industrial processes in Norwich City Council are not likely to exceed the objectives for lead to be achieved in 2004 and 2008. A detailed assessment is not required for lead in Norwich City Council.

7 Updating and Screening Assessment for Nitrogen Dioxide

7.1 INTRODUCTION

The principal source of NOx emissions is road transport, which accounted for about 49% of total UK emissions in 2000. Major roads carrying large volumes of high-speed traffic (such as motorways and other primary routes) are a predominant source, as are conurbations and city centres with congested traffic. Within most urban areas, the contribution of road transport to local emissions will be much greater than for the national picture.

Meeting the annual mean objective in 2005, and the limit value in 2010, is expected to be considerably more demanding than achieving the 1-hour objective. National studies have indicated that the annual mean objective is likely to be achieved at all urban background locations outside of London by 2005, but that the objective may be exceeded more widely at roadside sites throughout the UK in close proximity to busy road links. Projections for 2010 indicate that the EU limit value may still be exceeded at urban background sites in London, and at roadside locations in other cities.

7.2 STANDARDS AND OBJECTIVES FOR NITROGEN DIOXIDE

The Government and the Devolved Administrations have adopted two Air Quality Objectives for nitrogen dioxide, as an annual mean concentration of 40 μgm^{-3}, and a 1-hour mean concentration of 200 μgm^{-3} not to be exceeded more than 18 times per year. The objectives are to be achieved by the end of 2005.

7.3 CONCLUSIONS OF THE FIRST ROUND OF REVIEW AND ASSESSMENT FOR NITROGEN DIOXIDE

The following conclusions were given for nitrogen oxides in the earlier stages of Review and Assessment report for Norwich City Council:

- **Stage 3 Assessment of any NO_2 identified potential exceedences of the objectives at 3 separate locations.**
- **Three AQMAs were declared**
- **A stage 4 Review and Assessment has recently been completed.**

The locations of the AQMAs are shown on Figure 7.1.

7.4 SCREENING ASSESSMENT OF NITROGEN DIOXIDE

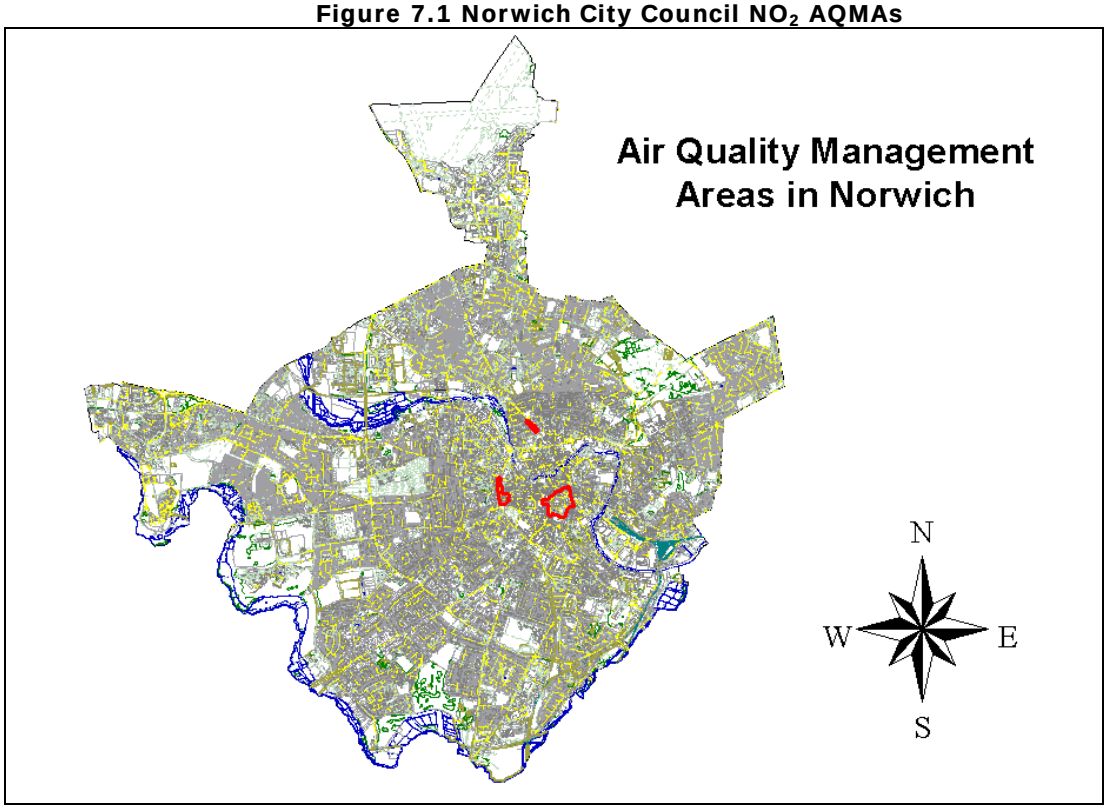
The Technical Guidance LAQM TG (03) requires assessment of nitrogen dioxide to consider the following sources, data or locations:

- **Monitoring data outside an AQMA**
- **Monitoring data within an AQMA**
- **Narrow congested streets with residential properties close to the kerb**
- **Junctions**
- **Busy streets where people may spend 1-hour or more close to traffic**
- **Roads with high flow of buses and/or HGVs**
- **New roads constructed or proposed since first round of review and assessment**
- **Roads close to the objective during the first round of review and assessment**
- **Roads with significantly changed traffic flows**

- Bus Stations
- New industrial sources
- Industrial sources with substantially increased emissions
- Aircraft

These are evaluated in the following sections.

Figure 7.1 Norwich City Council NO_2 AQMAs



7.5 BACKGROUND CONCENTRATIONS FOR NITROGEN DIOXIDE

The average annual mean background nitrogen dioxide concentration estimated from the UK background maps (http://www.airquality.co.uk/archive/laqm/tools.php) was 27.7 μgm^{-3} in 2001 with a maximum concentration of 30.9 for 2005 the estimated annual average was 24.8μgm^{-3} with a maximum of 27.8 for 2010 the estimated average is 21.4μgm^{-3} with a maximum of 23.9μgm^{-3}.

7.6 SCREENING ASSESSMENT OF MONITORING DATA

7.6.1 Automatic Monitoring

Nitrogen dioxide concentrations were monitored at a background continuous monitoring site at Norwich Centre (Friars Quay) and at roadside sites at Norwich Roadside, Ber Street and at Goldings Place. The Norwich Centre and Norwich Roadside sites are part of defra's Automatic Urban and Rural Network and have operated from 1997 onwards.

The Norwich Centre monitoring station (TG230089) is within a self-contained, air-conditioned housing located within the south western corner of a central Norwich public

garden. The nearest road is located approximately 12 metres away at St George's Street although traffic flow is free flowing and very light (1 or 2 vehicles per minute observed off peak). The manifold inlet is approximately 3 metres high. The surrounding area is generally open and comprises of residential and light industrial premises.

The Norwich Roadside site (TG234078) is within an existing office building complex approximately 6 metres from a busy 2-lane urban street (Ber Street). Traffic flow is approximately 16,000 vehicles per day and is subject to frequent congestion. The manifold inlet is approximately 6 metres above ground and is mounted close to the building facade. The surrounding area comprises retail outlet and business premises.

The Golding Place continuous monitor is located in a residential street approximately 25 m from the kerb of the A147 Grapes Hill.

The Norwich Centre and Norwich Roadside continuous monitoring stations are included in defra's Automatic Urban and Rural Network. The data are checked and ratified by netcen.

The Golding Place site is operated by Norwich City Council. The equipment is calibrated and the data are checked and ratified by netcen to the same standard as the Automatic Urban and Rural Network.

Table 7.1 summarises the measurements of nitrogen dioxide concentrations at the Norwich Centre, Norwich Roadside and Norwich Golding Place continuous monitoring stations for relevant periods. Data for Cambridge Roadside is included for comparison.

Table 7.1. Monitored Nitrogen Dioxide Concentrations

Site	Period	Data capture, %	NO_x, concentration $\mu g\ m^{-3}$ as NO_2	NO_2 Concentration, $\mu g\ m^{-3}$	
				Period average	Period 99.8th percentile hourly mean
Norwich Centre	2002	94.9	39.1	25.3	88
	12/4/02-28/2/03[&]	95.2		25.8	99
	12/4/02-4/10/02	93.8		18.7	69
	3/9/02-10/6/03[&]	92.5		30.3	103
Norwich Roadside	2002	97.7	61.5	30.3	96
	12/4/02-28/2/03[&]	96.4		30.8	100
	12/4/02-4/10/02	96.8		26.9	93
	3/9/02-10/6/03[&]	94.7		35.3	107
Norwich Golding Place	3/9/02-10/6/03[&]	94.2	71.6	38.1	122
Cambridge Roadside	2002	94.0		42.7	104
	12/4/02-28/2/03[&]	94.8		43.1	103
	12/4/02-4/10/02	93.4		40.6	105
	3/9/02-10/6/03[&]	95.3		44.0	103

[&] Ratified to 31/12/02

7.6.2 **Estimation of annual mean nitrogen dioxide concentrations from short-term monitoring data**

It was only possible to carry out a diffusion tube monitoring survey at sites within the AQMA between April and October 2002. Data from other diffusion tube sites was available from April 2002 to February 2003. The Norwich Golding Place site started in September 2002. The measurements

at these sites were adjusted to provide estimates of annual mean concentrations during 2002 by reference to measurements made over the same periods at the Norwich Centre, Norwich Roadside and Cambridge Roadside sites. Table 7.2 provides details of measurements used to derive the adjustment factor.

Table 7.2 Adjustment factors used to estimate annual mean concentrations from part year data.

Period	Long term site	Annual mean 2002	Period mean	Ratio
12/4/02-28/2/03	Norwich Centre	25.3	25.8	0.981
	Norwich Roadside	30.3	30.8	0.984
	Cambridge Roadside	42.7	43.1	0.991
	Average			0.985
12/4/02-4/10/02	Norwich Centre	25.3	18.7	1.353
	Norwich Roadside	30.3	26.9	1.126
	Cambridge Roadside	42.7	40.6	1.052
	Average			1.177
3/9/02-10/6/03	Norwich Centre	25.3	30.3	0.835
	Norwich Roadside	30.3	35.3	0.858
	Cambridge Roadside	42.7	44.0	0.970
	Average			0.888

7.6.3 Diffusion tube monitoring

7.6.3.1 Method of adjustment of bias in the reported diffusion tube concentrations

In this report, we have assessed the bias in diffusion tube data using the concentrations recorded using diffusion tubes collocated with the Norwich Centre continuous monitoring site on Ber Street. Table 7.3 shows the concentrations measured by continuous monitor and by diffusion tube at the site for relevant periods. Bias adjustment factors have been calculated for each period following AQM TG (03) guidance. Part year adjustment factors, calculated in Table 7.2 above have then been applied to derive an overall adjustment factor to convert part year diffusion tube measurements to 2002 annual mean concentrations.

Table 7.3 Assessment of bias in nitrogen dioxide diffusion tube measurements

Diffusion tube period	Continuous monitor concentration, μg m^{-3}	Diffusion tube concentration μg m^{-3}	Bias adjustment factor for period	Bias adjustment factor to 2002
12/4/02-28/2/03	25.8	25.0	1.032	1.016
12/4/02-4/10/02	18.7	20.8	0.899	1.058

7.6.3.2 Factors used to predict future diffusion tube concentrations from current concentrations

The DEFRA Review and Assessment: Technical Guidance. LAQM.TG (03) provides factors to project forward concentrations at background locations, based on the concentrations measured in recent years.

Background
- **2002 to 2005 0.93**

Kerbside
- **2002 to 2005 0.92**

The projected concentrations at each of the diffusion tube sites are shown in Table 7.4. Figs 7.2 – 7.4 show the estimated concentrations in 2005 based on the diffusion tube measurements.

7.6.4 7.6.4 Comparison of the monitoring results with the relevant air quality objectives

The annual average nitrogen dioxide concentrations measured at the background continuous monitoring sites at Norwich Centre, Norwich Roadside and Golding Place were all markedly less than the 2005 objective of 40 μg m^{-3} as an annual mean. The concentrations are expected to decrease from the current values in the period to 2005 and so it is concluded that the objective will be met at these sites.

The Golding Place continuous monitor is located close to the Grapes Hill AQMA and the exposure is likely to be representative of public exposure in the area. The forecast concentration in 2005 derived from the continuous monitoring results is 34x0.92= 31 μg m^{-3}. It seems unlikely based on the continuous monitoring results that members of the public will be exposed to concentrations exceeding the objective of 40 μg m^{-3} in the vicinity of the Goldings Place continuous monitor close to Grapes Hill AQMA in 2005.

Nitrogen dioxide concentrations are not expected to exceed the objective at diffusion tube locations within the Castle AQMA. However, it is not clear whether the diffusion tube sites correspond to worst case public exposure.

It is estimated that the objective will be exceeded at one of the diffusion tube sites , midway along St Augustines Street in the St Augustines AQMA. It is likely that members of the public will be exposed to similar concentrations of nitrogen dioxide over the annual mean averaging time of the objective.

Table 7.4 Diffusion tube measurements

Site	OS Grid reference, m		Concentration, µg m^{-3}		
	X	Y	Period	2002, bias adjusted	2005 estimate
Vulcan Rd	622226	311746	36.9	37.4	34.4
Heartsease	625231	310098	30.2	30.6	28.2
Tombland	623335	308853	34.8	35.4	32.5
Cattlemarket	623290	308394	36.8	37.4	34.4
St Stephens	622847	308025	34.2	34.8	32.0
Ipswich Rd	622546	307504	28.6	29.1	26.8
Earlham Rd	619120	308259	30.5	31.0	28.5
Colman Rd	621084	308519	34.8	35.3	32.5
Unthank Rd	622003	308112	34.7	35.3	32.5
Johnstone Pl	622460	308444	38.6	39.2	36.1
Chapelfield	622596	308238	23.4	23.8	21.9
Castlemeadow	623155	308604	34.7	35.3	32.4
Guildhall	622931	308560	23.1	23.4	21.6
Exchange St	623000	308714	31.3	31.8	29.3
St Georges	623085	308895	23.7	24.1	22.2
St Augustines	622818	309582	43.6	44.3	40.7
Ber St 1	623451	307811	25.0	25.4	23.3
Parmeter Pl	623467	3008418	20.4	21.6	19.9
Rouen Rd	623302	308310	26.4	27.9	25.7
Paragon Pl	622381	308648	25.5	27.0	24.8
Upper St Giles	622457	308571	23.4	24.7	22.7
Copeman St	622451	308701	22.5	23.8	21.9
Opie St	623182	308633	23.0	24.3	22.4
Cassella	622392	308844	22.9	24.2	22.3
Golding Pl	622392	308761	23.4	24.7	22.7
St Augustines - Colmans	622915	309485	27.4	29.0	26.7
St Augustines - top	622795	309626	34.1	36.1	33.2
Bull Close			22.7	24.1	22.1
Spencer St			20.8	22.1	20.3

Fig7.2 St Augustines Street – location of diffusion tubes and 2005 projections mg m^{-3}

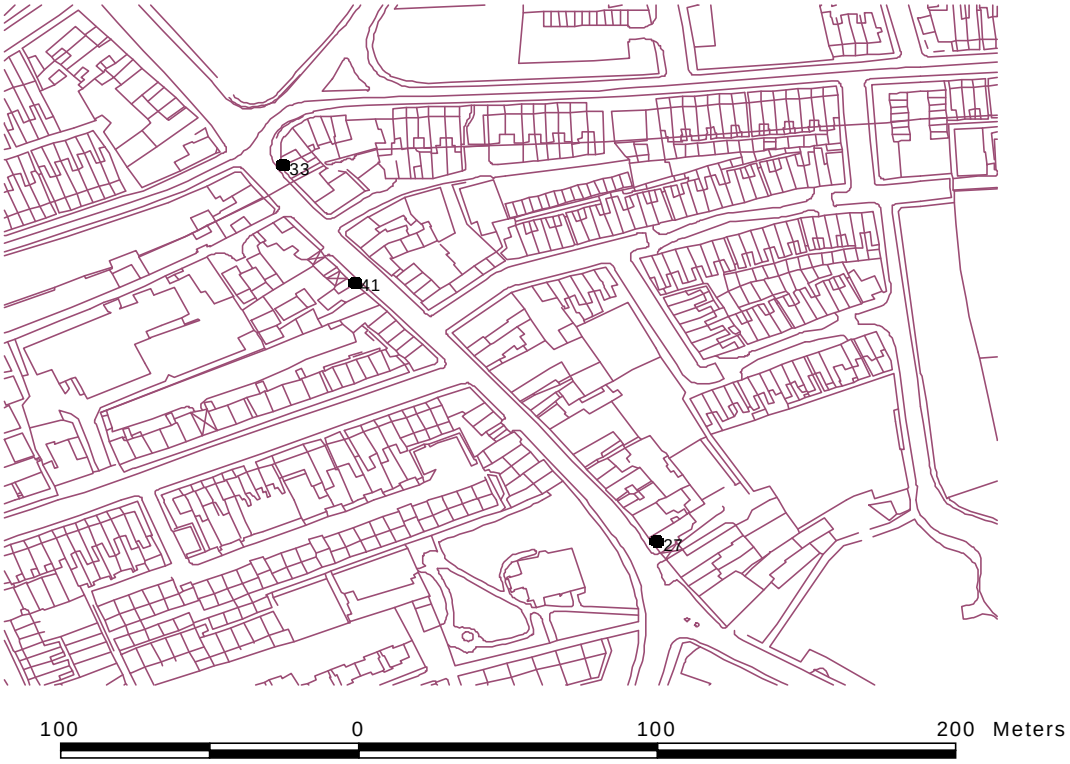


Fig.7.3 Castle - location of diffusion tubes and 2005 projections mg m^{-3}

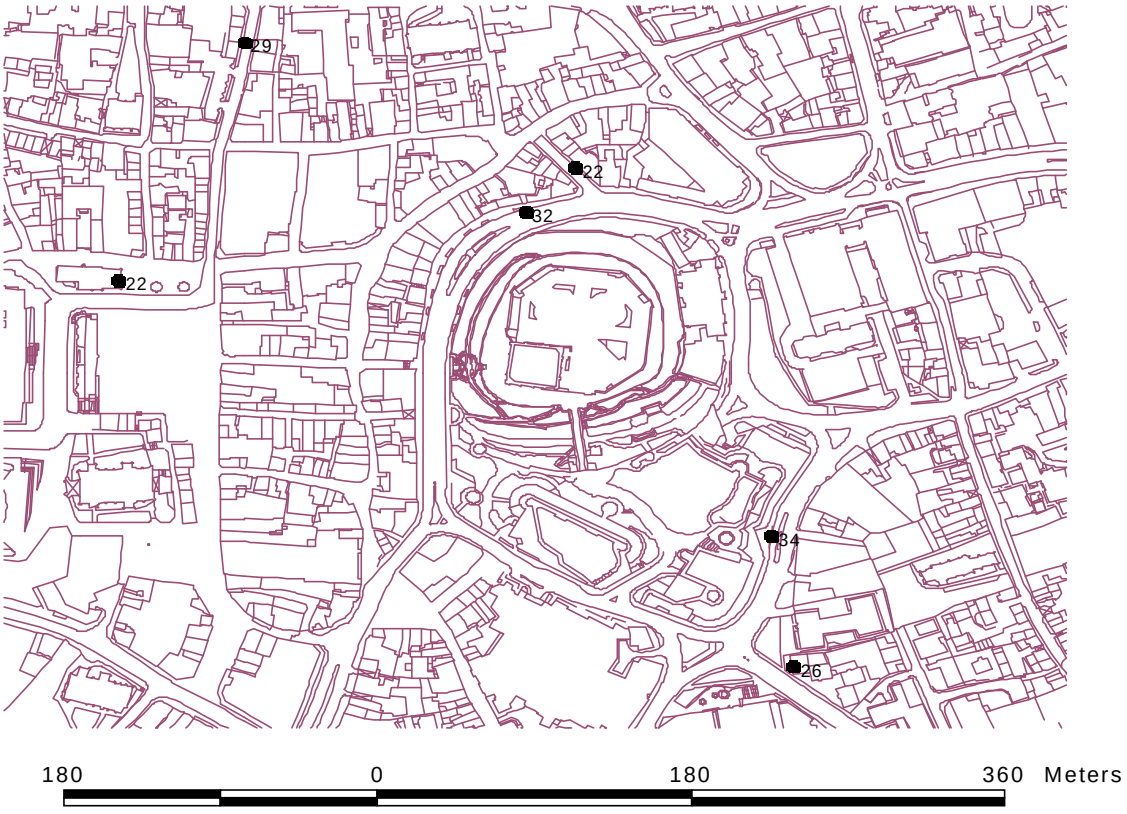
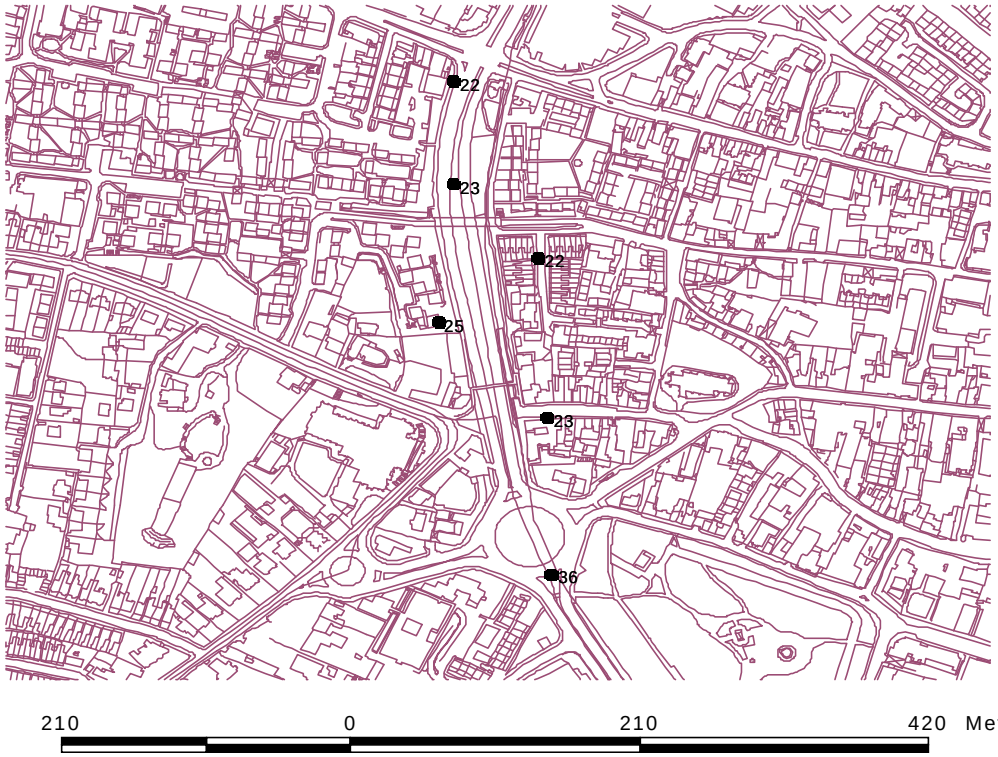


Fig 7.4 Grapes Hill - location of diffusion tubes and 2005 projections mg m^{-3}



7.6.5 Comparison of the monitoring results with the relevant air quality objectives

The annual average nitrogen dioxide concentrations measured at the background continuous monitoring sites at Norwich Centre, Norwich Roadside and Golding Place were all markedly less than the 2005 objective of 40 μg m^{-3} as an annual mean. The concentrations are expected to decrease from the current values in the period to 2005 and so it is concluded that the objective will be met at these sites.

Nitrogen dioxide concentrations are not expected to exceed the objective at diffusion tube locations within the Castle AQMA. However, it is not clear whether the diffusion tube sites correspond to worst case public exposure.

It is estimated that the objective will be exceeded at one of the diffusion tube sites, midway along St Augustines Street in the St Augustines AQMA. It is likely that members of the public will be exposed to similar concentrations of nitrogen dioxide over the annual mean averaging time of the objective.

7.7 SCREENING ASSESSMENT OF ROAD TRAFFIC SOURCES

Traffic flow data were taken from the NAEI 2000 roads database and from manual and automatic traffic count data supplied by Norwich City Council and Norfolk County Council (Appendix 2 and Stage 3 report). For screening purposes, appropriate receptor distances based on the closest property where public exposure was likely and appropriate speeds for the road were used. Norwich City Council supplied traffic growth figures for 2004 and 2005.
Table 7.5 shows predicted nitrogen dioxide concentrations in 2005 calculated using DMRB for roads in Norwich City Council.

7.7.1 Street Canyons

The DMRB model may significantly under-predict concentrations of Nitrogen dioxide alongside urban city-centre roads classified as 'street canyons'. In this context a street canyon may be described as a relatively narrow street with buildings on wither sides, where the height of the buildings is generally greater than the width of the road. To avoid missing potential exceedences of the objective in such locations the predicted annual mean NO2 'road traffic component' concentration, in the 'local output' sheet of DMRB, by a factor of 2, to take account of the model underprediction. This is then added to the background to give total concentration (as advised in TG (04)). There is one street canyon in Norwich City Council St. Augustines.

Table 7.5 Predicted nitrogen dioxide concentrations in 2005 calculated using DMRB for roads in Norwich City Council

Receptor ID	Link	Distance from link centre to receptor (m)	Annual average speed (km/h)	AADT (combined, veh/day)	Total % HDV	NO2 (µg/m3)
39	A140 Colman Rd	9.3	20	23772	6.3	37.6
40	A11 Newmarket Rd	2	20	19562	1.8	33.8
41	A1056 Ipswich Rd	2	20	15575	1.8	33.3
42	A147 Grapes Hill	2	20	39822	2.2	36.1
43	A11 St Stephens Rd	2	20	27684	2.1	35.0
44	A147 St Crispins Rd	2	20	33261	1.8	35.1
45	A147 Barn Rd	25	20	40214	1.7	32.4
46	A147 Barrack St	2	20	27315	1.9	34.7
47	A1067 Pitt Street	2	20	19691	1.6	33.7
48	A140 Boundary Rd	20	20	27356	7.5	36.6
49	St Augustines (street Canyon)	4.3	25	23088	3.9	**43.2**
50	Castle Meadow	2	25	10433	6.0	34.0
51	Dereham rd/Norwich rd	10	25	38283	6.0	38.0
52	Farmers avenue	10	20	12792	6.0	34.8
53	Cattle Market	10	20	28704	6.0	37.8
54	Red Lion	4.5	20	13104	6.0	35.6
60	St Stephens	13	15	15000	5.0	35.3

*** Assumed conservative traffic flow as no traffic counts available.**
Note: a distance to road centre of 2 m was modelled as a worst case scenario. For this reason a low speed of 20km/h was also used as a default. Where this caused a problem the actual measured distance to nearest receptor and speed was used.

The DMRB screening model indicates that the 2005 annual mean objective for NO_2 is likely to be exceeded at one roadside receptors in Norwich City Council, St Augustines Street Canyon which is within the existing AQMA. Diffusion tube data for St Augustines also shows an exceedance predicted for 2005.

7.7.2 Busy Junctions

Annual average NO_2 concentrations near busy road junctions in Norwich City Council have been estimated for 2005 using DMRB (Table 7.6).

Table 7.6 Estimated nitrogen dioxide concentrations near busy junctions in Norwich City Council

Receptor ID	Link	Distance from link centre to receptor (m)	Annual average speed (km/h)	AADT (combined, veh/day)	Total % HDV	NO2 (µg/m3)
55	A140 Colman Rd / Newmarket road	15	46	23772	6	
55		32	46	19562	6	37.6
56	Red Lion / Farmers Avenue	17	46	11768.5	6	
56		6	46	12792	6	37.2
57	A140 Colman Rd / Unthank Rd	12	46	23772	6.3	
57		10	46	5000	6.3	38.8
58	A147 Barn Rd / Dereham Rd	10	46	40215	1.7	
58		13	46	5000	5	36.2
59	A147 Barn Rd / Chapel Rd Roundabout	25	46	40215	1.7	
59		25	46	5000	5	34.0
61	A147 King Street / Rouen Road	10	46	33312	5	
61		10	46	7152	3	39.1

*** Assumed conservative traffic flow as no traffic counts available**
Note: a distance to road centre of 2 m was modelled as a worst case scenario. For this reason a low speed of 20km/h was also used as a default. Where this caused a problem the actual measured distance to nearest receptor was used.

The DMRB screening model indicates that the 2005 annual mean objective for NO2 is likely to be met at receptors near the identified busy road junctions in the Norwich area.

7.8 FURTHER ASSESSMENT OF ROAD TRAFFIC SOURCES

There have been no roads identified, either as locations where people may spend an hour or more close to traffic or with a high flow of buses and/or HGVs that have not already been assessed. There are no new or proposed roads since the first round of review and assessment. All roads considered by Norwich City Council to have the potential to cause an exceedance of the objectives, including those close to the objective in the last round have been assessed.

As the stage 4 has very recently been completed and therefore areas identified in the stage 3 assessment that were predicted to exceed the objectives 3 have already been modelled at a detailed level.

- **As St Augustines (street canyon) has already been assessed in the stage 4 report and an AQMA declared, (as for Grapes hill and the castle area), there is no need to take these forward to a detailed assessment.**

7.9 SCREENING ASSESSMENT OF INDUSTRIAL SOURCES

The Guidance LAQM TG (03) lists the following processes as significant potential sources of nitrogen dioxide:

Part A (percentage of total emissions from all UK plant in this sector to the UK total in brackets)
Iron and steel (19)
Petroleum processes (16)
Combustion processes (34)
Cement/lime manufacture (9)
Carbonisation (6)
Gasification (4)
Inorganic chemicals (4)

Part B
Glass manufacture

The part B processes have been checked against Table in A2.182 of the Technical guidance and none of the processes in the authorisation list have the potential to emit significant quantities of NO_2.

7.10 SCREENING ASSESSMENT OF OTHER TRANSPORT SOURCES

7.10.1 Bus Stations

The main bus station movements in Norwich City are summarised below. The station has less movements per day than the flow of 1000 given in the Guidance as the level requiring further investigation and the nearest residential receptor is approximately 150m. Therefore this is not considered to be a significant source and is not considered further.

Movements from Norwich City Bus Station

First Bus Company	22 movements per hour 07:00 to 19:00
City Link	Average 4 per day
Chenery	6 movements per day
Sanders	6 movements per day
Airport buses	2 per hour 05:30 to 23:00 hrs
Total	315 per day

Bus Station Surrey Street Norwich grid ref E 622994.23 N 308013.11

7.10.2 Airports

There is an airport in to the north of Norwich,
It lifts 144000 tonnes of freight a year and has 366796 terminal passengers a year. Both these figures lie below the screening figures stated in the guidance, (5 million passengers per year and/or 500,000 tonnes of freight). Therefore this source does not need to be considered in a further assessment.

7.11 CONCLUSIONS FOR NITROGEN DIOXIDE CONCENTRATIONS IN NORWICH CITY COUNCIL

Predicted concentrations of nitrogen dioxide indicate that the annual average objective is likely to be exceeded in 2005 at relevant receptors within the existing AQMAs. A stage 4 review and assessment has recently been completed and no significantly new data has come to light since then. A detailed asesssment of these areas is not required. There are no significant industrial sources of nitrogen dioxide in Norwich City Council.

8 Updating and Screening Assessment for Sulphur Dioxide

8.1 INTRODUCTION

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

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

8.2 STANDARD AND OBJECTIVE FOR SULPHUR DIOXIDE

The Government and the Devolved Administrations have adopted a 15-minute mean of 266 µgm^{-3} as an air quality standard for sulphur dioxide, with an objective for the standard not to be exceeded more than 35 times in a year by the end of 2005.
Additional objectives have also been set which are equivalent to the EU limit values specified in the First Air Quality Daughter Directive. These are for a 1-hour mean objective of 350 µgm^{-3}, to be exceeded no more than 24 times per year, and a 24-hour objective of 125 µgm^{-3}, to be exceeded no more than 3 times per year, to be achieved by the end of 2004.

8.3 SCREENING ASSESSMENT OF SULPHUR DIOXIDE

The Technical Guidance LAQM TG (03) requires assessment of sulphur dioxide to consider the following sources, data or locations:

- **Monitoring data within an AQMA**
- **Monitoring data outside an AQMA**
- **New industrial sources**
- **Industrial sources with substantially increased emissions**
- **Areas of domestic coal burning**
- **Small boilers (>5MW (thermal)) burning coal or oil**
- **Shipping**
- **Railway Locomotives**

These are evaluated in the following sections.

8.4 BACKGROUND CONCENTRATIONS FOR SULPHUR DIOXIDE

The estimated average background sulphur dioxide concentration taken from the UK background maps (http://www.airquality.co.uk/archive/laqm/tools.php) for 2001 was 2.8µgm^{-3}, the maximum concentration was 6.6 µgm^{-3}.

8.5 SCREENING ASSESSMENT OF MONITORING DATA

There is monitoring data for sulphur dioxide in the Norwich City Council region at the Norwich centre monitoring site. In 2002 summary statistics for this site showed a maximum 15 minute mean of 96 µg m^{-3}, a maximum hourly mean of 61 µg m^{-3} and a 24 hour mean of 24 µg m^{-3} , none of which exceed the objectives, data capture was 96.8 % (details in appendix 1).

8.6 SCREENING ASSESSMENT OF INDUSTRIAL SOURCES

The Guidance LAQM TG (03) lists the following processes as significant potential sources of sulphur dioxide:

Part A (percentage of total emissions from all UK plant in this sector to the UK total in brackets)
Iron and steel (9)
Petroleum processes (15)
Combustion processes (45)
Cement/lime manufacture (3)
Carbonisation (10)
Non-ferrous metals (7)
Ceramic Production (9)

Part B
Combustion plant 20-50 mwth
Furnaces 20-50 mwth
Copper processes
Refractory goods
Glass manufacture
Roadstone coating

The part B processes have been checked against Table in A2.182 of the Technical guidance and none of the processes in the authorisation list have the potential to emit significant quantities of SO_2.

8.6.1 Small Boilers

No small boiler processes were identified by Norwich City Council greater than 5MW with receptors within 500m, and therefore none were identified as needing assessment.

8.7 SCREENING ASSESSMENT OF DOMESTIC SOURCES

8.7.1 Domestic coal burning

There are no data for domestic coal burning available but solid fuel use continues to decline throughout the area. Norwich City Council advises that it is unlikely that there are any areas with 50 houses using these fuels in a 500m x 500m square.

8.8 SCREENING ASSESSMENT OF OTHER TRANSPORT SOURCES

8.8.1 Railways

According to information supplied there are no areas where railway engines are run for more than 15 minutes continuously and where members of the public might be exposed. The mainline at Norwich station is electrified.

8.9 CONCLUSIONS FOR SULPHUR DIOXIDE CONCENTRATIONS NORWICH CITY COUNCIL

There are no significant industrial or domestic sources of sulphur dioxide in Norwich City Council that are expected to exceed the SO_2 objectives. A detailed assessment is not required for sulphur dioxide.

9 Updating and Screening Assessment for PM_{10}

9.1 THE NATIONAL PERSPECTIVE

National UK emissions of primary PM_{10} have been estimated as totalling 196000 tonnes in 2000 The main sources of primary PM10 are road transport (all road transport emits PM10, but diesel vehicles emit a greater mass of particulate per vehicle kilometre), stationary combustion (domestic coal combustion has traditionally been the major source of particulate emissions in the UK) and industrial processes (including bulk handling, construction, mining and quarrying). Emissions of PM10 from the UK have declined since 1970. This is due mainly to the reduction in coal use.

The Government established the Airborne Particles Expert Group (APEG) to advise on sources of PM_{10} in the UK and current and future ambient concentrations. Their conclusions were published in January 1999 (APEG, 1999). APEG concluded that a significant proportion of the current annual average PM_{10} is due to the secondary formation of particulate sulphates and nitrates, resulting from the oxidation of sulphur and nitrogen oxides. These are regional scale pollutants and the annual concentrations do not vary greatly over a scale of tens of kilometres. There are also natural or semi-natural sources such as wind-blown dust and sea salt particles. The impact of local urban sources is superimposed on this regional background. Such local sources are generally responsible for winter episodes of hourly mean concentrations of PM_{10} above 100 $\mu g\ m^{-3}$ associated with poor dispersion. However, it is clear that many of the sources of PM_{10} are outside the control of individual local authorities and the estimation of future concentrations of PM_{10} are in part dependent on predictions of the secondary particle component.

9.2 STANDARD AND OBJECTIVE FOR PM_{10}

The Government and the Devolved Administrations have adopted two Air Quality Objectives for fine particles (PM_{10}), which are equivalent to the EU Stage 1 limit values in the first Air Quality Daughter Directive. The objectives vary depending on whether the Local Authority is in Scotland or the remainder of the UK. The objectives relevant to Norwich City Council are 40 μgm^{-3} as the annual mean, and 50 μgm^{-3} as the fixed 24-hour mean to be exceeded on no more than 35 days per year, to be achieved by the end of 2004.

9.3 SCREENING ASSESSMENT OF PM_{10}

The Technical Guidance LAQM TG (03) requires assessment of PM_{10} to consider the following sources, data or locations:

- **Monitoring data outside an AQMA**
- **Monitoring data within an AQMA**
- **Busy roads and junctions in Scotland**
- **Junctions**
- **Roads with high flow of buses and/or HGVs**
- **New roads constructed or proposed since first round of review and assessment**
- **Roads close to the objective during the first round of review and assessment**
- **Roads with significantly changed traffic flows**
- **New industrial sources**
- **Industrial sources with substantially increased emissions**
- **Areas with domestic solid fuel burning**
- **Quarries, landfill sites, opencast coal, handling of dusty cargoes at ports etc**
- **Aircraft**

These are evaluated in the following sections.

9.4 BACKGROUND CONCENTRATIONS FOR PM_{10}

The estimated average background PM_{10} concentration estimated from the UK background maps (http://www.airquality.co.uk/archive/laqm/tools.php) in μgm^{-3} were:

	2001	*2004*	*2010*
Max	23.4	22.3	20.4
Average	22.5	21.5	19.7

9.5 SCREENING ASSESSMENT OF MONITORING DATA

Monitoring for PM_{10} has been undertaken at Norwich City Centre and Golding Place. A TEOM instrument is in place and all data are multiplied by a factor of 1.3 to ensure gravimetric equivalence. At Golding Place the monitor was only in place for the from September 2002, data for the following 4 months showed and a period average of 16$\mu g\ m^{-3}$ and a maximum hourly value of 64 $\mu g\ m^{-3}$. The Norwich Centre site showed a period average in 2002 of 10 $\mu g\ m^{-3}$ with a maximum hourly value of 61 $\mu g\ m^{-3}$, the data capture was 96.8%. Details of both sites are given in Appendix 1.

9.6 SCREENING ASSESSMENT OF ROAD TRAFFIC SOURCES

Traffic flow data were taken from the NAEI 2000 roads database and from manual and automatic traffic count data supplied by Norwich City Council and Norfolk County Council (Appendix 2). For screening purposes, appropriate receptor distances based the closest property where public exposure was likely appropriate speeds for the road were used. Norfolk County Council supplied traffic growth figures for 2005. These were used for the 2004 predictions, as 2004 traffic counts were not available. This provides a conservative estimate, as traffic predictions for 2005 are slightly higher than would be predicted for 2004.

9.6.1 Street Canyons

The DMRB model may significantly under-predict concentrations of nitrogen dioxide alongside urban city-centre roads classified as 'street canyons' but there is no clear evidence that this is the case for PM_{10} (Section 8.32 TG (04)) and therefore no correction is made for PM_{10} in street canyons.

Table 9.1 Predicted PM10 concentrations in 2004 and 2010 calculated using DMRB for roads in Norwich City Council

ID	Link	Distance from link centre to receptor (m)	Annual average speed (km/h)	Total % HDV	2004 PM10 (µg/m3)	2004 Number of PM10 exceedences	2010 PM10 (µg/m3)	2010 Number of PM10 exceedences
39	A140 Colman Rd	9.3	20	6.3	29.0	24	24.0	10
40	A11 Newmarket Rd	2	20	1.8	26.8	17	23.0	8
41	A1056 Ipswich Rd	2	20	1.8	26.4	16	22.8	8
42	A147 Grapes Hill	2	20	2.2	28.6	23	24.0	10
43	A11 St Stephens Rd	2	20	2.1	27.7	20	23.5	9
44	A147 St Crispins Rd	2	20	1.8	27.9	20	23.7	9
45	A147 Barn Rd	25	20	1.7	25.6	14	22.4	7
46	A147 Barrack St	2	20	1.9	27.5	19	23.4	9
47	A1067 Pitt Street	2	20	1.6	26.7	17	23.0	8
48	A140 Boundary Rd	2	20	7.5	28.1	21	23.4	9
49	St Augustines	4.3	25	3.9	27.5	19	23.3	9
50	Castle Meadow	2	25	6.0	26.1	15	22.6	7
51	Dereham rd/Norwich rd	10	25	6.0	29.1	24	24.2	11
52	Farmers Avenue	10	20	6.0	26.8	17	22.8	8
53	Cattle Market	10	20	6.0	29.2	25	24.2	10
54	Red Lion	4.5	20	6.0	27.5	19	23.4	9
60	St Stephens	13	15	5.0	27.5	19	23.2	9

Note: a distance to road centre of 2 m was modelled as a worst case scenario. For this reason a low speed of 20km/h was also used as a default. Where this caused a problem the actual measured distance to nearest receptor was used.

The DMRB run shows no exceedences of the 2004 objective. Exceedences of the 2010 stage 2 limit value are predicted. In part this is due to the modelling using a 2m worst case scenario for some links. However, there will be an exceedance at all locations modelled as the background concentration in 2010 (20.4μgm^{-3}) is predicted to be above the limit value even before a road contribution is added. This limit value is not included in UK regulations.

9.6.2 Busy Junctions

Annual average PM_{10} concentrations near busy road junctions in Norwich City Council have been estimated for 2005 using DMRB (Table 9.2).

Table 9.2 Predicted PM_{10} concentrations in 2004 and 2010 calculated using DMRB for busy junctions in Norwich City Council

ID	Link	Distance from link centre to receptor (m)	Annual average speed (km/h)	Total % HDV	2004 PM10 (μg/m3)	2004 Number of PM10 exceedences	2010 PM10 (μg/m3)	2010 Number of PM10 exceedences
55	A140 Colman Rd / Newmarket road	15	46	6				
55		32	46	6	27.9	20	23.4	9
56	Red lion / farmers avenue	17	46	6				
56		6	46	6	27.6	20	23.3	9
57	A140 Colman Rd / Unthank Rd	12	46	6.3				
57		10	46	6.3	28.7	23	23.8	10
58	A147 Barn Rd / Dereham Rd	10	46	1.7				
58		13	46	5	27.5	19	23.4	9
59	A147 Barn Rd / Chapel Rd Roundabout	25	46	1.7				
59		25	46	5	26	15	22.5	7
61	A147 King Street / Rouen Road	10	46	5				
61		10	46	3	29.2	25	24.2	11

Note: a distance to road centre of 2 m was modelled as a worst case scenario. For this reason a low speed of 20km/h was also used as default. Where this caused a problem the actual measured distance to nearest receptor was used.

There are no instances of DMRB predicting an annual mean in excess of the 40μgm^{-3} annual mean objective and / or more than 35 exceedences of the 24-hour mean, the objective for 2004. The DMRB screening model indicates that the 2004 annual mean objective for PM_{10} is not likely to be exceeded at receptors in Norwich City Council. However the DMRB model does indicate possible exceedences of the 2010 limit value at all the modelled junctions.

9.6.3 Other Traffic Assessment

There have been no roads identified, either as locations where people may spend an hour or more close to traffic or with a high flow of buses and/or HGVs that have not already been assessed. There are no new or proposed roads since the first round of review and assessment. All roads considered by Norwich City Council to have the potential to cause an exceedance of the objectives, including those close to the objective in the last round have been assessed.

9.7 SCREENING ASSESSMENT OF INDUSTRIAL SOURCES

The Guidance LAQM TG (03) lists the following processes as significant potential sources of PM_{10}:

Part A (percentage of total emissions from all UK plant in this sector to the UK total in brackets)
Iron and steel (61)
Petroleum processes (4)
Combustion processes (13)
Cement/lime manufacture (7)
Carbonisation (2)
Gasification (4)

Non-ferrous metals (4)
Fertilizer production

Part B
Combustion plant 20-50 MWt
Furnaces 20-50 MWt
Coal and coke processes
Quarry Process
Roadstone coating
Rubber processes
China and clay processes
Coating powder
Coil coating

The part B processes have been checked against Table in A2.182 of the Technical guidance and none of the processes in the authorisation list have the potential to emit significant quantities of PM_{10}.

None of the Part A or Part B industrial processes in Norwich City Council (Appendix 3) operate these processes or have the potential to emit significant quantities of PM_{10}.

There are no industrial processes, current or proposed, in neighbouring areas that have the potential to emit significant quantities of PM_{10}.

9.8 SCREENING ASSESSMENT OF FUGITIVE AND UNCONTROLLED SOURCES

9.8.1 Quarries and landfill sites

There are no recorded quarries or landfill sites with relevant locations for public exposure within 200m.

9.8.2 Domestic solid fuel burning

There are no data for domestic coal burning available but solid fuel use continues to decline throughout the area. It is unlikely that there are any areas with 50 houses using these fuels in a 500m square.

9.9 SCREENING ASSESSMENT OF OTHER TRANSPORT SOURCES

9.9.1 Airports

There is an airport to the north of Norwich. It lifts 144000 tonnes of freight a year and has 366796 terminal passengers a year. Both these figures lie below the screening figures stated in the guidance, i.e. a throughput of 5 million passengers per year and/or 500,000 tonnes of freight. Therefore this source does not need to be considered in a further assessment.

9.10 CONCLUSIONS FOR PM10 CONCENTRATIONS NORWICH CITY COUNCIL

The DMRB screening model indicates that the annual mean objective for PM_{10} will be met in 2004, but that exceedences of the 2010 objective are likely. It is not yet possible to declare an AQMA for the 2010 PM_{10} objective. Therefore it is advised that Norwich City Council do not proceed to a Detailed Assessment at this stage but bear in mind the possibility of having to comply with the objective and how this may affect their monitoring strategies in the region.

A detailed assessment is not required for PM_{10} in Norwich City Council at this stage as it is predicted that the 2004 objective will be met.

10 Conclusions

10.1 CARBON MONOXIDE

There are no roads in Norwich City Council that can be classified as 'very busy' according to the criteria in the guidance. Monitoring data suggest an exceedence of the objective is unlikely. A detailed assessment is not required based for carbon monoxide in Norwich City Council.

10.2 BENZENE

There are no roads in Norwich City Council that can be classified as 'very busy' according to the criteria in the guidance. There are no petrol stations with a throughput greater than 2 million litres and with relevant exposure within 10m of the pumps.

A detailed assessment is, therefore, not required based for benzene in Norwich City Council.

10.3 1,3-BUTADIENE

Estimated background concentrations and data from national monitoring stations indicate that the objective for 1,3-butadiene is likely to be achieved by the end of 2003. There are no industrial processes, current or proposed, in Norwich City Council which have the potential to emit 1,3-butadiene. A detailed assessment is not required for 1,3-butadiene in Norwich City Council.

10.4 LEAD

Emissions of lead from industrial processes in Norwich City Council are not likely to exceed the objectives for lead to be achieved in 2004 and 2008. A detailed assessment is not required for lead in Norwich City Council.

10.5 NITROGEN DIOXIDE

Predicted concentrations of nitrogen dioxide indicate that the annual average objective is likely to be exceeded in 2005 at relevant receptors situated within the existing AQMA. A stage 4 review and assessment has recently been completed and no significantly different data have become available. There are no significant industrial sources of nitrogen dioxide in Norwich City Council. There is no need to progress to a detailed assessment for this pollutant.

10.6 SULPHUR DIOXIDE

There are no significant industrial or domestic sources of sulphur dioxide in Norwich City Council that are expected to exceed the SO_2 objectives. A detailed assessment is not required for sulphur dioxide.

10.7 PM_{10}

The DMRB screening model indicates that the annual mean objective for PM_{10} will be met in 2004, but that exceedences of the 2010 limit value are likely. It is not possible to declare an AQMA for the 2010 PM_{10} limit value. Therefore it is advised that Norwich City Council do not proceed to a Detailed Assessment at this stage but bear in mind the possibility of having to comply with the objective and how this may affect their monitoring strategies in the region.

A detailed assessment is not required for PM_{10} in Norwich City Council at this stage as it is predicted that the 2004 objective will be met.

10.8 SUMMARY AND RECOMMENDATIONS

It is recommended that a detailed review and assessment is not undertaken and Norwich City Council produces an annual progress report for DEFRA.

11 References

Part IV of the Environment Act 1995. Local Air Quality Management. LAQM.TG (03) January 2003.

Norwich City Council Stages 1 & 2 Air Quality Review and Assessment.

Stage 1 Review and Assessment of Air Quality. Norwich City Council Aug 1998. Stanger.

Stage 3 Air Quality Review and Assessment. Norwich City Council Jan 2002. Stanger Science and Environment

Stage 3 Air Quality Review and Assessment Update. August 2002. AEA Technology, Kate Haigh

Stage 4 Air Quality Review and Assessment Update. August 2003. AEA Technology, John Abbott

DETR (2000b) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Department of the Environment, Transport and the Regions. Cm 4548, SE 2000/3, NIA 7.

http://www.airquality.co.uk/archive/laqm/tools.php

Design Manual For Roads and Bridges. Highways Agency 2003

12 The UK Air Quality Strategy

The Government prepared the Air Quality Strategy for England, Scotland, Wales and Northern Ireland for consultation in August 1999. It was published in January 2000 (DETR, 2000)[2].

12.1.1 National Air Quality Standards

At the centre of the Air Quality Strategy is the use of national air quality standards to enable air quality to be measured and assessed. These also provide the means by which objectives and timescales for the achievement of objectives can be set. These standards and associated specific objectives to be achieved between 2003 and 2008 are shown in Table 12.1. The table shows the standards in $\mu g\ m^{-3}$.

Table 12.1 Objectives included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the purpose of Local Air Quality Management

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene			
All authorities	16.25 μg/m^3	running annual mean	31.12.2003
Authorities in England and Wales only	5.00 μg/m^3	annual mean	31.12.2010
Authorities in Scotland and Northern Ireland only[a]	3.25 μg/m^3	running annual mean	31.12.2010
1,3-Butadiene	2.25 μg/m^3	running annual mean	31.12.2003
Carbon monoxide		maximum daily running 8-hour mean	31.12.2003
Authorities in England, Wales and Northern Ireland only[a]	10.0 mg/m^3		
Authorities in Scotland only	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 μg/m^3	annual mean	31.12.2004
	0.25 μg/m^3	annual mean	31.12.2008
Nitrogen dioxide[b]	200 μg/m^3 not to be exceeded more than 18 times a year	1 hour mean	31.12.2005
	40 μg/m^3	annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)[c]	50 μg/m^3 not to be exceeded more than 35 times a year	24 hour mean	31.12.2004
All authorities	40 μg/m^3	annual mean	31.12.2004
Authorities in Scotland only[d]	50 μg/m^3 not to be exceeded more than 7 times a year	24 hour mean	31.12.2010
	18 μg/m^3	annual mean	31.12.2010
Sulphur dioxide	350 μg/m^3 not to be exceeded more than 24 times a year	1 hour mean	31.12.2004
	125 μg/m^3 not to be exceeded more than 3 times a year	24 hour mean	31.12.2004
	266 μg/m^3 not to be exceeded more than 35 times a year	15 minute mean	31.12.2005

a. In Northern Ireland none of the objectives are currently in regulation. Air Quality (Northern Ireland) Regulations are scheduled for consultation early in 2003.
b. The objectives for nitrogen dioxide are provisional.
c. Measured using the European gravimetric transfer sampler or equivalent.
d. These 2010 Air Quality Objectives for PM_{10} apply in Scotland only, as set out in the Air Quality (Scotland) Amendment Regulations 2002.

12.1.2 Timescales to achieve the objectives for the pollutants in Air Quality Strategy

In most local authorities in the UK, objectives will be met for most of the pollutants within the timescale of the objectives shown in Table 12.1. It is important to note that the objectives for NO_2 remain provisional. The Government has recognised the problems associated with achieving the standard for ozone and this will not therefore be a statutory requirement. Ozone is a secondary pollutant and transboundary in nature and it is recognised that local authorities themselves can exert little influence on concentrations when they are the result of regional primary emission patterns.

12.2 AIR QUALITY REVIEWS – THE APPROACHES AND EXPECTED OUTCOMES

Technical Guidance has been issued in 'Review and Assessment: Technical Guidance' LAQM.TG (03)[3] to enable air quality to be monitored, modelled, reviewed and assessed in an appropriate and consistent fashion. This updating and screening assessment has considered the procedures set out in this technical guidance.

The primary objective of undertaking a review of air quality is to identify any areas that are unlikely to meet national air quality objectives and ensure that air quality is considered in local authority decision making processes. The complexity and detail required in a review depends on the risk of failing to achieve air quality objectives and it has been proposed therefore that reviews should be carried out in two steps. Both steps of review and assessment may be necessary and every authority is expected to undertake at least a first stage review and assessment of air quality in their authority area. The steps are briefly described in the following table, Table 12.2.

Table 12.2 Brief details of steps in the second Round of the Air Quality Review and Assessment process

Level of Assessment	Objective	Approach
Updating and Screening	To identify those matters that have changed since the last review and assessment, which might lead to a risk of an air quality objective being exceeded	Use a checklist to identify significant changes that require further consideration. Where such changes are identified, than apply simple screening tools to decide whether there is sufficient risk of an exceedence of an objective to justify a Detailed Assessment
Detailed assessment	To provide an accurate assessment of the likelihood of an air quality objective being exceeded at locations with relevant exposure. This should be sufficiently detailed to allow the designation or amendment of any necessary AQMAs	Use quality-assured monitoring and validated modelling methods to determine current and future pollutant concentrations in areas where there is a significant risk of exceeding an air quality objective.
Annual Progress reports	Local authorities should prepare annual air quality Progress Reports between subsequent rounds of reviews and assessments. The concept is that this will ensure continuity in the LAQM process.	The precise format for the Progress Report has not yet been determined, but will essentially follow the checklist approach that is set out in subsequent chapters of this document. Further details on the Progress Reports will be provided via the Helpdesks by the middle of 2003. It is envisaged that these Progress Reports could be useful for the compilation of annual 'state of the

environment' reports that many authorities already prepare.

The current deadline for completion of updating and screening assessments is May 2003, and for detailed assessments April 2004.

12.3 LOCATIONS THAT THE REVIEW AND ASSESSMENT MUST CONCENTRATE ON

For the purpose of review and assessment, the authority should focus their work on locations where members of the public are likely to be exposed over the averaging period of the objective. Table 12.3 summarises the locations where the objectives should and should not apply.

Table 12.3 Typical locations where the objectives should and should not apply

Averaging Period	Pollutants	Objectives *should* apply at …	Objectives should *not* generally apply at …
Annual mean	• 1,3 Butadiene • Benzene • Lead • Nitrogen dioxide • Particulate Matter (PM_{10})	• All background locations where members of the public might be regularly exposed.	• Building facades of offices or other places of work where members of the public do not have regular access.
		• Building facades of residential properties, schools, hospitals, libraries etc.	• Gardens of residential properties.
			• Kerbside sites (as opposed to locations at the building facade), or any other location where public exposure is expected to be short term
24 hour mean and 8-hour mean	• Carbon monoxide • Particulate Matter (PM_{10}) • Sulphur dioxide	• All locations where the annual mean objective would apply.	• Kerbside sites (as opposed to locations at the building facade), or any other location where public exposure is expected to be short term.
		• Gardens of residential properties.	

Table 12.3 (contd.) **Typical locations where the objectives should and should not apply**

Averaging Period	Pollutants	Objectives should apply at ...	Objectives should generally not apply at ...
1 hour mean	• Nitrogen dioxide • Sulphur dioxide	• All locations where the annual mean and 24 and 8-hour mean objectives apply.	• Kerbside sites where the public would not be expected to have regular access.
		• Kerbside sites (e.g. pavements of busy shopping streets).	
		• Those parts of car parks and railway stations etc. which are not fully enclosed.	
		• Any outdoor locations to which the public might reasonably expected to have access.	
15 minute mean	• Sulphur dioxide	• All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer.	

It is unnecessary to consider exceedences of the objectives at any location where public exposure over the relevant averaging period would be unrealistic. Locations should also represent non-occupational exposure.

Appendices

CONTENTS

Appendix 1
Monitoring data

CONTENTS

Norwich Centre
http://www.stanger.co.uk/siteinfo/MonitoringSite.asp?ID=78

The monitoring station is within a self-contained, air-conditioned housing located within the South south western corner of a central Norwich public garden. The nearest road is located approximately 12 metres away at St George's Street although traffic flow is free flowing and very light (1 or 2 vehicles per minute observed off peak). The manifold inlet is approximately 3 metres high. The surrounding area is generally open and comprises of residential and light industrial premises.

OS Grid Reference: TG230089
Site Type: Urban Centre
Start Date: 24/07/97
Pollutants Measured: O3,CO,SO2,PM10,NOx

Norwich Roadside
http://www.stanger.co.uk/siteinfo/MonitoringSite.asp?ID=90

The monitoring station is within an existing office building complex approximately 6 metres from a busy 2-lane urban street. Traffic flow is approximately 16,000 vehicles per day and is subject to frequent congestion. The manifold inlet is approximately 6 metres high and is mounted close to the building facade. The surrounding area comprises retail outlet and business premises.

OS Grid Reference: TG234078
Site Type: Roadside
Start Date: 21/06/97
Pollutants Measured: NOx http://www.aeat.co.uk/netcen/airqual/bulletins/

NORWICH AIRPORT January to December 2002

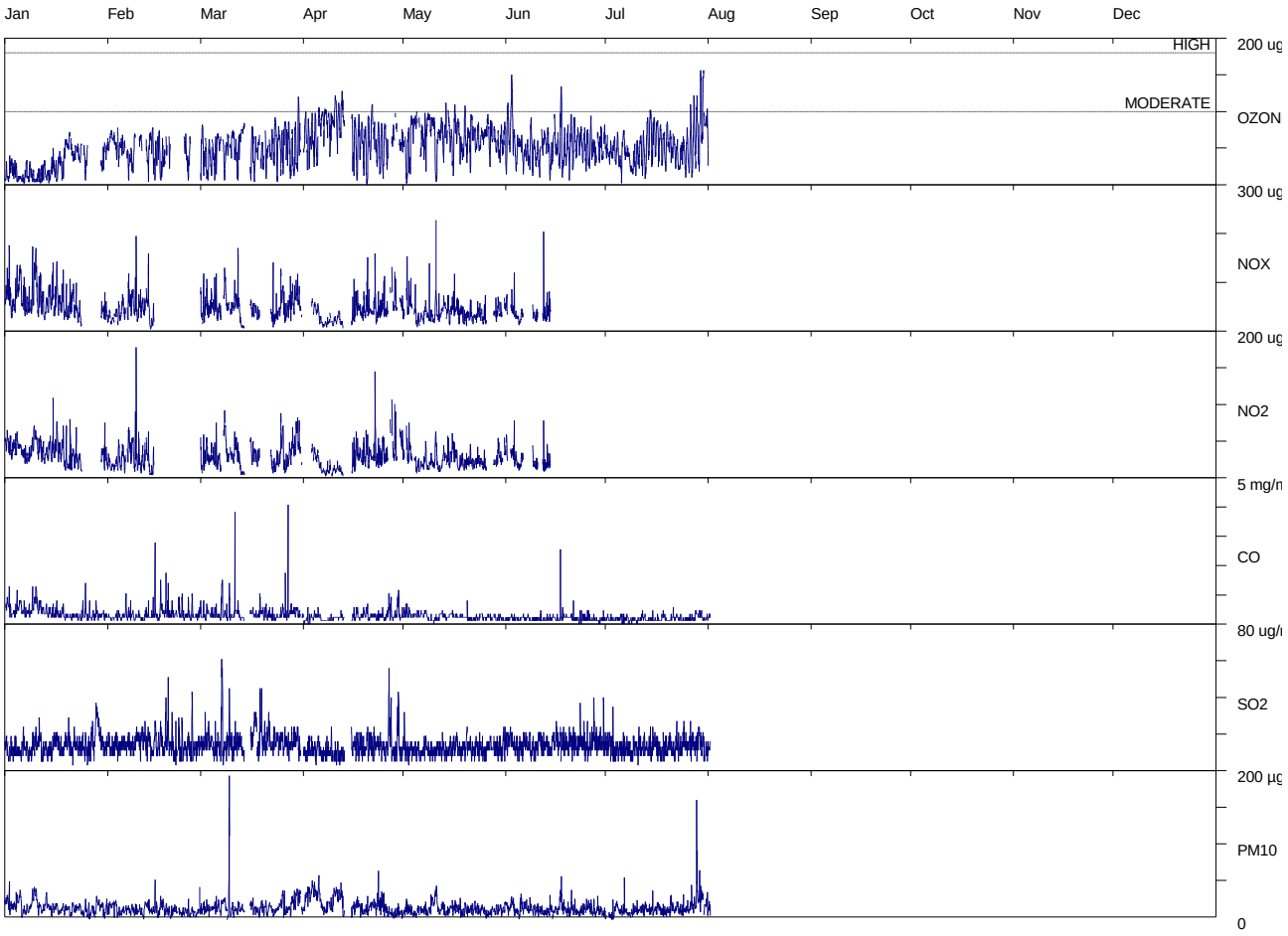
These data have been fully ratified by netcen

POLLUTANT	CO	NO_2	NO_X	O_3	PM_{10}	SO_2
Number Very High	0	0	-	0	0	0
Number High	0	0	-	0	0	0
Number Moderate	0	0	-	170	0	0
Number Low	4952	2783	-	4318	4850	19265
Maximum 15-minute mean	9.8 mg m^{-3}	331 µg m^{-3}	539 µg m^{-3}	166 µg m^{-3}	504 µg m^{-3}	96 µg m^{-3}
Maximum hourly mean	4.1 mg m^{-3}	178 µg m^{-3}	227 µg m^{-3}	156 µg m^{-3}	193 µg m^{-3}	61 µg m^{-3}
Maximum running 8-hour mean	1.3 mg m^{-3}	76 µg m^{-3}	145 µg m^{-3}	139 µg m^{-3}	87 µg m^{-3}	52 µg m^{-3}
Maximum running 24-hour mean	0.9 mg m^{-3}	65 µg m^{-3}	126 µg m^{-3}	109 µg m^{-3}	42 µg m^{-3}	30 µg m^{-3}
Maximum daily mean	0.9 mg m^{-3}	58 µg m^{-3}	111 µg m^{-3}	101 µg m^{-3}	36 µg m^{-3}	27 µg m^{-3}
Average of hourly means	0.3 mg m^{-3}	29 µg m^{-3}	47 µg m^{-3}	52 µg m^{-3}	13 µg m^{-3}	14 µg m^{-3}
Data capture of hourly means	56.2 %	31.8 %	31.8 %	50.0 %	56.0 %	56.1 %

All mass units are at 20'C and 1013mb
NO_X mass units are NO_X as NO_2

Pollutant	Air Quality Strategy Standard (Jan 2000) and (Amendment) Regulations 2002	Exceedences	Days
Carbon Monoxide	Running 8-hour mean > 10.0 mg m^{-3}	0	0
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	0	0
Nitrogen Oxides (NO_2)	Annual mean > 30 µg m^{-3}	1	-
Ozone	Running 8-hour mean > 100 µg m^{-3}	85	14
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	0	0
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 40 µg m^{-3}	0	-
Sulphur Dioxide	15-minute mean > 266 µg m^{-3}	0	0
Sulphur Dioxide	Hourly mean > 350 µg m^{-3}	0	0
Sulphur Dioxide	Daily mean > 125 µg m^{-3}	0	0
Sulphur Dioxide	Annual mean > 20 µg m^{-3}	0	-

Norwich Airport Air Monitoring
Hourly Mean Data for January to December 2002



NORWICH CENTRE January to December 2002

These data have been fully ratified by netcen

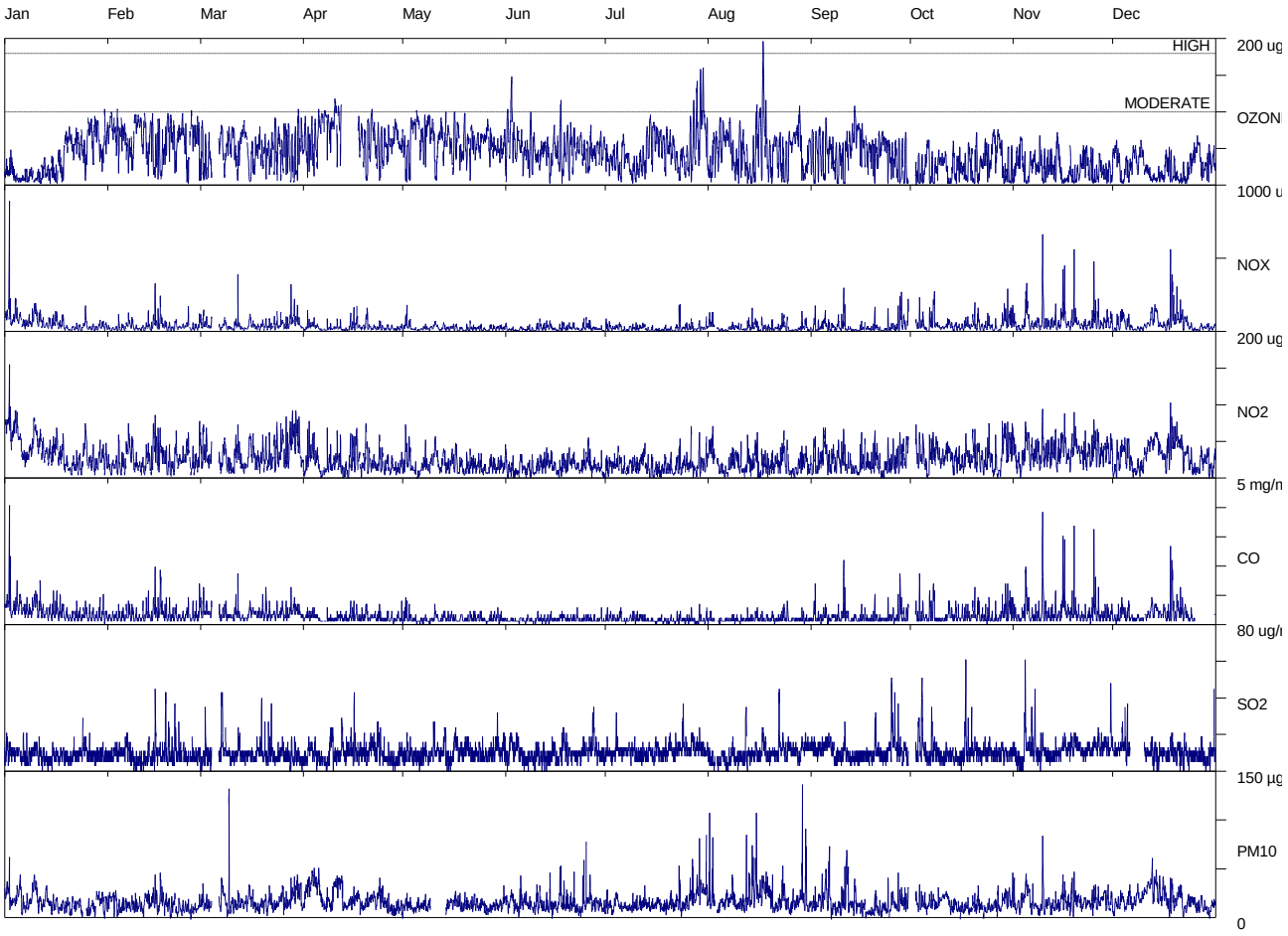
Small grassed open space on edge of city centre.

POLLUTANT	CO	NO_2	NO_X	O_3	PM_{10}	SO_2
Number Very High	0	0	-	0	0	0
Number High	0	0	-	2	0	0
Number Moderate	0	0	-	159	0	0
Number Low	8436	8317	-	8370	8449	33178
Maximum 15-minute mean	5.1 mg m^{-3}	170 µg m^{-3}	1037 µg m^{-3}	202 µg m^{-3}	218 µg m^{-3}	96 µg m^{-3}
Maximum hourly mean	4.1 mg m^{-3}	155 µg m^{-3}	890 µg m^{-3}	196 µg m^{-3}	136 µg m^{-3}	61 µg m^{-3}
Maximum running 8-hour mean	2.5 mg m^{-3}	94 µg m^{-3}	402 µg m^{-3}	170 µg m^{-3}	61 µg m^{-3}	38 µg m^{-3}
Maximum running 24-hour mean	1.1 mg m^{-3}	84 µg m^{-3}	217 µg m^{-3}	120 µg m^{-3}	43 µg m^{-3}	24 µg m^{-3}
Maximum daily mean	1.1 mg m^{-3}	81 µg m^{-3}	198 µg m^{-3}	108 µg m^{-3}	38 µg m^{-3}	21 µg m^{-3}
Average of hourly means	0.3 mg m^{-3}	25 µg m^{-3}	39 µg m^{-3}	44 µg m^{-3}	16 µg m^{-3}	10 µg m^{-3}
Data capture of hourly means	96.3 %	94.9 %	94.9 %	94.8 %	96.5 %	96.8 %

All mass units are at 20'C and 1013mb
NO_X mass units are NO_X as NO_2

Pollutant	Air Quality Strategy Standard (Jan 2000) and (Amendment) Regulations 2002	Exceedences	Days
Carbon Monoxide	Running 8-hour mean > 10.0 mg m^{-3}	0	0
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	0	0
Nitrogen Oxides (NO_2)	Annual mean > 30 µg m^{-3}	1	-
Ozone	Running 8-hour mean > 100 µg m^{-3}	75	11
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	0	0
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 40 µg m^{-3}	0	-
Sulphur Dioxide	15-minute mean > 266 µg m^{-3}	0	0
Sulphur Dioxide	Hourly mean > 350 µg m^{-3}	0	0
Sulphur Dioxide	Daily mean > 125 µg m^{-3}	0	0
Sulphur Dioxide	Annual mean > 20 µg m^{-3}	0	-

Norwich Centre Air Monitoring
Hourly Mean Data for January to December 2002



NORWICH GOLDING PLACE January to December 2002

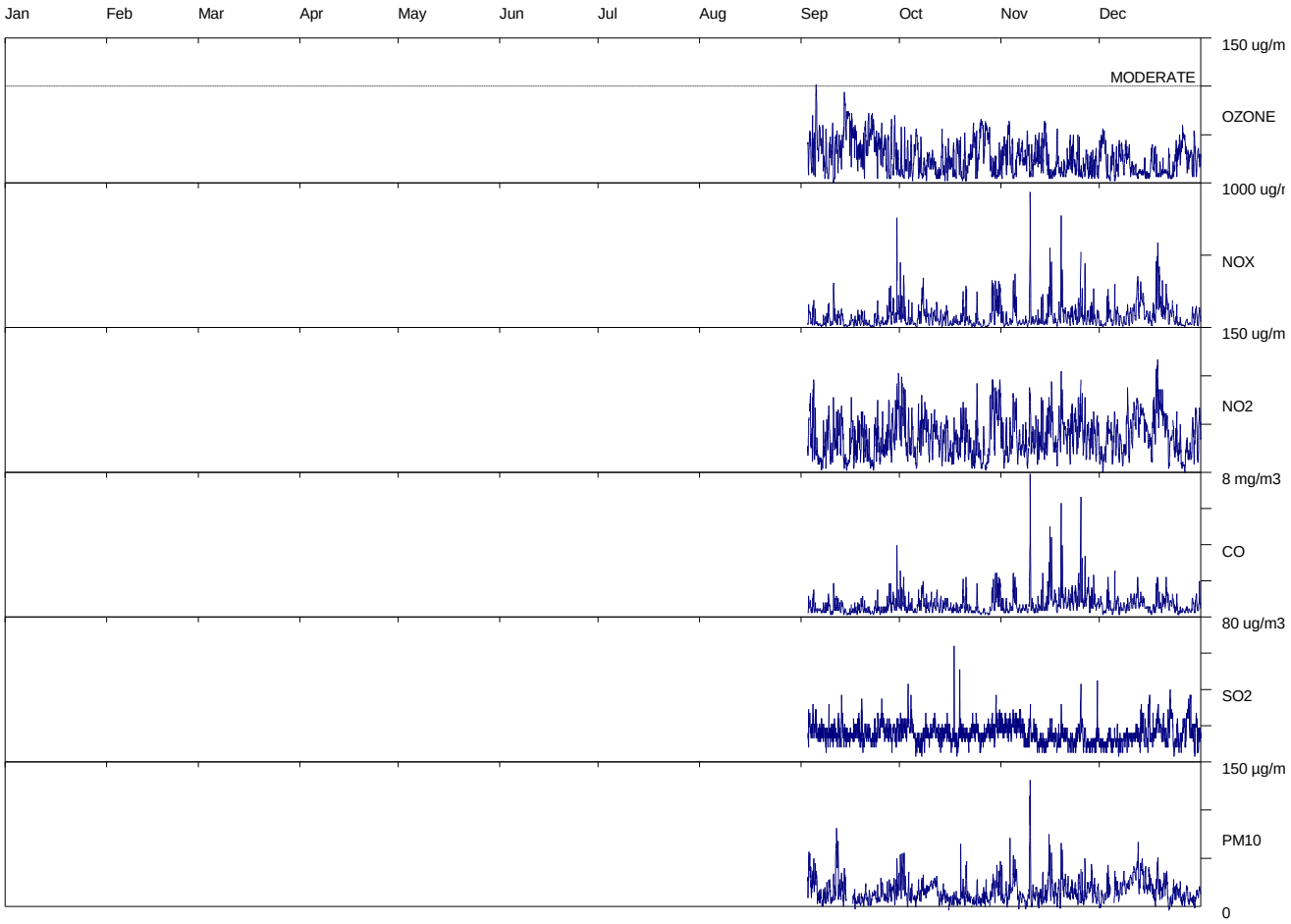
These data have been fully ratified by netcen

POLLUTANT	CO	NO_2	NO_X	O_3	PM_{10}	SO_2
Number Very High	0	0	-	0	0	0
Number High	0	0	-	0	0	0
Number Moderate	0	0	-	1	7	0
Number Low	2875	2867	-	2879	2761	11247
Maximum 15-minute mean	10.1 mg m^{-3}	127 µg m^{-3}	1194 µg m^{-3}	104 µg m^{-3}	147 µg m^{-3}	97 µg m^{-3}
Maximum hourly mean	7.9 mg m^{-3}	117 µg m^{-3}	938 µg m^{-3}	102 µg m^{-3}	131 µg m^{-3}	64 µg m^{-3}
Maximum running 8-hour mean	4.6 mg m^{-3}	104 µg m^{-3}	551 µg m^{-3}	89 µg m^{-3}	95 µg m^{-3}	33 µg m^{-3}
Maximum running 24-hour mean	2.4 mg m^{-3}	83 µg m^{-3}	336 µg m^{-3}	71 µg m^{-3}	53 µg m^{-3}	29 µg m^{-3}
Maximum daily mean	2.0 mg m^{-3}	80 µg m^{-3}	282 µg m^{-3}	69 µg m^{-3}	42 µg m^{-3}	29 µg m^{-3}
Average of hourly means	0.7 mg m^{-3}	37 µg m^{-3}	76 µg m^{-3}	26 µg m^{-3}	16 µg m^{-3}	16 µg m^{-3}
Data capture of hourly means	32.8 %	32.7 %	32.7 %	32.8 %	31.7 %	32.8 %

All mass units are at 20'C and 1013mb
NO_X mass units are NO_X as NO_2

Pollutant	Air Quality Strategy Standard (Jan 2000) and (Amendment) Regulations 2002	Exceedences	Days
Carbon Monoxide	Running 8-hour mean > 10.0 mg m^{-3}	0	0
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	0	0
Nitrogen Oxides (NO_2)	Annual mean > 30 µg m^{-3}	1	-
Ozone	Running 8-hour mean > 100 µg m^{-3}	0	0
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	1	1
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 40 µg m^{-3}	0	-
Sulphur Dioxide	15-minute mean > 266 µg m^{-3}	0	0
Sulphur Dioxide	Hourly mean > 350 µg m^{-3}	0	0
Sulphur Dioxide	Daily mean > 125 µg m^{-3}	0	0
Sulphur Dioxide	Annual mean > 20 µg m^{-3}	0	-

Norwich Golding Place Air Monitoring
Hourly Mean Data for January to December 2002



NORWICH ROADSIDE January to December 2002

These data have been fully ratified by netcen

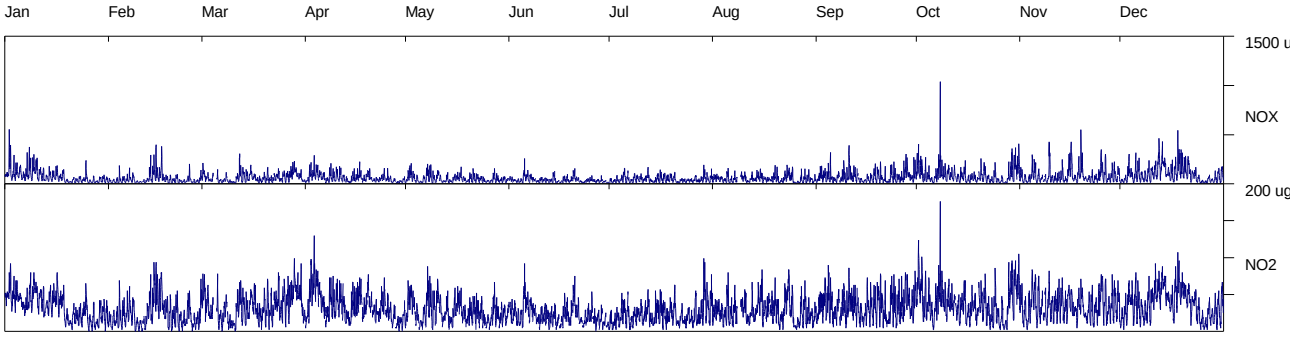
Located in the Guildhall with traffic flow approximately 10,000 vehicles per day.

POLLUTANT	NO_2	NO_X
Number Very High	0	-
Number High	0	-
Number Moderate	0	-
Number Low	8555	-
Maximum 15-minute mean	275 µg m^{-3}	1864 µg m^{-3}
Maximum hourly mean	176 µg m^{-3}	1039 µg m^{-3}
Maximum running 8-hour mean	96 µg m^{-3}	324 µg m^{-3}
Maximum running 24-hour mean	72 µg m^{-3}	245 µg m^{-3}
Maximum daily mean	67 µg m^{-3}	206 µg m^{-3}
Average of hourly means	30 µg m^{-3}	61 µg m^{-3}
Data capture of hourly means	97.7 %	97.7 %

All mass units are at 20'C and 1013mb
NO_X mass units are NO_X as NO_2

Pollutant	Air Quality Strategy Standard (Jan 2000) and (Amendment) Regulations 2002	Exceedences	Days
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	0	0
Nitrogen Oxides (NO_2)	Annual mean > 30 µg m^{-3}	1	-

Norwich Roadside Air Monitoring
Hourly Mean Data for January to December 2002



Produced by netcen on behalf of defra

NORWICH CENTRE
1 January to 31 December 2002

These data have been fully ratified by netcen

Small grassed open space on edge of city centre.

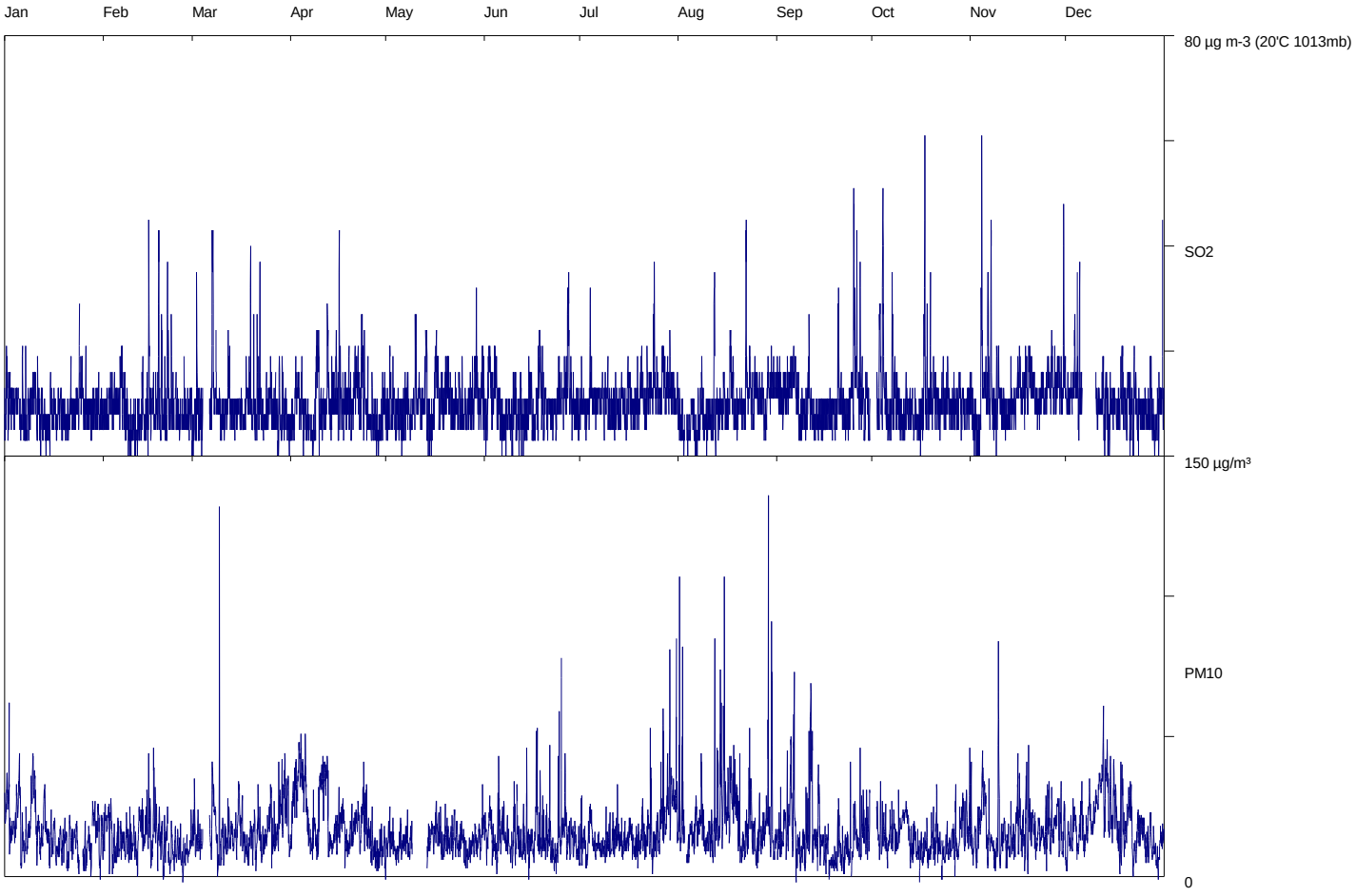
POLLUTANT	SO_2	PM_{10}
Number Very High	0	0
Number High	0	0
Number Moderate	0	0
Number Low	33178	8449
Maximum 15-minute mean	96 µg m^{-3}	218 µg m^{-3}
Maximum hourly mean	61 µg m^{-3}	136 µg m^{-3}
Maximum running 8-hour mean	38 µg m^{-3}	61 µg m^{-3}
Maximum running 24-hour mean	24 µg m^{-3}	43 µg m^{-3}
Maximum daily mean	21 µg m^{-3}	38 µg m^{-3}
Average	10 µg m^{-3}	16 µg m^{-3}
Data capture	96.8 %	96.5 %

All mass units are at 20'C and 1013mb

Pollutant	Air Quality Regulations (2000) and (Amendment) Regulations 2002	Exceedences	Days
Sulphur Dioxide	15-minute mean > 266 µg m^{-3}	0	0
Sulphur Dioxide	Hourly mean > 350 µg m^{-3}	0	0
Sulphur Dioxide	Daily mean > 125 µg m^{-3}	0	0
Sulphur Dioxide	Annual mean	-	-
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	0	0
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 40 µg m^{-3}	0	-

Produced by netcen on behalf of defra

Norwich Centre Air Monitoring
Hourly Mean Data for 1 January to 31 December 2002



NONE

	Place	Apr-02	May-02	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02			Dec-02	Jan-03	Feb-03
1	Vulcan Rd	12	13	15	15	14	17	13	26	1	Vulcan Rd	21	35	32
2	Heartsease	17	12	15				13	20	2	Heartsease	13	15	22
3	Tombland	21	17	17	20	13	16	13	22	3	Tombland	19	20	22
4	Cattlemarket	16	14	9	22	18	18	17		4	Cattlemarket	25	20	33
5	St Stephens	20	3	13	26	17	18	15	21	5	St Stephens	22	21	22
6	Ipswich Rd	16	7	9	13	9	13	16	21	6	Ipswich Rd	16	19	26
7	Earlham Rd	17	10	13	15	12	17	10	22	7	Earlham Rd	18	17	27
8	Colman Rd	14	12	18	12	13	14	18	15	8	Colman Rd	46	18	19
9	Unthank Rd	18	10	12	20	20	18	13	23	9	Unthank Rd	21	18	27
10	Johnstone Pl	18	14	14	21	20	23	12	24	10	Johnstone Pl	23	21	34
11	Chapelfield	13	9	11	8	10	14	20		12	Castlemeadow	21	21	29
12	Castlemeadow	21	8		19	14	15	11	24	13	Guildhall	18	15	18
13	Guildhall	12	5	3	4	11	15	10	21	14	Exchange St	17	19	25
14	Exchange St	15	11	11	13	17	17	17	20	15	St Georges		16	25
15	St Georges	6	6	7	9		17	9	18	16	St Augustines	23	25	29
16	St Augustines	21	20	23	25	22	20	15	29	17	Ber St 1	17	10	21
17	Ber St	12	12	12	12	8	8	11	20	18	Ber St 2	17		
18	Ber St 2							10	14	19	Ber St 3	14		
1	Parmeter Pl	6	7	8	8	6	12	14	25	A	Riverside	26	25	28
2	Rouen Rd	12	13	14	13	17	13			B	Eastbourne Pl	21	17	30
3	Paragon Pl	14	13	13	10	14	15			C	St Vedast St	20	17	26
4	Upper St Giles	14	9	14	11	13	13			D	Upper King St	18	18	26
5	Copeman St	14	9	10	10	12	16			E	Castlemeadow	18	20	28
6	Opie St	14	9	8	10	16	15							
7	Cassella	10	14	7	11	16	14							
8	Golding Pl	14	10	12	8	12	16							
9	St Augustines - Colmans	20	10		8	16	18							
10	St Augustines - top	21	0	16	15	20	18							
11	Bull Close	11	8	12	7	14	20							
12	Spencer St	15	13	9	11	8	9							

OS References for NO2 Diffusion Tubes STAGE IV		
Parmeter Pl	623467	3008418
Rouen Rd	623302	308310
Paragon Pl	622381	308648
Upper St Giles	622457	308571
Copeman St	622451	308701
Opie St	623182	308633
Cassella	622392	308844
Golding Pl	622392	308761
St Augustines - Colmans(south end)	622915	309485
St Augustines - top (north end)	622795	309626
OS References for NO2 Diffusion Tubes		
Vulcan Rd	622226	311746
Heartsease	625231	310098
Tombland	623335	308853
Cattlemarket	623290	308394
St Stephens	622847	308025
Ipswich Rd	622546	307504
Earlham Rd	619120	308259
Colman Rd	621084	308519
Unthank Rd	622003	308112
Johnstone Pl	622460	308444
Chapelfield	622596	308238
Castlemeadow	623155	308604
Guildhall	622931	308560
Exchange St	623000	308714
St Georges	623085	308895
St Augustines	622818	309582
Ber St	623451	307811

Appendix 2
Traffic Flow Data

CONTENTS

Norwich City AADT traffic flows

			1999 AADT			2005 AADT Low			2005 AADT Ave			2005 AADT High			
Norwich City			AMV	HGV	% HGV	AMV	HGV	% HGV	AMV	HGV	% HGV	AMV	HGV	% HGV	2010 AADT High
A140 Colman Rd	A140	Colman Rd	20889	1323	6.3%	22101	1400	6.3	22936	1453	6.3	23772	1506	6.3	25631
A11 Newmarket Rd	A11	Newmarket Rd	17190	303	1.8%	18187	321	1.8	18875	333	1.8	19562	345	1.8	21092
A1056 Ipswich Rd	A1056	Ipswich Rd	13686	241	1.8%	14480	255	1.8	15027	265	1.8	15575	274	1.8	16793
A147 Grapes Hill	A147	Grapes Hill	34993	779	2.2%	37023	824	2.2	38422	855	2.2	39822	887	2.2	42936
A11 St Stephens Rd	A11	St Stephens Rd	24327	516	2.1%	25738	546	2.1	26711	567	2.1	27684	587	2.1	29849
A147 St Crispins Rd	A147	St Crispins Rd	29228	537	1.8%	30923	568	1.8	32092	590	1.8	33261	611	1.8	35863
A147 Barn Rd	A147	Barn Rd	35338	598	1.7%	37388	633	1.7	38801	657	1.7	40215	681	1.7	43360
A147 Barrack St	A147	Barrack St	24003	462	1.9%	25395	489	1.9	26355	507	1.9	27315	526	1.9	29452
A1067 Pitt Street	A1067	Pitt Street	17303	282	1.6%	18307	298	1.6	18999	310	1.6	19691	321	1.6	21231
A140 Boundary Rd	A140	Boundary Rd	24039	1806	7.5%	25433	1911	7.5	26395	1983	7.5	27356	2055	7.5	29496

2004 DMRB Predictions

Receptor	Link no	Distance from link centre to receptor (m)	Traffic flow & speed		Traffic composition		Background concentrations						Total concentrations						
			AADT (combined, veh/day)	Annual average speed (km/h)	Road type (A,B)	Total % HDV	CO (mg/m3)	Benzene (mg/m3)	1,3-butadiene (mg/m3)	NOx (mg/m3)	NO2 (mg/m3)	PM10 (mg/m3)	CO (mg/m3)	Benzene (mg/m3)	1,3-butadiene (mg/m3)	NOx (mg/m3)	NO2 (mg/m3)	PM10 (mg/m3)	Number of PM10 exceedences
39	**A140 Colman Rd**	**9.3**	**23771.68**	**20**	**A**	**6.3**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.63	1.05	0.63	97.5	38.9	29.0	24
40	**A11 Newmarket Rd**	**2**	**19562.22**	**20**	**A**	**1.8**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.64	1.05	0.49	77.3	34.9	26.8	17
41	**A1056 Ipswich Rd**	**2**	**15574.67**	**20**	**A**	**1.8**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.62	0.98	0.44	74.9	34.5	26.4	16
42	**A147 Grapes Hill**	**2**	**39822.03**	**20**	**A**	**2.2**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.73	1.39	0.77	89.3	37.3	28.6	23
43	**A11 St Stephens Rd**	**2**	**27684.13**	**20**	**A**	**2.1**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.68	1.18	0.61	83.4	36.2	27.7	20
44	**A147 St Crispins Rd**	**2**	**33261.46**	**20**	**A**	**1.8**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.71	1.28	0.67	84.1	36.3	27.9	20
45	**A147 Barn Rd**	**25**	**40214.64**	**20**	**A**	**1.7**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.58	1.10	0.53	70.3	33.5	25.6	14
46	**A147 Barrack St**	**2**	**27315.41**	**20**	**A**	**1.9**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.68	1.18	0.60	82.1	35.9	27.5	19
47	**A1067 Pitt Street**	**2**	**19690.81**	**20**	**A**	**1.6**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.65	1.05	0.49	76.7	34.8	26.7	17
48	**A140 Boundary**	**2**	**27356.38**	**20**	**A**	**7.5**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.69	1.16	0.79	114.6	41.9	31.2	32

	Rd																		
49	St Augustines	**4.3**	**23088**	**25**	**A**	**3.9**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.61	1.03	0.53	85.8	36.7	27.5	19
50	castle meadow	**2**	**10433**	**25**	**A**	**6**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.52	0.86	0.41	78.1	35.1	26.1	15
51	Dereham rd/Norwich rd	**10**	**38283**	**25**	**A**	**6**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.63	1.18	0.75	100.0	39.4	29.1	24
52	farmers avenue	**10**	**12792**	**5**	**A**	**6**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.93	1.19	0.77	107.8	40.7	32.2	36
53	cattle market	**10**	**28704**	**20**	**A**	**6**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.65	1.12	0.69	98.5	39.1	29.2	25
54	red lion	**4.5**	**13104**	**20**	**A**	**6**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.58	0.92	0.47	86.4	36.8	27.5	19
55	A140 Colman Rd	**15**	**23772**	**20**	**A**	**6**	0.378308	0.716784	0.25	50.176	28.6443	22.3							
55	Newmarket road	**32**	**19562**	**20**	**A**	**6**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.72	1.16	0.73	111.7	41.4	31.1	32
56	red lion	**17**	**11768.5**	**20**	**A**	**6**	0.378308	0.716784	0.25	50.176	28.6443	22.3							
56	farmers avenue	**6**	**12792**	**20**	**A**	**6**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.71	1.05	0.61	109.2	41.0	30.7	30
57	A140 Colman Rd	**12**	**23772**	**20**	**A**	**6.3**	0.378308	0.716784	0.25	50.176	28.6443	22.3							
57	cross road (unthank rd)	**10**	**5000**	**20**	**A**	**6.3**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.76	1.10	0.68	120.8	42.9	32.3	37
58	A147 Barn Rd	**10**	**40214.64**	**20**	**A**	**1.7**	0.378308	0.716784	0.25	50.176	28.6443	22.3							
58	Junction with Dereham rd	**13**	**5000**	**20**	**A**	**5**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.83	1.36	0.74	98.4	39.1	30.1	28
59	A147 Barn Rd	**25**	**40214.64**	**20**	**A**	**1.7**	0.378308	0.716784	0.25	50.176	28.6443	22.3							
59	Chapel Rd Roundabout	**25**	**5000**	**20**	**A**	**5**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.70	1.15	0.58	84.4	36.4	27.8	20
60	St Stephens	**13**	**15000**	**15**	**A**	**5**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.62	0.95	0.49	84.7	36.5	27.5	19
61	A147 King Street	**10**	**33312**	**25**	**A**	**5**	0.378308	0.716784	0.25	50.176	28.6443	22.3							
61	Rouen Rd	**10**	**7152**	**25**	**A**	**3**	0.378308	0.716784	0.25	50.176	28.6443	22.3	0.77	1.21	0.73	116.9	42.3	31.8	34

2005 DMRB Predictions

Receptor		Distance from link centre to receptor (m)	Traffic flow & speed		Traffic composition		Background concentrations						Total concentrations						
			AADT (combined, veh/day)	Annual average speed (km/h)	Road type (A,B)		CO (mg/m3)	Benzene (mg/m3)	1,3-butadiene (mg/m3)	NOx (mg/m3)	NO2 (mg/m3)	PM10 (mg/m3)	CO (mg/m3)	Benzene (mg/m3)	1,3-butadiene (mg/m3)	NOx (mg/m3)	NO2 (mg/m3)	PM10 (mg/m3)	Number of PM10 exceedences
	Link no					Total % HDV													
39	**A140 Colman Rd**	**9.3**	**23771.68**	**20**	**A**	**6.3**	0.378308	0.677544	0.25	48	27.8	22.10404	0.60	0.97	0.58	92.6	37.6	28.4	22
40	**A11 Newmarket Rd**	**2**	**19562.22**	**20**	**A**	**1.8**	0.378308	0.677544	0.25	48	27.8	22.10404	0.61	0.96	0.45	73.3	33.8	26.2	16
41	**A1056 Ipswich Rd**	**2**	**15574.67**	**20**	**A**	**1.8**	0.378308	0.677544	0.25	48	27.8	22.10404	0.59	0.90	0.41	71.1	33.3	25.9	15
42	**A147 Grapes Hill**	**2**	**39822.03**	**20**	**A**	**2.2**	0.378308	0.677544	0.25	48	27.8	22.10404	0.68	1.25	0.69	84.6	36.1	27.9	20
43	**A11 St Stephens Rd**	**2**	**27684.13**	**20**	**A**	**2.1**	0.378308	0.677544	0.25	48	27.8	22.10404	0.64	1.08	0.55	79.1	35.0	27.1	18
44	**A147 St Crispins Rd**	**2**	**33261.46**	**20**	**A**	**1.8**	0.378308	0.677544	0.25	48	27.8	22.10404	0.66	1.16	0.60	79.7	35.1	27.3	18
45	**A147 Barn Rd**	**25**	**40214.64**	**20**	**A**	**1.7**	0.378308	0.677544	0.25	48	27.8	22.10404	0.55	1.01	0.49	66.8	32.4	25.2	13
46	**A147 Barrack St**	**2**	**27315.41**	**20**	**A**	**1.9**	0.378308	0.677544	0.25	48	27.8	22.10404	0.64	1.07	0.54	77.8	34.7	26.9	17
47	**A1067 Pitt Street**	**2**	**19690.81**	**20**	**A**	**1.6**	0.378308	0.677544	0.25	48	27.8	22.10404	0.61	0.96	0.45	72.7	33.7	26.2	15
48	**A140 Boundary Rd**	**2**	**27356.38**	**20**	**A**	**7.5**	0.378308	0.677544	0.25	48	27.8	22.10404	0.65	1.06	0.72	108.7	**40.5**	30.5	29
49	St Augustines	**4.3**	**23088**	**25**	**A**	**3.9**	0.378308	0.677544	0.25	48	27.8	22.10404	0.58	0.95	0.49	81.4	35.5	26.9	17
50	castle meadow	**2**	**10433**	**25**	**A**	**6**	0.378308	0.677544	0.25	48	27.8	22.10404	0.50	0.80	0.39	74.3	34.0	25.7	14
51	Dereham rd/Norwich rd	**10**	**38283**	**25**	**A**	**6**	0.378308	0.677544	0.25	48	27.8	22.10404	0.60	1.07	0.68	94.9	38.0	28.5	22

52	farmers avenue	**10**	**12792**	**5**	**A**	**6**	0.378308	0.677544	0.25	48	27.8	22.10404	0.86	1.10	0.70	102.2	39.4	31.1	32
53	cattle market	**10**	**28704**	**20**	**A**	**6**	0.378308	0.677544	0.25	48	27.8	22.10404	0.61	1.02	0.63	93.6	37.8	28.5	22
54	red lion	**4.5**	**13104**	**20**	**A**	**6**	0.378308	0.677544	0.25	48	27.8	22.10404	0.55	0.85	0.44	82.2	35.6	26.9	17
55	A140 Colman Rd	**15**	**23772**	**20**	**A**	**6**	0.378308	0.677544	0.25	48	27.8	22.10404							
55	Newmarket road	**32**	**19562**	**20**	**A**	**6**	0.378308	0.677544	0.25	48	27.8	22.10404	0.67	1.05	0.67	106.0	**40.0**	30.3	29
56	red lion	**17**	**11768.5**	**20**	**A**	**6**	0.378308	0.677544	0.25	48	27.8	22.10404							
56	farmers avenue	**6**	**12792**	**20**	**A**	**6**	0.378308	0.677544	0.25	48	27.8	22.10404	0.66	0.96	0.56	103.6	39.6	30.0	27
57	A140 Colman Rd	**12**	**23772**	**20**	**A**	**6.3**	0.378308	0.677544	0.25	48	27.8	22.10404							
57	cross road (unthank rd)	**10**	**5000**	**20**	**A**	**6.3**	0.378308	0.677544	0.25	48	27.8	22.10404	0.71	1.01	0.62	114.6	**41.5**	31.5	33
58	A147 Barn Rd	**10**	**40214.64**	**20**	**A**	**1.7**	0.378308	0.677544	0.25	48	27.8	22.10404							
58	Junction with Dereham rd	**13**	**5000**	**20**	**A**	**5**	0.378308	0.677544	0.25	48	27.8	22.10404	0.77	1.23	0.66	93.1	37.7	29.4	25
59	A147 Barn Rd	**25**	**40214.64**	**20**	**A**	**1.7**	0.378308	0.677544	0.25	48	27.8	22.10404							
59	Chapel Rd Roundabout	**25**	**5000**	**20**	**A**	**5**	0.378308	0.677544	0.25	48	27.8	22.10404	0.65	1.05	0.53	80.1	35.2	27.3	18
60	St Stephens	**13**	**15000**	**15**	**A**	**5**	0.378308	0.677544	0.25	48	27.8	22.10404	0.58	0.88	0.46	80.5	35.3	27.0	18
61	A147 King Street	**10**	**33312**	**25**	**A**	**5**	0.378308	0.677544	0.25	48	27.8	22.10404							
61	Rouen Rd	**10**	**7152**	**25**	**A**	**3**	0.378308	0.677544	0.25	48	27.8	22.10404	0.72	1.10	0.66	110.7	**40.8**	31.0	31

2010 DMRB Predictions

Receptor		Distance from link centre to receptor (m)	Traffic flow & speed		Traffic composition		Background concentrations						Total concentrations						
			AADT (combined, veh/day)	Annual average speed (km/h)	Road type (A,B)		CO (mg/m3)	Benzene (mg/m3)	1,3-butadiene (mg/m3)	NOx (mg/m3)	NO2 (mg/m3)	PM10 (mg/m3)	CO (mg/m3)	Benzene (mg/m3)	1,3-butadiene (mg/m3)	NOx (mg/m3)	NO2 (mg/m3)	PM10 (mg/m3)	Number of PM10 exceedences
	Link no																		
						Total % HDV													
39	**A140 Colman Rd**	**9.3**	**25630.8**	**20**	**A**	**6.3**	0.378308	0.592	0.25	38.7	23.9	20.4	0.54	0.81	0.49	69.2	31.2	24.0	10
40	**A11 Newmarket Rd**	**2**	**21092.13**	**20**	**A**	**1.8**	0.378308	0.592	0.25	38.7	23.9	20.4	0.55	0.81	0.39	56.2	28.3	23.0	8
41	**A1056 Ipswich Rd**	**2**	**16792.72**	**20**	**A**	**1.8**	0.378308	0.592	0.25	38.7	23.9	20.4	0.53	0.76	0.36	54.6	28.0	22.8	8
42	**A147 Grapes Hill**	**2**	**42936.41**	**20**	**A**	**2.2**	0.378308	0.592	0.25	38.7	23.9	20.4	0.60	1.03	0.56	63.9	30.1	24.0	10
43	**A11 St Stephens Rd**	**2**	**29849.23**	**20**	**A**	**2.1**	0.378308	0.592	0.25	38.7	23.9	20.4	0.57	0.90	0.46	60.1	29.2	23.5	9
44	**A147 St Crispins Rd**	**2**	**35862.76**	**20**	**A**	**1.8**	0.378308	0.592	0.25	38.7	23.9	20.4	0.59	0.96	0.49	60.6	29.3	23.7	9
45	**A147 Barn Rd**	**25**	**43359.73**	**20**	**A**	**1.7**	0.378308	0.592	0.25	38.7	23.9	20.4	0.51	0.84	0.41	51.7	27.3	22.4	7
46	**A147 Barrack St**	**2**	**29451.68**	**20**	**A**	**1.9**	0.378308	0.592	0.25	38.7	23.9	20.4	0.57	0.89	0.45	59.2	29.1	23.4	9
47	**A1067 Pitt Street**	**2**	**21230.78**	**20**	**A**	**1.6**	0.378308	0.592	0.25	38.7	23.9	20.4	0.55	0.81	0.39	55.8	28.2	23.0	8
48	**A140 Boundary Rd**	**2**	**29495.85**	**20**	**A**	**7.5**	0.378308	0.592	0.25	38.7	23.9	20.4	0.58	0.88	0.60	80.2	33.5	25.2	13
49	St Augustines	**4.3**	**24893.65**	**25**	**A**	**3.9**	0.378308	0.592	0.25	38.7	23.9	20.4	0.52	0.80	0.42	61.7	29.6	23.3	9
50	castle meadow	**2**	**11248.94**	**25**	**A**	**6**	0.378308	0.592	0.25	38.7	23.9	20.4	0.47	0.69	0.35	57.6	28.7	22.6	7
51	Dereham rd/Norwich rd	**10**	**41277.01**	**25**	**A**	**6**	0.378308	0.592	0.25	38.7	23.9	20.4	0.54	0.90	0.57	70.9	31.6	24.2	11
52	farmers avenue	**10**	**13792.43**	**5**	**A**	**6**	0.378	0.592	0.25	38.7	23.9	20.4	0.73	0.92	0.58	76.6	32.7	25.4	13

							308												
53	cattle market	**10**	**30948.86**	**20**	**A**	**6**	0.378308	0.592	0.25	38.7	23.9	20.4	0.55	0.85	0.53	69.9	31.4	24.2	10
54	red lion	**4.5**	**14128.83**	**20**	**A**	**6**	0.378308	0.592	0.25	38.7	23.9	20.4	0.51	0.72	0.39	63.2	29.9	23.4	9
55	A140 Colman Rd	**15**	**25631.15**	**20**	**A**	**6**	0.378308	0.592	0.25	38.7	23.9	20.4							
55	Newmarket road	**32**	**21091.89**	**20**	**A**	**6**	0.378308	0.592	0.25	38.7	23.9	20.4	0.60	0.88	0.55	78.4	33.1	25.2	13
56	red lion	**17**	**12688.88**	**20**	**A**	**6**	0.378308	0.592	0.25	38.7	23.9	20.4							
56	farmers avenue	**6**	**13792.43**	**20**	**A**	**6**	0.378308	0.592	0.25	38.7	23.9	20.4	0.60	0.81	0.48	78.5	33.1	25.2	13
57	A140 Colman Rd	**12**	**25631.15**	**20**	**A**	**6.3**	0.378308	0.592	0.25	38.7	23.9	20.4							
57	cross road (unthank rd)	**10**	**5391.037**	**20**	**A**	**6.3**	0.378308	0.592	0.25	38.7	23.9	20.4	0.63	0.84	0.52	86.4	34.6	26.1	15
58	A147 Barn Rd	**10**	**43359.73**	**20**	**A**	**1.7**	0.378308	0.592	0.25	38.7	23.9	20.4							
58	Junction with Dereham rd	**13**	**5391.037**	**20**	**A**	**5**	0.378308	0.592	0.25	38.7	23.9	20.4	0.66	1.01	0.54	69.8	31.3	25.0	12
59	A147 Barn Rd	**25**	**43359.73**	**20**	**A**	**1.7**	0.378308	0.592	0.25	38.7	23.9	20.4							
59	Chapel Rd Roundabout	**25**	**5391.037**	**20**	**A**	**5**	0.378308	0.592	0.25	38.7	23.9	20.4	0.58	0.87	0.44	60.8	29.4	23.6	9
60	St Stephens	**13**	**16173.11**	**15**	**A**	**5**	0.378308	0.592	0.25	38.7	23.9	20.4	0.53	0.74	0.40	60.9	29.4	23.2	9
61	A147 King Street	**10**	**35917.24**	**25**	**A**	**5**	0.378308	0.592	0.25	38.7	23.9	20.4							
61	Rouen Rd	**10**	**7711.339**	**25**	**A**	**3**	0.378308	0.592	0.25	38.7	23.9	20.4	0.63	0.92	0.55	81.8	33.8	25.7	14

Appendix 3
Part B Authorised processes list

CONTENTS

NORWICH CITY COUNCIL PART B AUTHORISATIONS HELD.
A= AUTHORISED, R= REVOKED, W= WORKING ON, C= CLOSED

REFERENCE		APPLICANT	ADDRESS	GRID REF EASTING	GRID REF NORTHING	AUTH DATE	DATE PROCESS CEASED	PROCESS
EPA91/11/B1	A	A WILLIAMS ABBEY LANE GARAGE	1-4 ABBEY LANE KING STREET NORWICH	623652	308108	17-Mar-92	31-Mar-03	W/ OIL BURNER <0.4 MW NET RATED THERMAL INPUT.
EPA91/13/B1	A	REVELL POTTERGATE MOTORS	DRAYTON ROAD NORWICH	622178	310177	17-Mar-92		W/ OIL BURNER <0.4 MW NET RATED THERMAL INPUT.
EPA91/15/B1	A	YOUNGS DOORS LTD	CITY ROAD WORKS NORWICH	623468	307559	22-Oct-92		TIMBER TREATMENT >500M2/YR
EPA91/3/B1	A	CITY OF NORWICH CREMOTORIA	EARLHAM ROAD NORWICH	621199	308858	01-Oct-92		THE INCINERATION OF HUMAN REMAINS
EPA91/5/B1	A	JR DAIN TRANSMISSIONS	45 WHIFFLER ROAD NORWICH	621017	310944	17-Mar-92		W/ OIL BURNER <0.4 MW NET RATED THERMAL INPUT.
EPA91/6/B1	A	B ROWLAND	ABBEY LANE KING STREET NORWICH	623641	308135	17-Mar-92		W/ OIL BURNER <0.4 MW NET RATED THERMAL INPUT.
EPA92/11/B3	R	HOLDEN GROUP BODY REPAIR CENTRE	4-6 WHIFFLER ROAD NORWICH	621133	310782	20-Jul-94		RESPRAYING OF ROAD VEHICLES >2T VOC.
EPA92/12/B3	R	R ROBINSONS & CO (MOTOR SERVICES) LTD	HEIGHAM CAUSEWAY HEIGHAM STREET NORWICH	622358	301374	20-Aug-96	01-Aug-01	RESPRAYING OF ROAD VEHICLES >2T VOC.
EPA92/13/B3	R	MANN EGERTON & CO LTD	VULCAN ROAD NORTH NORWICH	622174	312221	28-Jul-94		RESPRAYING OF ROAD VEHICLES >2T VOC.
EPA92/18/B3	A	DESIRA BODY CENTRE	WHITING ROAD NORWICH	622934	306147	28-Jul-94		RESPRAYING OF ROAD VEHICLES >2T VOC.
EPA92/2/B2	A	ANGLIA LEAD LTD	49 BARKER STREET NORWICH	622260	309698	31-Mar-93		FOUNDRY PROCESS FOR THE MELTING AND RECASTING OF LEAD
EPA92/3/B2	A	READICRETE LTD	1 THORPE ROAD NORWICH	623615	308212	11-Mar-93		BLENDING, LOADING AND USE OF BULK CEMENT INC. THE BATCHING OF READY-MIXED CONCRETE
EPA92/5/B2	A	REDLAND AGGREGATES LTD	OLD STATION ROAD TROWSE	624442	307220	18-Jan-93		QUARRY PROCESS: ROADSTONE PLANT
EPA92/5/B3	A	START RITE SHOES LTD	CROME ROAD NORWICH	623673	310079	28-Feb-94		ADHESIVE COATING PROCESS
EPA92/6/B2	R	LC JAY & SON LTD	19/21 OAK STREET NORWICH	622754	309027	12-Jul-93	31-Mar-03	FOUNDRY PROCESS

EPA92/6/B3	A	LAURENCE SCOTT & ELECTROMOTORS LTD	PO BOX 25 KERRISON ROAD NORWICH	624449	307816	22-Mar-94		COATING OF METAL AND PLASTIC
EPA92/7/B3	A	RR FLEXO LTD	8-10 CONCORDE ROAD NORWICH	622407	312030	12-May-94		COATING OF FLEXIBLE PACKAGING - FLEXOGRAPHIC PRINTING
EPA92/8/B3	A	JARROLD PRINTING	WHITEFRIARS NORWICH	623478	309313	19-Apr-94		COATING PROCESS - THE APPLICATION OF PRINTING INK TO PAPER
EPA92/9/B3	A	BUSSEYS LTD	TOWER HOUSE 24 WHIFFLER ROAD NORWICH	621138	310869	28-Jul-94		RESPRAYING OF ROAD VEHICLES >2T VOC.
EPA95/24/B3	A	DIAMOND H CONTROLS	VULCAN ROAD NORTH NORWICH	622065	312193	22-Jan-97		COATING PROCESS - NITRIC ACID
EPA95/27/B3	A	A & W CUSHION LTD	ST BENEDICTS SAWMILLS BARN ROAD NORWICH	622434	309031	20-Jan-97		MANUFACTURE OR TIMBER PRODUCTS &CHEMICAL TREATMENT OF TIMBER
EPA97/1	A	NATIONAL C.R. CENTRES LTD	1A FIFERS LANE NORWICH	621842	312550	18-Oct-00		RESPRAYING OF ROAD VEHICLES >1T VOC.
EPA97/2	A	J SAINSBURY	QUEENS ROAD NORWICH	623232	307758			UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA97/3	W	SPRAYAVIA INTERNATIONAL	NORWICH AIRPORT	621842	312987			RESPRAYING OF AIRCRAFT
EPA98/1	A	Q8 NORWICH SOUTH	BARRETT ROAD	622928	306490			UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA98/13	A	SHELL	IPSWICH ROAD	622232	306465			UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA98/16	A	CASTLE SERVICE STATION	ROSE LANE	623434	308511			UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA98/17	A	RING ROAD SERVICE STATION	MILE CROSS LANE	622290	311720			UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA98/18	A	SHELL	SWEET BRIAR ROAD	620697	310803			UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA98/2	R	SAVE SERVICE STATION	58-62 DEREHAM ROAD	622223	308929		31-Mar-03	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA98/21	A	MOUSEHOLD SERVICE STATION	MOUSEHOLD LANE	624387	310782			UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA98/22	A	BLACK ARROW SERVICE STATION	AYLSHAM ROAD	622430	310071			UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA98/23	R	FIVEWAYS GARAGE	EARLHAM ROAD	619894	308434		31-Mar-03	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA98/25	A	BROADSIDE FILLING STATION	174 AYLSHAM ROAD	622092	310648			UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA98/27	A	SHELL ARLINGTON SERVICE STATION	84 UNTHANK ROAD	622008	308093			UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS

EPA98/33	A	Q8	MARTINEAU LANE	624052	306813		UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA98/4	A	ST BENEDICTS FILLING STATION	9 DEREHAM ROAD	622340	308928		UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA98/41	A	HARTWELL NORWICH	295 AYLSHAM ROAD NORWICH NR3 2RY	622053	310904		RESPRAYING OF ROAD VEHICLES >1T VOC.
EPA98/8	A	SHELL	PLUMSTEAD ROAD	625065	309467		UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA99/01	A	ATLAS AGGREGATES	GUARDIAN ROAD			12-Jan-00	MOBILE CRUSHING PLANT
EPA99/01	A	MORRISONS	ALBION WAY	624060	308054		UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA99/02	A	ATLAS AGGREGATES	GUARDIAN ROAD			12-Jan-00	MOBILE CRUSHING PLANT
EPA99/03/B2	A	NVWC	DENMARK HOUSE JUPITER ROAD	622724	313511	01-Apr-00	RESPRAYING OF ROAD VEHICLES >1T VOC.
EPA2000/01	A	LIND	BESSEMER ROAD	622809	305865	18-May-00	RESPRAYING OF ROAD VEHICLES >1T VOC.
EPA2000/02	T	HEATRAE SAUDIA	HURRICANE WAY	621869	312690	07-Dec-00	PICKLING PLANT, APPLIED FOR TIVIALITY
EPA2000/03	A	CONSTITUTION MOTORS	CONSTITUTION HILL	623347	310819	20-Nov-00	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA2000/04	A	EATON RISE SERVICE STATION	IPSWICH ROAD	622089	305704	20-Feb-01	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA2000/05	A	NATIONWIDE	HALL ROAD	622252	305296	07-Feb-01	RESPRAYING OF ROAD VEHICLES >1T VOC.
EPA2000/06	A	NORWICH AUTO CENTRE	BESSEMER ROAD	622747	305881	27-Feb-01	W/ OIL BURNER <0.4 MW NET RATED THERMAL INPUT.
EPA2000/07	W	TRINITY GARAGE	CAMBRIDGE STREET	621978	308028	26-Mar-01	W/ OIL BURNER <0.4 MW NET RATED THERMAL INPUT.
EPA2000/08	A	BELVOIR GARAGE	BELVOIR STREET	621510	308656	01-Mar-01	W/ OIL BURNER <0.4 MW NET RATED THERMAL INPUT.
EPA2001/01/B3	A	ROBINISONS	BARKER STREET	622366	309331	23-Feb-01	RESPRAYING OF ROAD VEHICLES >1T VOC.
EPA2002/01/B3	A	SOLUS	WHIFFLER ROAD	621133	310782	1.11.02	RESPRAYING OF ROAD VEHICLES >1T VOC.
EPA2002/02/	A	BP SAFEWAY PARTNERSHIP	FIVE WAYS EARLHAM ROAD	619894	308434	20.3.03	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA 98/9	W	GREENWAYS GARAGE (NCH) LTD	GREENWAYS EATON	620502	306026		UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA 98/5	C	INNERLINK MOTOR CO	126-128 BARRACK STREET				UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS

EPA 98/6	C	KEYWAY	420 DEREHAM ROAD		By 31/12/99	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA 98/7	C	NORWICH SERVICE STATION	DEREHAM ROAD		By 31/12/99	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA 98/10	C	BUSSEY AND SABBERTON	WHIFFLER ROAD		By 31/12/99	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA 98/11	C	EATON RISE SERVICE STATION	IPSWICH ROAD	Authorised above under new reference	By 31/12/99	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA 98/12	C	DONALD UTTING AND SON LTD	2 GOLDSMITH STREET		By 31/12/99	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA 98/14	C	R ROBINSON AND CO LTD	HEIGHAM STREET		By 31/12/99	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA 98/15	C	CONSTITUTION MOTORS	142 CONSTITUTION HILL	Authorised above under new reference	By 31/12/99	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA 98/19	C	DOLPHIN AUTOS LTD	193 NELSON STREET		By 31/12/99	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA 98/20	C	QUEENS ROAD SERVICE STATION	QUEENS ROAD		By 31/12/99	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA 98/24	C	AIRWAYS SERVICE STATION	FIFERS LANE		By 31/12/99	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA 98/29	C	BUSSEY AND SABBERTON LTD	THORPE ROAD		By 31/12/99	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA 98/30	C	PHOENIX	BRACONDALE		By 31/12/99	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA 98/32	C	TEAM SPIRIT	SPROWSTON ROAD		By 31/12/99	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA/92/1/B2	N/A	THE BUILDERS DIRECT SUUPPLY CO LTD	MASON ROAD NORWICH		By 31/12/99	BLENDING , PACKING AND LOADING OF CEMENT -
EPA91/1/B2	N/A	RUGBY CEMENT (NORWICH DEPOT)	RIVERSIDE NORWICH		By 31/12/99	BLENDING, LOADING AND USE OF BULK CEMENT INC. THE BATCHING OF READY-MIXED CONCRETE
EPA91/12/B1	N/A	J TUNMORE	43 HURRICANE WAY NORWICH		By 31/12/99	W/ OIL BURNER <0.4 MW NET RATED THERMAL INPUT.
EPA91/16/B1	N/A	RHONE POULENC	SWEET BRIAR ROAD NORWICH		By 31/12/99	COMBUSTION PROCESS
EPA91/2/B2	N/A	DIAMOND H CONTROLS	VULCAN ROAD NORTH NORWICH		By 31/12/99	ZINC DI-CASTING
EPA91/7/B1	N/A	PW TURNER	7 UNICORN YARD OAK STREET NORWICH		By 31/12/99	W/ OIL BURNER <0.4 MW NET RATED THERMAL INPUT.

EPA91/8/B1	N/A	J KNIGHTS	NORMAN BUILDINGS ROUEN ROAD NORWICH		By 31/12/99	W/ OIL BURNER <0.4 MW NET RATED THERMAL INPUT.
EPA91/9/B1	N/A	SC STONE	BELVOIR GARAGE 1A BELVOIR STREET NORWICH		By 31/12/99	W/ OIL BURNER <0.4 MW NET RATED THERMAL INPUT.
EPA92/16/B3	N/A	TRIMOCO LTD (DELVES)	295 AYLSHAM ROAD NORWICH		By 31/12/99	RESPRAYING OF ROAD VEHICLES >2T VOC.
EPA92/19/B3	N/A	EAST ANGLIAN MOTOR & SHEET METAL CO LTD	GARDEN STREET NORWICH		By 31/12/99	RESPRAYING OF ROAD VEHICLES >2T VOC.
EPA92/2/B3	N/A	BEAVER ENGINEERING GROUP PLC	BARNARD ROAD BOWTHORPE NORWICH		By 31/12/99	PAINT SPRAYING PROCESS > 5 T VOC
EPA92/4/B3	N/A	NORWICH COACH WORKS	BURTON ROAD NORWICH		By 31/12/99	RESPRAYING OF ROAD VEHICLES.
EPA94/21/B3	N/A	EAST ANGLIAN MOTOR & SHEET METAL CO LTD	GARDEN STREET NORWICH		By 31/12/99	RESPRAYING OF ROAD VEHICLES >1T VOC.
EPA95/22/B3	N/A	HENLYS OF NORWICH	78 MILE CROSS LANE NORWICH		By 31/12/99	RESPRAYING OF ROAD VEHICLES >1T VOC.
EPA95/25/B3	N/A	ANC BODY CENTRE	VULCAN ROAD SOUTH NORWICH		By 31/12/99	RESPRAYING OF ROAD VEHICLES >1T VOC.
EPA95/26/B3	N/A	NORWICH CITY COUNCIL CITY WORKS	MILE CROSS ROAD NORWICH		By 31/12/99	CHEMICAL TREATMENT OF TIMBER
		Revoked / Lapsed / Trivial / Closed / Withdrawn				
EPA91/1/B1	R	WEST NORWICH HOSPITAL	BOWTHORPE ROAD NORWICH	02-Feb-93	By 31/12/99	CLINICAL WASTE INCINERATOR <1 TONNE/HR.
EPA91/10/B1	R	D SLAUGHTER	125 OAK STREET NORWICH	17-Mar-92	By 31/12/99	W/ OIL BURNER <0.4 MW NET RATED THERMAL INPUT.
EPA91/14/B1	R	ANGLIAN WINDOWS	FIFERS LANE NORWICH	30-Nov-92	By 31/12/99	TIMBER TREATMENT >500M2/YR.
EPA91/2/B1	R	MALDON TIMBER	SWEET BRIAR IND ESTATE NORWICH	27-Mar-92	By 31/12/99	TIMBER TREATMENT >500M2/YR.
EPA91/4/B1	R	J WALES ALPHA SHOP	UNIT 1 BEECH DRIVE MILE CROSS NORWICH	17-Mar-92	By 31/12/99	W/ OIL BURNER <0.4 MW NET RATED THERMAL INPUT.
EPA92/1/B3	R	FLORIDA SHOE FACTORY (NORWICH) LTD	DIBDEN ROAD NORWICH	30-Mar-94	By 31/12/99	ADHESIVE COATING PROCESS
EPA92/14/B3	R	HEATRAE SADIA HEATING LTD	HURRICANE WAY NORWICH	06-Oct-94	By 31/12/99	DI-ISOCYANATE PROCESS
EPA92/15/B3	R	HARTWELL NORWICH	MOUNTERGATE NORWICH	14-Sep-94	By 31/12/99	RESPRAYING OF ROAD VEHICLES >2T VOC.
EPA92/4/B2	R	ASBESTOS CEMENT DISTRIBUTORS	88 DRAYTON ROAD NORWICH	10-Jan-94	By 31/12/99	THE INDUSTRIAL FINISHING OF ANY ASBESTOS PRODUCT.
EPA93/17/B1	R	PR BULLARD 'PETES MOTORS'	BARN ROAD NORWICH	16-Jul-93	By 31/12/99	W/ OIL BURNER <0.4 MW NET RATED THERMAL INPUT.
EPA93/20/	R	START-RITE SHOES	CROME ROAD NORWICH	22-	By	DI-ISOCYANATE PROCESS

B3				Aug-94 31/12/99	
EPA93/8/B 2	R	READY MIXED CONCRETE (UK) LTD	c/o ATLAS AGG. LTD GUARDIAN ROAD NORWICH	17- May-94 By 31/12/99	MOBILE CONCRETE CRUSHING PLANT
EPA95/23/ B3	R	LIND OF NORWICH LTD	120 BER STREET NORWICH	By 31/12/99	RESPRAYING OF ROAD VEHICLES >1T VOC.
EPA98/26	R	OAKSTEAD SERVICE STATION	240 DEREHAM ROAD	By 31/12/99	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA98/28	R	OAKSTEAD SERVICE STATION	86 DRAYTON ROAD	By 31/12/99	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA98/31	R	SAINSBURYS	BOWTHORPE	14- Feb-99 By 31/12/99	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS
EPA92/17/ B3	R	LEX FORD NORWICH	591 HALL ROAD NORWICH	14- Dec-94 By 31/12/99	RESPRAYING OF ROAD VEHICLES >2T VOC.
EPA91/3/B 2	L	HEATRAE SADIA HEATING LTD	HURRICANE WAY NORWICH	25- Mar-94 By 31/12/99	METAL DECONTAMINATION. AUTOMATICALLY
EPA92/7/B 2	L	BRITISH ELECTRICAL REPAIRS LTD (B.E.R.L.)	LANSDOWNE ROAD FIFERS LANE NORWICH	19- Nov-93 By 31/12/99	THE DECONTAMINATION OF METAL.
EPA 98/42	W	CONSTITUTION MOTORS	142 CONSTITUTION HILL NORWICH	01- Feb-99 By 31/12/99	W/ OIL BURNER <0.4 MW NET RATED THERMAL INPUT.
EPA92/3/B 3	C	EATON INTERNATIONAL LTD.	HALL ROAD NORWICH	16- May-94 By 31/12/99	ADHESIVE COATING PROCESS
EPA 98/3	A	MANCROFT SERVICE STATION	84-108 BER STREET	By 31/12/99	UNLOADING OF PETROL INTO STORAGE AT SERVICE STATIONS

Appendix 4
Descriptions of selected models and tools

CONTENTS

Design Manual for Roads and Bridges (DMRB) - This screening method was formulated by the Highways Agency. The method gives a preliminary indication of air quality near roads. It is a simple procedure based on a tabulated input interface, which produces an estimate of concentrations at receptor locations defined by the user.

The DMRB method requires information on vehicle flow, HGV mix, vehicle speed and receptor-road distances. It contains a useful database of vehicular emission factors for future years. All the relevant AQS pollutants can be estimated.
More details of the model can be found at:
http://www.highways.gov.uk/contracts/index.htm

Appendix 5
Report Checklist

USA Checklist from http://www.uwe.ac.uk/aqm/review/checklists/usalist.doc

Criteria…	Met?	Report Location
Brief Outcomes of Previous Round summarised?	Ö	In each pollutant chapter and introduction
Which objectives are being taken to a Detailed Assessment?	Ö	Executive summary
		-
Carbon Monoxide		-
A) Monitoring data (New data? No of sites? Equipment/ QA/QC/ Exposure/ Worst case? Projected Exceedences?)	Ö	3.6
B) Very Busy Roads/Junctions (Background? Roads/ junctions? Exposure? Data? Calculations? Exceedences?)	Ö	3.7
CONCLUSION (Detailed assessment? For What?)	Ö	3.8
Benzene		
A) Monitoring data (New data? No of sites? Equipment/ QA/QC/ Exposure/ Worst case? Projected Exceedences?)	Ö	4.6
B) Very Busy Roads/Junctions (Background? Roads/ junctions? Exposure? Data? Calculations? Exceedences?)	Ö	4.7
C) Industrial Sources (Emissions data? Nomogram? Exceedences? Neighbouring authorities?)	Ö	4.8
D) Petrol Stations (Throughput? Busy Road? Exposure?)	Ö	4.9
E) Major fuel storage depots (petrol only) (Emissions? Exposure? Fugitive? Nomogram?)	Ö	4.10
CONCLUSION (Detailed assessment? For what?)	Ö	4.11
1,3-butadiene		
A) Monitoring data (New data? No of sites? Equipment/ QA/QC/ Exposure/ Worst case? Projected Exceedences?)	Ö	5.6
B) New Industrial Sources (Air Quality Assessments? Emissions data? Nomogram? Fugitive? Exceedences? Neighbouring authorities?)	Ö	5.7
C) Industrial Sources with Substantially Increased Emissions (Emissions data? Nomogram? Fugitive? Exceedences? Neighbouring authorities?)	Ö	5.7
CONCLUSION (Detailed assessment? For what?)	Ö	5.8
Lead		
A) Monitoring data (New data? No of sites? Equipment/ QA/QC/ Exposure/ Worst case? Projected Exceedences?)	Ö	6.5
B) New Industrial Sources (Air Quality Assessments? Emissions data? Nomogram? Fugitive? Exceedences? Neighbouring authorities?)	Ö	6.6
C) Industrial Sources with Substantially Increased Emissions (Emissions data? Nomogram? Fugitive? Exceedences? Neighbouring authorities?)	Ö	6.6
CONCLUSION (Detailed assessment? For what?)	Ö	6.7
Nitrogen Dioxide		
A) Monitoring data outside an AQMA (New data? No of sites? Equipment/ QA/QC/ Exposure/ Worst case? Projected Exceedences?)	Ö	7.6
B) Monitoring data inside an AQMA (New data? No of sites? Equipment/ QA/QC/ Exposure/ Worst case? Compliance?)	Ö	7.6

C) Narrow congested streets with residential properties close to the kerb (Background? Roads? Exposure? Data? Calculations? Width? Canyon Factor? Exceedences?)	Ö	7.7.1
D) Junctions (Background? Junctions? Exposure? Data? Calculations? Exceedences?)	Ö	7.7.2
E) Busy streets where people may spend 1hour or more close to traffic (Background? Roads 10 000 vpd? Exposure? Distance 5m or less? Data? Calculations? Exceedences?)	Ö	7.8
F) Roads with a high flow of buses and/or HGVs (Background? Roads >2500 HDV? Exposure? Data? Calculations? Exceedences?)	Ö	7.8
G) New roads constructed or proposed since the first round of R&A (Background? Roads/ junctions? Air Quality Assessments? Exposure? Data? Calculations? Exceedences?)	Ö	7.8
H) Roads close to the objective during the first round of R&A (Roads/ junctions 36-40□g/m3? Exposure?)	Ö	7.8
I) Roads with significantly changed traffic flows (Background? Roads with 25% increase? Exposure? Data? Calculations? Exceedences?)	Ö	7.8
J) Bus stations (>1,000 buses per day? Data? Calculations? Exposure? Exceedences?)	Ö	7.10.1
K) New Industrial Sources (Air Quality Assessments? Emissions data? Nomogram? Fugitive? Exceedences? Neighbouring authorities?)	Ö	7.9
L) Industrial Sources with Substantially Increased Emissions (Emissions data? Nomogram? Fugitive? Exceedences? Neighbouring authorities?)	Ö	7.9
M) Aircraft (Exposure < 1000m from boundary? Passenger throughput > 5mppa?)	Ö	7.10.2
CONCLUSION (Detailed assessment? For what?)	Ö	7.11
Sulphur Dioxide		
A) Monitoring data outside an AQMA (New data? No of sites? Equipment/ QA/QC/ Exposure/ Worst case? Projected Exceedences?)	Ö	8.5
B) Monitoring data inside an AQMA (New data? No of sites? Equipment/ QA/QC/ Exposure/ Worst case? Compliance?)	Ö	8.5
C) New Industrial Sources (Air Quality Assessments? Emissions data? Nomogram? Fugitive? Exceedences? Neighbouring authorities?)	Ö	8.6
D) Industrial Sources with Substantially Increased Emissions (Emissions data? Nomogram? Fugitive? Exceedences? Neighbouring authorities?)	Ö	8.6
E) Areas of Domestic Coal Burning (>100 premises by 0.5 km2?)	Ö	8.7
F) Small Boilers > 5 MW(thermal) (coal / fuel oil burning boilers? Exposure within 500m? Emissions? Nomogram?)	Ö	8.6.1
G) Shipping (Exposure within 1km? > 5000 movements per year?)	Ö	8.8.1
H) Railway Locomotives (stationary diesel locomotives for >15min? Exposure <15m?)	Ö	8.9
CONCLUSION (Detailed assessment? For what?)		
PM10		
A) Monitoring data outside an AQMA (New data? No of sites? Equipment/ Gravimetric/ QA/QC/ Exposure/ Worst case? Projected Exceedences?)	Ö	9.5
B) Monitoring data inside an AQMA (New data? No of sites? Equipment/ Gravimetric/ QA/QC/ Exposure/ Worst case? Compliance?)	Ö	9.5

C) Busy Roads and junctions (Scotland only) (Background? Roads/ junctions? Exposure? Data? Calculations? Exceedences?)	Ö	9.6.1
D) Junctions (Not Scotland) (Background? Junctions? Exposure? Data? Calculations? Exceedences?)	Ö	9.6.2
E) Roads with a high flow of buses and/or HGVs (Background? Roads >20% HDV? Exposure? Data? Calculations? Exceedences?)	Ö	9.6.3
F) New roads constructed or proposed since the first round of R&A (Background? Roads/ junctions? Air Quality Assessments? Exposure? Data? Calculations? Exceedences?)	Ö	9.6.3
G) Roads close to the objective during the first round of R&A (Roads/ junctions 30-36 24-hour exceedences of 50□g/m3? Exposure?)	Ö	9.6.3
H) Roads with significantly changed traffic flows (Background? Roads/ junctions? Exposure? Data? Calculations? Exceedences?)	Ö	9.6.3
I) New Industrial Sources (Air Quality Assessments? Emissions data? Nomogram? Fugitive? Exceedences? Neighbouring authorities?)	Ö	9.7
J) Industrial Sources with Substantially Increased Emissions (Emissions data? Nomogram? Fugitive? Exceedences? Neighbouring authorities?)	Ö	9.7
K) Areas of Domestic Coal Burning (>50 premises by 0.5 km2?)	Ö	9.8.2
L) Quarries/landfill sites/opencast coal/handling of dusty cargoes at ports etc. (Exposure? Dust concerns? Background?)	Ö	9.8.1
M) Aircraft (Exposure < 500m from boundary? Passenger throughput > 10 mppa? > 5 mppa in Scotland?)	Ö	9.9.1
CONCLUSION (Detailed assessment? For what?)	Ö	9.10