Supplementary Detailed Assessment of Air Quality in Sunderland

Prepared by

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on behalf of

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Executive Summary

The Detailed Assessment of air quality in Sunderland (submitted January 2005) concluded that there was a risk of the annual mean objective for nitrogen dioxide to be exceeded at two locations, Trimdon Street Roundabout and Chester Road/Ormond Street, and that Air Quality Management Areas (AQMAs) should be declared. Since publication of the Detailed Assessment report, additional information on measured nitrogen dioxide concentrations at the Chester Road/Ormond Street junction has become available. The results from three months continuous monitoring at this location, along with the full 12 months data from a diffusion tube monitoring site indicate that the annual mean nitrogen dioxide objective will be achieved by a reasonable margin in 2005.

In order to reflect the measured levels at this location, the concentrations of nitrogen dioxide modelled for the DA using ADMS-Roads have been re-verified using these local data. The model results indicate that exceedences of the nitrogen dioxide objective are unlikely, even at the properties closest to the junction.

These new monitoring data indicate that the annual mean nitrogen dioxide objective will be achieved at relevant locations. It is concluded that an Air Quality Management Area is not required at the Chester Road/Ormonde Street junction.

In addition, further information has been obtained relating to the second potential area of exceedence of the annual mean nitrogen dioxide objective at Trimdon Street Roundabout. The area of potential exceedence covers one receptor known as Embassy House, information has been obtained which confirms the property is to be purchased by the City of Sunderland as part of a large development plan. Completion of the sale is confirmed to be September 2005 and the property will be assured vacant possession with demolition soon after. Since there are no receptors in the area of potential exceedence there will be no requirement for the declaration of an Air Quality Management Area.

1 Introduction

1.1 Air Quality Consultants Ltd., was commissioned by the five Tyne and Wear local authorities to carry out Detailed Assessments of air quality. These were produced in January 2005 and the conclusions have been accepted by Defra.

1.2 The Detailed Assessment for the City of Sunderland concluded that there was a likelihood of the annual mean objective for nitrogen dioxide not being achieved at two locations, the Trimdon Street Roundabout and Chester Road/Ormond Street. It was therefore concluded that Air Quality Management Areas (AQMAs) should be declared at these two locations. Since publication of the Detailed Assessment report, additional information regarding nitrogen dioxide concentrations at the Chester Road/Ormond Street junction and relevant exposure adjacent to the Trimdon Street roundabout have become available. This report presents this new information and assesses the implication with regard to the original decision to declare AQMA's at these locations.

Introduction to the Second Round of Review and Assessment

1.3 The Government's Air Quality Strategy for England, Scotland, Wales and Northern Ireland[i] and the addendum to it, published in February 2003[ii], set out a framework for air quality improvements, which includes a series of air quality objectives. National and international measures are likely to achieve these objectives in most locations, but where areas of poor air quality remain, local air quality management will be necessary. Part IV of the Environment Act 1995 requires local authorities to periodically review and assess the current, and likely future, air quality in their area. The role of this process is to identify areas where it is unlikely that the air quality objectives will be achieved. These locations must be designated as Air Quality Management Areas (AQMAs) and subject to active management. Further details about the second round of Review and Assessment are available in the Tyne and Wear Detailed Assessment Report (2005).

1.4 The purpose of the Detailed Assessment is to determine whether an exceedence of an air quality objective is likely and the extent of that likely exceedence. If it is found that an air quality objective is likely to be exceeded, than an Air Quality Management Area (AQMA) must be declared. Subsequent to the declaration of an AQMA, a further assessment needs to be carried out to ascertain the sources contributing to the exceedence and to calculate the magnitude of reduction in emissions required to achieve the objective. An Air Quality Action Plan then needs to be prepared, which identifies measures to improve air quality, in pursuit of the air quality objectives.

The Air Quality Objectives

1.5 The Government's Air Quality Strategy[i] defines both standards and objectives for a range of air pollutants. The 'standards' are set as concentrations below which health effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of a particular pollutant. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of the costs, benefits, feasibility and practicality of achieving the standards. The objectives are prescribed within The Air Quality (England) Regulations 2000[iii] and The Air Quality (England) (Amendment) Regulations 2002[iv]. This latter publication set revised, more stringent objectives for benzene and carbon monoxide. The addendum to the Air Quality Strategy[ii] contains provisional objectives for PM_{10} to be achieved by 2010.

1.6 The air quality objectives are only applicable where members of the public are likely to be regularly present and are likely to be exposed over the averaging time of the objective[v]. For the annual mean objective, relevant exposure is limited to residential properties, schools and hospitals. The 1-hour objective applies at these and at any outdoor location where a member of the public might reasonably be expected to stay for the averaging period of the objective, such as shopping streets, parks and sports grounds, as well as bus stations and railway stations that are not fully enclosed. Table 1 sets out the objectives for nitrogen dioxide that are relevant to this report.

Table 1 Air Quality Objectives Relevant to This Report.

Pollutant	Time Period	Objective	To be achieved by[1]
Nitrogen Dioxide	1-hour mean	200 μg/m^3 not to be exceeded more than 18 times a year	2005
	Annual mean	40 μg/m^3	2005

[1] The achievement dates are all by the end of the specified year.

2 Assessment Methodology

Monitoring Data

2.1 The Detailed Assessment (DA) report was prepared using monitoring data that were available in October 2004. Since that time, monitoring has continued at the various diffusion tube locations described in the DA. The automatic NOx analyser that had been installed at the junction of Chester Road and Ormonde Street, but was not operational at the time of the DA report due to problems with the power supply, was commissioned at the end of November 2004.

2.2 The results of automatic air quality monitoring carried out in the City of Sunderland are published on the internet as part of the Tyne & Wear Air Quality Network (T&WAQN)[vi], which is maintained by the University of Sunderland. The locations of these monitoring sites are shown in the DA report. Details of the quality assurance and control procedures in place for each of the automatic monitoring stations are presented in Appendix 1 of this report.

2.3 Where monitoring data are not available for a full calendar year, data have been adjusted to an annual mean equivalent by comparison with data from the Newcastle Centre urban background site, which is operated by Newcastle City Council as part of the Government's Automatic Urban and Rural Network (AURN)[vii]. This approach is consistent with guidance provided in LAQM.TG(03) and further details are provided in Appendix 7 of the DA.

2.4 Monitoring for nitrogen dioxide is also carried out using passive diffusion tubes, which are exposed for a month at a time, before being returned to the laboratory for analysis. The City of Sunderland uses tubes which are supplied and analysed by Gradko using the 50% TEA in acetone method. All of the data presented in this report have been adjusted to account for diffusion tube bias. Further details of the adjustment factors used, are supplied in Appendix 6 of the DA.

Modelling

2.5 The conclusions within the DA report are based largely on predictions of nitrogen dioxide concentrations carried out using ADMS Roads (version 2.0), an atmospheric dispersion modelling software developed by Cambridge Environmental Research Consultants Ltd (CERC). Further information about input data and verification of the model are provided in the DA report.

Uncertainty

2.6 There is an element of uncertainty in all measured and modelled data. This includes uncertainty within the model itself as well as in the input data (e.g. existing and predicted traffic flow and composition). There is also uncertainty arising from the year to year variability in air quality monitoring data, the likely reduction in background air quality concentrations and the monitoring equipment.

2.7 The uncertainty in modelled data has been minimised by carrying out model verification and adjustment. Any known uncertainty in measured data is highlighted in the discussion of the results. No attempt has been made to quantify the level of uncertainty in the measured and modelled data presented in this report. However, the overall picture, in terms of all the available measured and modelled data and the quality of that data has been taken into consideration in the decision whether or not to declare an AQMA.

3 Chester Road/Ormonde Street

3.1 DMRB modelling data in the USA, identified the Chester Road/Ormonde Street junction as an area where there could be potential exceedences of the annual mean nitrogen dioxide objective. Diffusion tube monitoring and detailed modelling carried out as part of the DA confirmed that there were potential exceedences of the annual mean nitrogen dioxide objective at relevant locations near to this junction. It was concluded that, as a minimum, the AQMA should cover any relevant locations within the modelled 40 $\mu g/m^3$ contour shown in Figure 1.

3.2 The monitoring locations are described in Figure 2, and indicate the location of a diffusion tube sampler (123) and a continuous NOx analyser (CR). Monitoring data that were previously taken into consideration in the Detailed Assessment are presented in Table 2. The monitoring results indicated that the objective would be achieved at the diffusion tube monitoring site; however this location is not representative of worst-case exposure. As described above, the continuous NOx analyser at the roadside location adjacent to a residential property in Ormonde Street did not have a suitable dataset at the time of preparation of the DA .

3.3 This supplementary DA takes into account data from this continuous monitoring site. These data, along with the full 12 months data from the diffusion tube monitoring location, are presented in Table 3. These results indicate that the annual mean nitrogen dioxide objective is expected to be achieved at both locations by a reasonable margin in 2005.

3.4 In order to reflect the measured concentrations at this location, the concentrations of nitrogen dioxide modelled for the DA using ADMS-Roads have been re-verified using these new local data (for further information on model verification see Appendix 2). The model results are presented in Figure 3. These show good agreement with the measured values. The model results indicate that exceedences of the nitrogen dioxide objective are unlikely, even at the properties closest to the junction.

3.5 Based on these new modelling and monitoring data it is concluded that it is likely that the annual mean objective for nitrogen dioxide will be achieved at all relevant locations at the Chester Road/Ormonde Street junction, and the original decision to declare an AQMA should be revised. Monitoring will continue at this location until at least a full 12-month period of automatic monitoring data is available, and the results will be considered in future review and assessment reports.

Table 2 Chester Road/Ormonde Street - Nitrogen Dioxide Monitoring Data Presented in DA

Site number	Location	Site type	Relevant exposure	Monitor type	Concentration ($\mu g/m^3$)	Data capture (%)
January to September 2004 measured adjusted to 2003						
123	163 Chester Road	Roadside	Yes – not worst-case	Diffusion tube	39.0	100
2005 Projected from 2003 (from 2004 adjusted to 2003 in brackets)						
123	163 Chester Road	Roadside	Yes – not worst-case	Diffusion tube	N/A (37.0)	N/A
Objective = 40 $\mu g/m^3$ in 2005						

N.B. The monitoring period for 163 Chester Road was incorrectly described as Apr-Sept 2004 in the DA report.

Table 3 Chester Road/Ormonde Street - Nitrogen Dioxide Monitoring Data Updated Since DA

Site number	Location	Site type	Relevant exposure	Monitor type	Concentration ($\mu g/m^3$)	Data capture (%)
2004 Measured						
123	163 Chester Road	Roadside	Yes – not worst-case	Diffusion tube	31.3	100
CR	Chester Road	Roadside	Yes	Chemi-luminesence	32.8	100 (Dec-Mar)
2004 measured adjusted to 2003						
123	163 Chester Road	Roadside	Yes – not worst-case	Diffusion tube	34.6	N/A
CR	Chester Road	Roadside	Yes	Chemi-luminesence	36.4	N/A
2005 Projected from 2003 (from 2004 in brackets)						
123	163 Chester Road	Roadside	Yes – not worst-case	Diffusion tube	32.8 (30.5)	N/A
CR	Chester Road	Roadside	Yes	Chemi-luminesence	34.5 (32.0)	N/A
Objective = 40 $\mu g/m^3$ in 2005						

Figure 1 **Modelled Nitrogen Dioxide Concentration (μg/m^3) in 2005 – Chester Road/Ormonde Street based on regional verification of the model (Presented in the Detailed Assessment Report).**

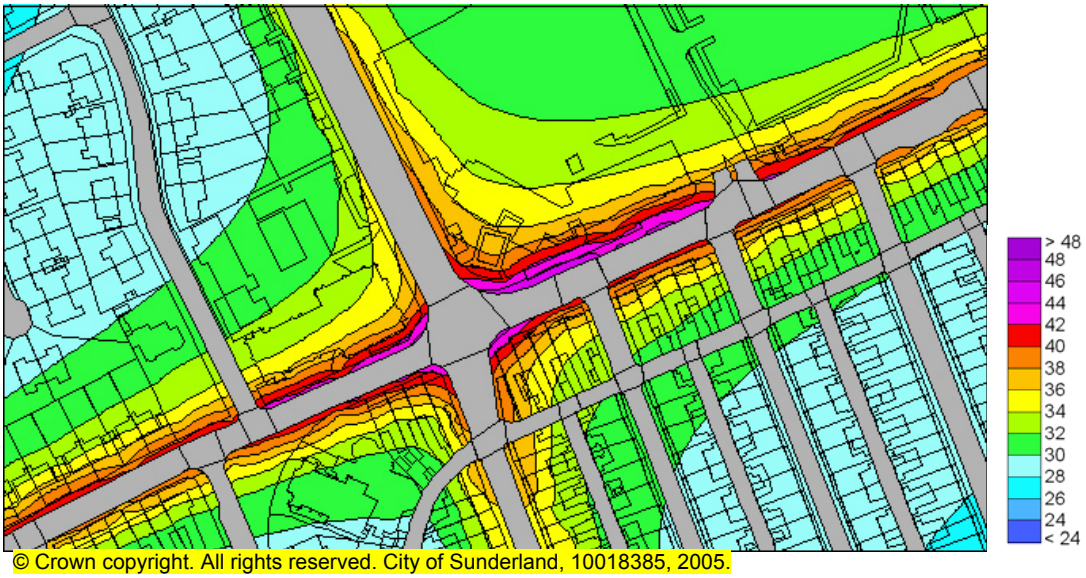
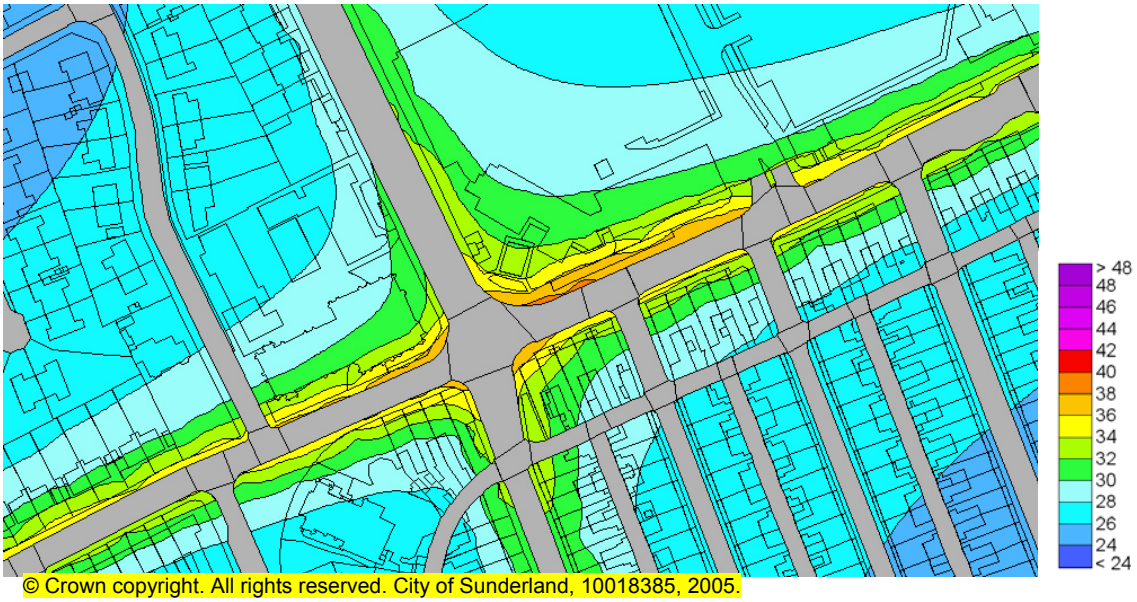


Figure 2 **Monitoring Locations – Chester Road/Ormonde Street**

Figure 3 Revised Modelled Nitrogen Dioxide Concentration (μg/m^3) in 2005 – Chester Road/Ormonde Street based on local verification of the model.

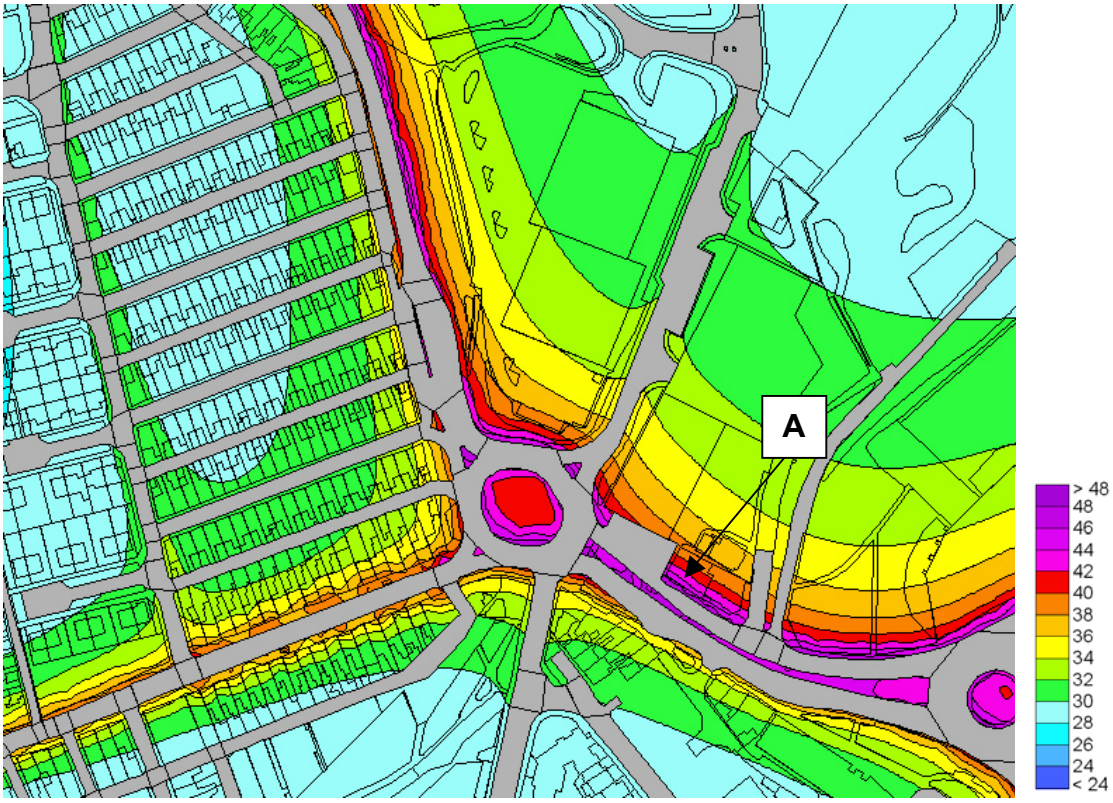


4 Trimdon Street

4.1 DMRB modelling data in the USA, identified the Trimdon Street Roundabout as an area where there could be potential exceedences of the annual mean nitrogen dioxide objective. Detailed modelling carried out as part of the DA confirmed that there were potential exceedences of the annual mean nitrogen dioxide objective at relevant locations near to the Trimdon Street roundabout and therefore an AQMA was required.

4.2 The only relevant location that potentially falls within the modelled 40 μg/m^3 contour is Embassy House (marked as 'A') shown in Figure 4. Embassy House is currently a shop on the ground floor, with a student flat above it. The property is to be purchased by the City of Sunderland as part of a large development plan. Completion of the sale is confirmed to be September 2005 and the property will be assured vacant possession with demolition soon after. Since there will then be no receptors in the area of potential exceedence there will be no requirement for the declaration of an Air Quality Management Area.

Figure 4 Modelled Nitrogen Dioxide Concentration (μg/m^3) in 2005 – Trimdon Street Roundabout



5 Conclusions

5.1 The requirement for an Air Quality Management Area in the vicinity of the Chester Road/Ormonde Street junction has been re-evaluated using new monitoring data that has become available since the completion of the Detailed Assessment. These new data indicate that the annual mean nitrogen dioxide objective will be achieved at all relevant locations. It is concluded that there is no requirement to declare an Air Quality Management Area at this location.

5.2 The requirement for an Air Quality management Area in the vicinity of Trimdon Street Roundabout has been re assessed on the basis that there will be no relevant receptors and it has been concluded that there is no requirement to declare an Air Quality Management Area in this location.

6 References

i DETR (January 2000), The Air Quality Strategy for England, Scotland, Wales and Northern Ireland.
ii Defra, (February 2003), The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Addendum.
iii The Air Quality (England) Regulations 2000, Statutory Instrument 928
iv The Air Quality (England) (Amendment) Regulations 2002, Statutory Instrument 3043
v Defra (2003) Local Air Quality Management Technical Guidance LAQM.TG(03).
vi Sunderland University 2004, Tyne & Wear Air Quality Network. www.enviweb.sunderland.ac.uk
vii Defra (2005), UK Air Quality Archive, www.airquality.co.uk