CAPITA SYMONDS

Planning, Environment & Design

SCANNED

North-West Haverhill

Air Quality Assessment

August 2013

Quality Management

Job No	CS/059139		
Project	North-West Haverhill		
Location	Suffolk		
Title	Air Quality Assessment		
Document Ref	001	**Issue / Revision**	01
File reference	G:\ZENV\!Projects\CS059139 NW Haverhill AQ\CS NW Haverhill AQ Assessment Final 260713.docx		
Date	06 August 2013		
Prepared by	Daniel Moon	Signature (for file)	
Checked by	David Helliwell	Signature (for file)	
Authorised by	Graeme Flynn	Signature (for file)	pp

Revision Status / History

Rev	Date	Issue / Purpose/ Comment	Prepared	Checked	Authorised
00	04/13	Air Quality Assessment	DM	DH	DM
01	06/13	Air Quality Assessment – Minor Amendments	DM	DH	DM

Contents

Figures

Appendices

Executive Summary

Capita Symonds has conducted an air quality assessment in light of an amendment to a planning application that proposes to construct approximately 450 residential units on land north-west of Haverhill before a proposed relief road has been built. Concern from St Edmundsbury Borough Council was raised that traffic associated with the proposed development will impact upon air quality around Cangle Junction. Monitoring data within the vicinity of Cangle Junction has showed that existing concentrations of NO_2 are close to exceeding the annual mean nitrogen dioxide (NO_2) National Air Quality Objective (NAQO).

The assessment has predicted the effect of additional traffic emissions associated with the proposed development to annual average NO_2 concentrations at receptors within the Cangle Junction area using the ADMS-Roads detailed dispersion model. The assessment has been conducted in accordance of LAQM.TG(09).

Monitoring data from the Withersfield Road diffusion tube site and predictions of baseline air quality show that existing annual mean NO_2 concentrations are likely to exceed the relevant NAQO at some considered receptors within the study area. The number of considered receptors predicted to experience annual mean NO_2 concentrations that exceed the relevant NAQO falls from seven out of eleven during 2014 to five in 2016 due to measures within the AQS (Defra, 2007) and improvements in vehicle emissions technology (i.e. Euro VI standards) are likely to result in reductions in NO_x emissions. The annual mean NO_2 concentration is predicted not to exceed 60µg/m^3 at any considered receptor suggesting that it is likely the 1-hour NO_2 NAQO is achieved.

The predicted impact additional traffic associated with the proposed development has upon annual mean NO_2 concentrations at considered receptors ranges from an increase of 0.5-1.0µg/m^3. The magnitude of the impacts remains broadly similar for both 2014 and 2016 assessment scenarios and is considered to be small according to Environmental Protection UK guidance. The significance of impacts is considered to be slight adverse or negligible. This is not considered significant. Pollution contours of the annual mean NO_2 concentrations for 2014 show that traffic associated with the development is unlikely to increase the number of receptors within the study area experiencing annual mean concentrations of NO_2 that exceed the relevant NAQO.

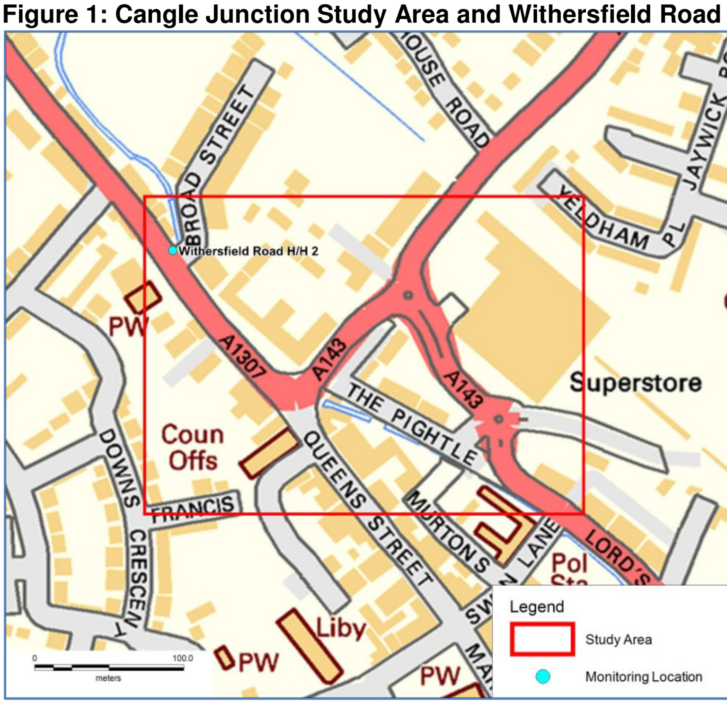
In conclusion, this air quality assessment has not identified any significant effects of the proposed development to air quality within the Cangle Junction area. In addition to this, any effect is likely to be temporary once the relief road is constructed. Air quality should not be a material consideration to the proposed phasing of the development associated with the current planning application.

1. Introduction

1.1 Context

Capita Symonds has been commissioned by Savills to conduct an air quality impact assessment for a residential development on land at North-West Haverhill, Suffolk. In 2009 St Edmundsbury Borough Council received a planning application (ref: SE/09/1283) for construction of a NW Haverhill Relief Road and a outline planning application for a large residential development (around 1,150 units), a primary school, a local centre, public open space, landscaping and other associated infrastructure. The application is currently pending consideration. It is proposed to construct the development in two phases. The first phase comprises approximately 450 residential units together with the eastern section of the proposed NW Haverhill Relief Road. Without the completed relief road westbound traffic (towards Cambridge) will be diverted through the Cangle Junction. Air quality monitoring within this area has shown that the annual mean nitrogen dioxide (NO_2) concentrations are close to exceeding the relevant National Air Quality Objective (NAQO, see Section 2.1 and Section 4.2). St Edmundsbury Borough Council has raised some concern that additional traffic associated with the proposed phasing of the current planning application in this area may temporarily impact significantly upon local air quality and cause the annual mean NO_2 concentrations to exceed the relevant NAQO until the relief road is constructed. The purpose of this assessment is to address these concerns by investigating the effect of additional traffic emissions associated with the proposed phasing of the development to air quality around the Cangle Junction. Figure 1 presents the monitoring location in question and the study area of this assessment.

Figure 1: Cangle Junction Study Area and Withersfield Road Monitoring Location



Source: Capita Symonds (Ordnance Survey © Crown copyright 2013)

1.2 Scope

This investigation assesses current air quality within the study area by drawing on existing monitoring data available locally. In order to assess the effect of the proposed development to air quality in the Cangle Junction area the study also predicts air quality at existing sensitive receptors within the study area using a detailed dispersion model. The effect of the proposed development to air quality within the study area has been predicted during the anticipated first year of operation of the proposed development and during the third year of operation to understand the longevity of any such effect.

This assessment focuses on NO_2 as this is the main pollutant of concern locally and most associated with road traffic emissions.

2. Legislation & Policy

2.1 Air Quality Strategy

Part IV of the Environment Act 1995 introduced a system of Local Air Quality Management (LAQM). This requires Local Authorities to regularly and systematically review and assess air quality within their boundaries against a series of objectives, and appraise development and transport plans against these assessments.

The Air Quality Strategy (2007) establishes the policy for ambient air quality for the UK. Its primary objective is to ensure that everyone can enjoy a level of ambient air quality in public places that poses no significant risk to health or quality of life, and to protect the environment. The Strategy sets out the National Air Quality Objectives (NAQOs). Those included in LAQM are prescribed in the Air Quality (England) Regulations 2000 and the Air Quality (England) (Amendment) Regulations 2002.

The NAQOs used in this assessment for NO_2 are shown in Table 1.

Table 1: NO_2 National Air Quality Objectives (NAQO)

Pollutant	Objective
Nitrogen dioxide (NO_2)	200µg/m^3 measured as a 1-hour mean, not to be exceed more than 18 times a year
	40µg/m^3 measured as an annual mean

Source: Air Quality (England) Regulations, 2000

The air quality objectives for the protection of human health apply to outdoor locations where people are regularly present, and where they might reasonably be expected to be exposed over the relevant averaging times (which vary from 15 minutes to a year). The air quality objectives do not apply to occupational, indoor or in-vehicle exposure.

Where a NAQO is unlikely to be met, the local authority must designate an Air Quality Management Area (AQMA) and draw up an Air Quality Action Plan (AQAP) setting out the measures it intends to introduce in pursuit of the objectives within its AQMA. Land use and transport planning are major components of effective AQAPs.

Local authorities' approach to establishing an AQMA may differ. Some declare the whole district/borough an AQMA, others have declared AQMAs at specific areas where NAQOs have been shown or predicted to be exceeded. The latter approach can lead to the declaration of multiple AQMAs so some authorities have declared a whole area, around exceedences of the relevant NAQO, an AQMA. Over 230 local authorities have declared AQMAs.

St Edmundsbury Borough Council had declared an AQMA in Great Barton, however the AQMA has now been revoked. The AQMA incorporated the Gatehouse cottage and 1 - 8 The Street.

The AQMA was located approximately 30km north east of the proposed development site. It is unlikely that the previous AQMA will be affected by the proposed development or will render the AQAP unworkable.

2.2 Air Quality Standards Regulations

The Air Quality (Standards) Regulations 2010 transpose into English law the requirements of European Directives 2008/50/EC and 2004/107/EC on ambient air quality. They include limit values for NO_2. These limit values are numerically the same as the NAQO values, but differ in terms of compliance dates, locations where they apply and legal responsibility.

The limit values are applicable at all locations except:

- where members of the public do not have access and there is no fixed habitation;
- on factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply; and
- on the carriageway of roads; and on the central reservations of roads except where there is normally pedestrian access.

The limit values are mandatory whereas there is no legal obligation to meet the NAQOs. However they don't apply to this assessment as local authorities have no statutory obligation to assess air quality against them in order to assist with long-term planning and the assessment of development proposals in their local areas.

2.3 Planning Policy

2.3.1 National Policy

Planning policy in the UK is governed by the National Planning Policy Framework, published in March 2012[1]. Sustainable development, with an emphasis on economic, social and environmental sustainability is at the forefront of the policy. It advises that in order to contribute to conserving or enhancing the natural and local environment, planning considerations should prevent:

"both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution."

This is to be achieved whilst maintaining adherence to the NAQOs and taking into account the presence of AQMAs. Developments in AQMAs should also be consistent with the local air quality action plan.

[1] Department for Communities and Local Government (2012), National Planning Policy Framework

2.3.2 Local Policy

The Core Strategy Development Plan Document (DPD) was adopted by the council on 14th December 2010, and now forms part of the Local Development Framework (LDF) for St Edmundsbury.

The Core Strategy sets out the vision, objectives, spatial strategy and overarching policies for the provision of new development in the borough up to 2031. Policy CS2 Sustainable Development within the Core Strategy states:

"A high quality, sustainable environment will be achieved by designing and incorporating measures appropriate to the nature and scale of development, including:

<u>The protection and enhancement of natural resources:</u>

E) conserving and, wherever possible, enhancing other natural resources including, air quality and the quality and local distinctiveness of soils;"

Chapter 5 within the Core Strategy describes the strategy especially with regards to Haverhill. Paragraph 5.5 within the Core Strategy states:

"Across the town there will need to be a balanced approach to catering for motorised journeys and other methods of travel in order to manage levels of congestion, air quality and road safety. The delivery of sustainable transport solutions should remain a high priority and measures to reduce out-commuting, especially by car, will be encouraged."

2.4 Other Guidance

Guidance for local authority air quality and planning officers on how to consider air quality within the development control process was issued by Environmental Protection UK (EPUK) in April 2010[2]. Although this has no statutory standing, earlier versions have been widely used by local authorities.

[2] EPUK (2010), *Development Control: Planning for Air Quality (2010 Update)*

3. Methodology

3.1 Consultation

James Lemon, the Environment Officer at St Edmundsbury Borough Council, has been consulted with regards to the scope and methodology of this assessment which was agreed[3].

3.2 Existing Air Quality

Existing air quality within the vicinity of the site has been assessed by drawing on the following measured and modelled information:

- St Edmundsbury Borough Council's LAQM reports provided information regarding historical air quality within the borough;
- Data from St Edmundsbury Borough Council's NO_2 diffusion tube network. The diffusion tubes are supplied and analysed by Environmental Scientifics Group and are prepared using 50% triethanolamine (TEA) in acetone; and
- Modelled data for 1km x 1km grids covering the study area provided on the Department for Environment, Food and Rural Affairs (Defra) website[4] have been used to determine the background air quality in the area.

Automatic air quality monitoring has not been conducted within the borough.

3.3 Impact of the Development to Air Quality

The contribution of emissions from road traffic movements within the study area to annual average NO_2 concentrations at identified sensitive receptors and the Withersfield Road monitoring site have been predicted using the ADMS-Roads Extra (v3.1.4) detailed dispersion model. This model has been widely used in the UK for this kind of assessment.

The ADMS-Roads dispersion model predicts the contribution of traffic emissions to pollutant concentrations at a given receptor. It is necessary to add an estimate of the background concentration to obtain the total pollutant concentration for comparison against the NAQOs. Modelled background NO_2 concentrations for the 1km x 1km grids covering the study area provided by Defra have been used in the assessment. Background oxides of nitrogen (NO_x, mixture of nitric oxide and NO_2) and NO_2 concentrations for each assessment scenario are presented in Section 4.3 of this report. "Do Nothing" scenarios refer to future baseline with no development and "Do Something" refers to a future scenario with the development operational.

The assessment scenarios are as follows:

- Verification (2010, 2011 and 2012);
- Baseline (2012);
- First Year of Operation "Do Nothing" (2014);
- First Year of Operation "Do Something" (2014);
- Third Year of Operation "Do Nothing" (2016); and

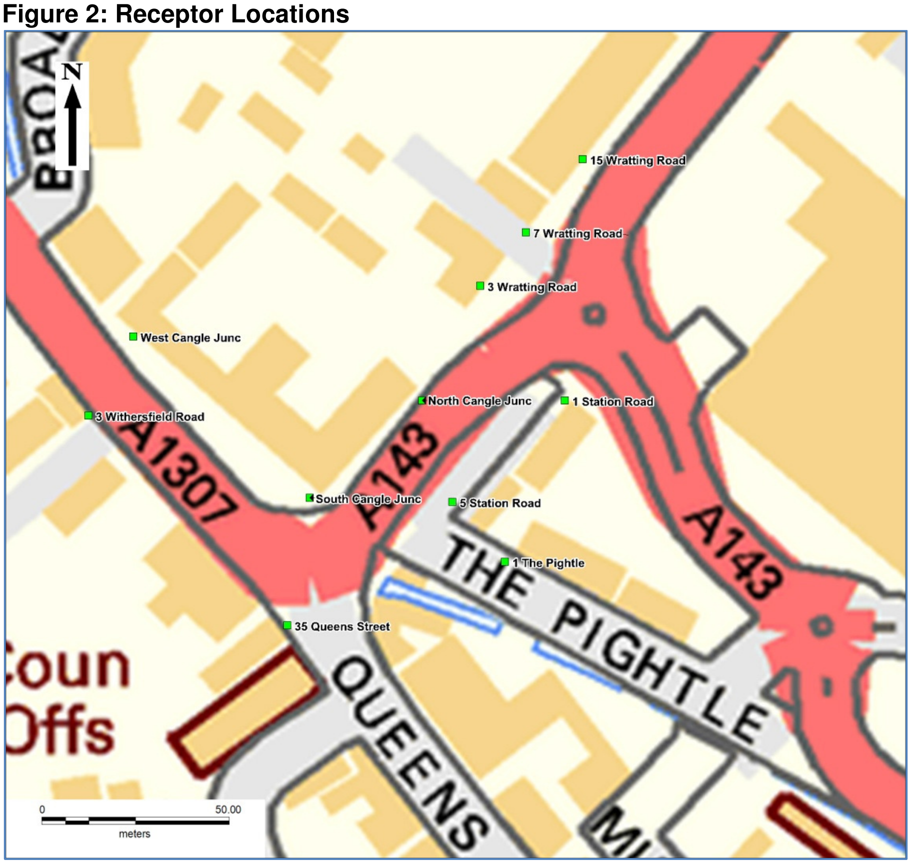
[3] Telephone conversation on 01/03/2013

[4] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

- Third Year of Operation "Do Something" (2016).

The annual mean NAQOs apply at locations where it is deemed the public might be regularly exposed such as building facades of residential properties, schools, hospitals and care homes. The 1-hour mean NAQOs apply at all locations where it is reasonable to expect members of the public to spend one or more (i.e. busy shopping streets, car parks, bus stations, railway stations, etc.). Concentrations of NO_2 have been predicted at the façades of sensitive receptors closest to considered roads within the study area where concentrations are expected to be at their highest. It has been assumed that the average height of all receptors is 1.5m above ground level. Receptors considered within the assessment are deemed to represent locations of relevant exposure which will experience the greatest impact to air quality due to the additional traffic associated with the development. Receptors considered in this assessment are presented in Figure 2.

Figure 2: Receptor Locations



Source: Capita Symonds (Ordnance Survey © Crown copyright 2013)

Concentrations of NO_2 were also predicted at 1.5m above ground level at nodes across a 200x150m grid that covers the study area with a resolution of 4m in order to produce pollution contours for the 2014 "do nothing" and 2014 "do something" assessment scenarios.

Annual average daily traffic (AADT) and the percentage Heavy Duty Vehicles (HDVs) data, defined as vehicles over 3.5 tonnes, have been provided by the Capita Symonds' Transport Planning team.

Motor vehicle emissions were estimated using the Emissions Factor Toolkit (EFT) v5.2 issued on behalf of Defra (2013).

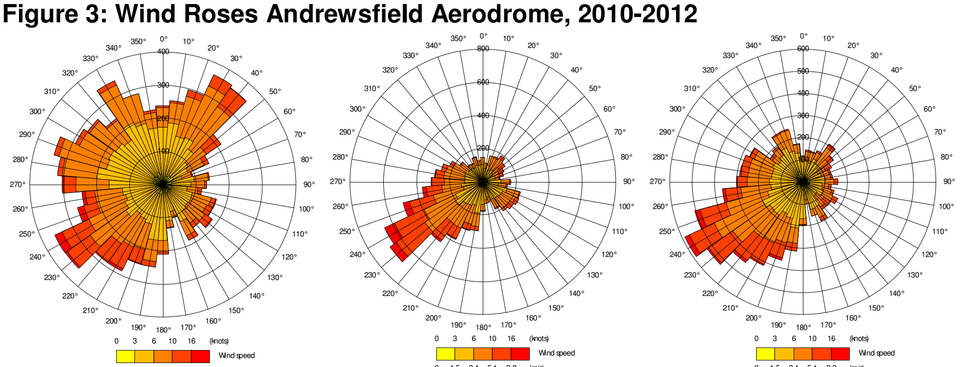
During peak periods (07:00-10:00 and 16:00-19:00) the Cangle Junction reaches its highest traffic throughput resulting in a degree of queuing traffic. Emissions from queuing traffic around Cangle Junction during peak hours have been considered within this assessment. Further detail to how queuing traffic has been considered in this assessment is provided in Appendix B. The CERC Helpdesk Note 60 (Modelling Queuing Traffic) was used to provide guidance when characterising emissions from queuing traffic within the detailed dispersion model. Average queue length data around the Cangle Junction used within this assessment is based on a traffic survey undertaken on 27th September 2012 and is presented in Appendix B. To calculate the emission rate from the queuing traffic a representative AADT must first be estimated. It has been assumed that the vehicles are travelling at the lowest possible speed (5kph) and the average vehicle length is four metres.

Predicted NO_x concentrations were converted to NO_2 using the methodology outlined in the LAQM.TG(09) guidance for St Edmundsbury.

A surface roughness of 0.5m and a Monin-Obukov length of 30m were used within the model which are representative of suburban areas.

Hourly sequential meteorological data for three years (2010, 2011 and 2012) from Andrewsfield Aerodrome has been used for this assessment. This is the most representative meteorological station where the necessary parameters are recorded. Andrewsfield is located approximately 20km south of the site. Meteorological data was sourced from the National Oceanic and Atmospheric Administration (NOAA). The predicted ambient pollutant concentrations have been averaged over the three meteorological years to provide 'typical' concentrations for each assessment year. Wind roses for the meteorological data used in the assessment are presented in Figure 3.

Figure 3: Wind Roses Andrewsfield Aerodrome, 2010-2012



2010 **2011** **2012**

Source: Capita Symonds

LAQM.TG(09) recommends using a combination of automatic and diffusion tube monitoring data to verify predictions of NO_x concentrations, however it is recognised that the monitoring techniques perform differently. It is important to verify model predictions against monitoring data as historically dispersion models tend to under predict the contribution of traffic emissions to pollutant concentrations. Monitoring data from the Withersfield Road diffusion tube monitoring site (2010-2012) have been used for verification of NO_x predictions. All other monitoring sites are located well outside the study area and have not been considered. Verification of NO_x concentrations has been conducted in accordance with LAQM.TG(09). It was calculated that model predictions of the contribution of traffic emissions to concentrations of NO_x are adjusted by a factor of 3.2184. The verification study is presented in more detail in Appendix C.

3.4 Assessment Criteria

The predicted NO_2 concentrations were assessed against the NAQOs (see Table 1).

The predicted annual average concentrations for NO_2 were used to screen whether the 1-hour NO_2 NAQO is likely to be breached. Data from a large number of monitoring sites, where road transport is the predominant emission source, shows that the short term objective is generally not exceeded when the annual average concentrations of NO_2 are less than 60µg/m^3.

The magnitude of impacts on annual mean concentrations of NO_2 of the development has been defined in the Institute of Air Quality Management (IAQM) guidance issued in 2009[5]. These definitions have been adopted by EPUK and applied to the results of this assessment.

Table 2 presents the IAQM's definition of impact magnitude as a percentage of the relevant annual mean NAQO.

Table 2: IAQM's Definition of Impact Magnitude for Changes in Annual Mean NO_2 Concentrations as a Percentage of the Relevant NAQO

Magnitude	Criteria
Large	>10% of relevant NAQO
Medium	5 – 10% of relevant NAQO
Small	1 – 5% of relevant NAQO
Imperceptible	<1% of relevant NAQO

Source: EPUK

[5] IAQM (2009), http://www.iaqm.co.uk/text/News/IAQM_PS_Significance_16_11_2009.pdf

Table 3 presents the IAQM's impact descriptors to describe the significance of changes in annual average NO_2 and PM_{10} concentrations due to a scheme at considered receptors. It should be noted that the guidance states that this magnitude and significance criteria should not be used to evaluate the overall air quality impact of a scheme but should be used to inform it.

Substantial and moderate adverse/beneficial air quality impact descriptors are considered significant.

Table 3: IAQM's Air Quality Impact Descriptors for Changes to Annual Mean NO_2 Concentrations at Sensitive Receptors

Absolute Concentration in Relation with NAQO	Magnitude of Impact		
	Small	Medium	Large
Increase with Scheme			
Above NAQO *With* Scheme ($[NO_2]$ >40µg/m^3)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below NAQO *With* Scheme ($[NO_2]$ = 36–40µg/m^3)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below NAQO *With* Scheme ($[NO_2]$ = 30–36µg/m^3)	Negligible	Slight Adverse	Slight Adverse
Well Below NAQO *With* Scheme ($[NO_2]$ <30µg/m^3)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above NAQO *Without* Scheme ($[NO_2]$ >40µg/m^3)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below NAQO *Without* Scheme ($[NO_2]$ = 36–40µg/m^3)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below NAQO *Without* Scheme ($[NO_2]$ = 30–36µg/m^3)	Negligible	Slight Beneficial	Slight Beneficial
Well Below NAQO *With*out Scheme ($[NO_2]$ <30µg/m^3)	Negligible	Negligible	Slight Beneficial

Source: EPUK
NB: All imperceptible changes are considered negligible

4. Existing Air Quality

4.1 LAQM

St Edmundsbury Borough Council's first round of the LAQM Review and Assessment concluded that the NAQOs for six out of the seven prescribed pollutants would be achieved. It highlighted that the annual mean NO_2 NAQO was unlikely to be achieved by 2005 around the A14 trunk road. Consequently, an Air Quality Management Order designating four areas around the A14 trunk road as AQMAs. The stage 4 assessment (Further Assessment) reported measured annual average NO_2 concentrations within the AQMAs was below the relevant NAQO and accordingly the Order was revoked in 2003. Until 2008 all Review and Assessments of air quality showed that the NAQOs would be achieved. The 2008 Progress report showed that the annual mean NO_2 NAQO was unlikely to be achieved at a location along The Street in the village of Great Barton. A Detailed Assessment carried out in 2009 concluded that the annual mean NO_2 NAQO would not be achieved in the vicinity of the Post Office on The Street and an AQMA was declared in 2010. This AQMA was subsequently revoked in December 2012, the NAQOs are shown to be achieved in all locations within the. Table 4 gives a summary of available Review and Assessment reports since 1999.

Table 4: Summary of Review and Assessment Reports for St. Edmundsbury Borough Council

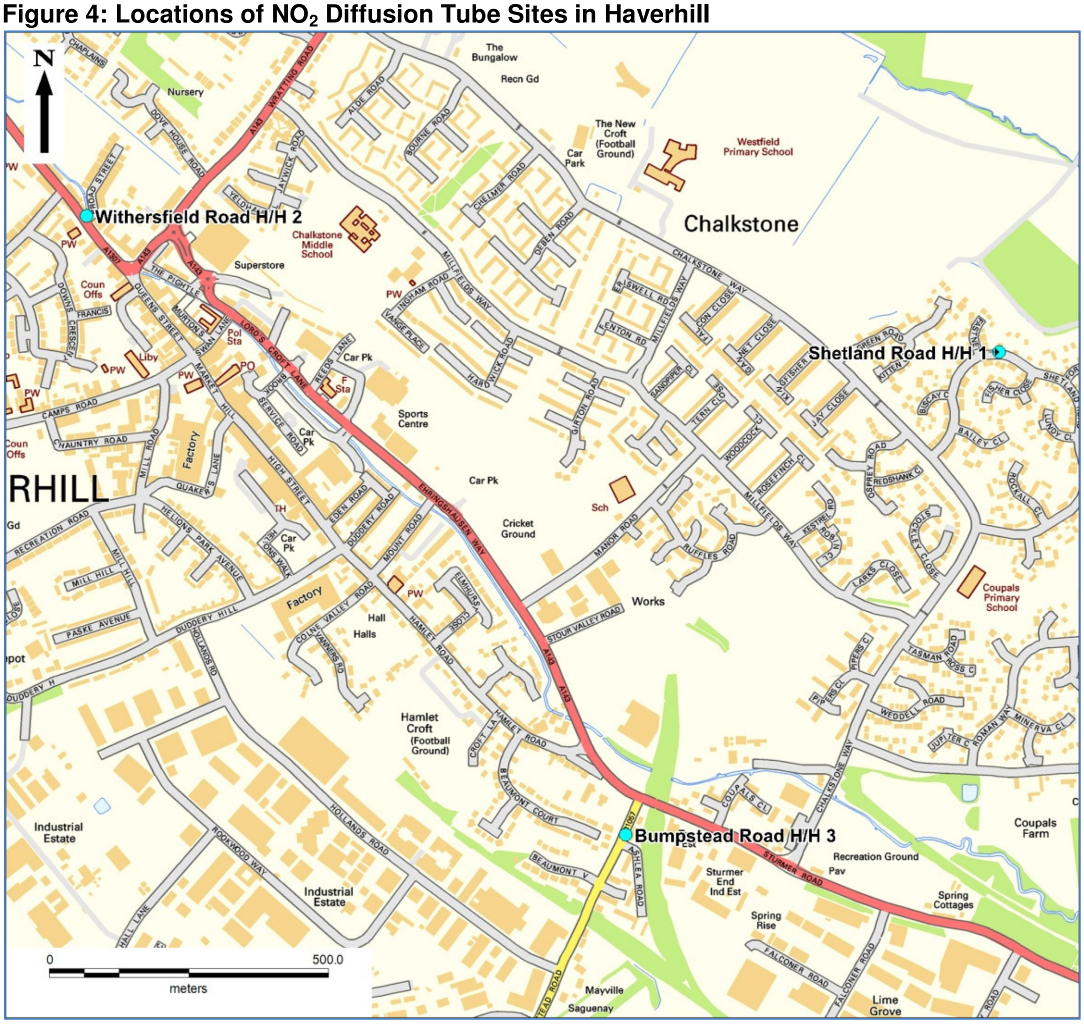
Report Name	Date	Outcome
First Stage Review	Jan 1999	Move to stage 2 assessment.
Second Stage Review	Feb 2000	Move to stage 3 assessment for NO_2.
Third Stage Review	Jan 2001	Declaration of four AQMAs adjacent to A14 in Bury St Edmunds in respect of NO_2.
Stage Four Review and Assessment	Nov 2002	Annual mean objective for NO_2 likely to be met. AQMAs revoked.
Updating and Screening	May 2003	Breaches of air quality objectives unlikely
Progress Report	2004	Breaches of air quality objectives unlikely
Progress Report	2005	Breaches of air quality objectives unlikely
Updating and Screening Assessment	2006	Breaches of air quality objectives unlikely
Progress Report	2007	Breaches of air quality objectives unlikely
Progress Report	May 2008	Detailed assessment for NO_2 along A143 Great Barton adjacent to the Post Office.
Updating and Screening Assessment	June 2009	Breaches of air quality objectives unlikely but confirms exceedences of NO_2 along Great Barton adjacent to the Post Office.
Detailed Assessment for Great Barton	November 2009	Exceedence of NO_2 along A143 Great Barton adjacent to the Post Office. AQMA declared April 2010.
Progress Report	April 2010	Other than AQMA in Great Barton breaches of air quality objectives unlikely.
Updating and Screening Assessment	April 2012	Great Barton AQMA to be revoked

Source: 2011 Air Quality Progress Report for St Edmundsbury Borough Council

4.2 Passive Monitoring

Concentrations of NO_2 are monitored at eighteen sites across St. Edmundsbury using diffusion tubes. In addition to the Withersfield Road diffusion tube monitoring site there are two other sites located within Haverhill that are applicable to this assessment. The Shetland Road site is classified as background site as it located a significant distance away from major sources of air pollution. The Withersfield Road and Bumpstead Road sites are classified as urban sites as they are located within 5m of the kerb of an arterial road. The Withersfield Road site is located within the study area. Concentrations of NO_2 are measured in triplicate samples at the Withersfield Road site to ensure a higher degree of precision. The locations of the NO_2 diffusion tube sites are presented in Figure 4.

Figure 4: Locations of NO_2 Diffusion Tube Sites in Haverhill



Source: Capita Symonds (Ordnance Survey © Crown copyright 2013)

Table 5 presents the annual mean NO_2 concentrations measured at diffusion tube monitoring sites within Haverhill from 2006 to 2012.

Table 5: Annual Mean NO_2 Concentrations Measured at NO_2 Diffusion Tube Sites in Haverhill (2006-2012)

Site	Classification	Annual Mean NO_2 Concentration ($\mu g/m^3$)						
		2006	2007	2008	2009	2010	2011*	2012*
Shetland Road	Background	16	17	18	17	12	15	14
Withersfield Road	Urban	36	39	36	38	36	41	39
Bumpstead Road	Urban	-	-	33	30	28	-	-

Note: Data has been adjusted using factors derived from the Diffusion Tube Bias Adjustment Factors Spreadsheet (March 2013). The factors used for 2011 and 2012 are 0.83 and 0.79 respectively.

Monitoring data presented in Table 5 shows annual mean NO_2 concentrations in Haverhill have broadly remained static since 2006. The annual mean NO_2 NAQO was not achieved at the Withersfield Road site during 2011. Annual mean NO_2 concentrations during other years at this site are shown to be just below (IAQM descriptor, $[NO_2]$ = 36-40$\mu g/m^3$) the NAQO.

4.3 Defra Modelled Background Maps

Defra provides modelled background concentrations for each 1 x 1km grid across all local authority areas from base year 2010. This data can be projected up to 2030. Table 6 presents the estimated background concentrations for the 1 x 1km grids covering the study area (566500, 245500 and 567500, 245500) for each assessment year (2012 and 2014). This data was added to the predicted contribution of traffic emissions to NO_2 concentrations, presented in Section 5 of this report, in order to assess against the NAQO.

Table 6: Defra Modelled Background Annual Mean NO_x and NO_2 Concentrations

Year	NO_x ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
	566500, 245500	
2012	25.3	15.9
2014	23.3	14.9
	567500, 245500	
2012	29.6	18.1
2014	27.1	16.9

Defra modelled background NO_2 concentrations across the study area show reasonable agreement with background NO_2 concentrations monitored at the Shetland Road site.

4.4 Conclusion

Evaluation of existing air quality within Haverhill suggests that the annual mean NO_2 NAQO is unlikely to be achieved in the study area. It is likely that concentrations of NO_2 will be greater around Cangle Junction than monitored at Withersfield Road as driving conditions are more unfavourable (i.e. queuing traffic and lower vehicle speeds).

5. Predicted Air Quality

5.1 Predicted NO_2 Concentrations

Table 7 presents the predicted annual mean NO_2 concentrations at the closest facades of considered receptors to the roads within the study area for the baseline (2012) and future (2014) assessment scenarios.

Table 7: Predicted Annual Mean NO_2 Concentrations at Considered Receptors

Receptor	Annual Mean NO_2 Concentrations (µg/m^3)				
	Baseline (2012)	Future "Do Nothing" (2014)	Future "Do Something" (2014)	Future "Do Nothing" (2016)	Future "Do Something" (2016)
3 Wratting Rd	**44.0**	**40.5**	**41.2**	36.2	36.9
7 Wratting Rd	**44.2**	**40.3**	**41.1**	36.0	36.7
15 Wratting Rd	**42.4**	38.1	38.9	34.0	34.8
1 Station Rd	**54.7**	**53.1**	**54.1**	**47.4**	**48.3**
5 Station Rd	**48.9**	**46.0**	**46.8**	**41.0**	**41.8**
N. Cangle Junc	**50.9**	**47.0**	**47.8**	**41.9**	**42.7**
W. Cangle Junc	**40.9**	36.8	37.5	32.8	33.5
S. Cangle Junc	**57.0**	**51.8**	**52.5**	**46.3**	**47.1**
35 Queens St	**52.4**	**52.8**	**53.4**	**47.2**	**48.0**
3 Withersfield Rd	**40.0**	38.9	39.7	34.7	35.4
1 The Pightle	36.1	34.3	34.7	30.7	31.2

Note: Figures highlighted in bold represent the exceedence of the annual mean NO_2 NAQO (40µg/m^3)

Predicted baseline annual mean NO_2 concentrations exceeds the relevant NAQO at all receptors with exception to 1 The Pightle. The greatest baseline annual mean NO_2 concentration is predicted to be experienced at South Cangle Junction. Predicted baseline annual mean NO_2 concentrations do not exceed 60µg/m^3 at any considered receptors suggesting the 1-hour NO_2 NAQO will be achieved.

Predicted future "do nothing" (2014) annual mean NO_2 concentrations exceed the relevant NAQO at seven considered receptors. Annual mean concentrations of NO_2 during 2014 are not predicted to cause the exceedence of the relevant NAQO at any considered receptor with or without the development. The greatest 2014 annual mean NO_2 concentration is predicted to be experienced at 1 Station Road. Predicted annual mean NO_2 concentrations during 2014 do not exceed 60µg/m^3 at any considered receptors suggesting the 1-hour NO_2 NAQO will be achieved..

Predicted future "do nothing" (2016) annual mean NO_2 concentrations exceed the relevant NAQO at five considered receptors. Annual mean concentrations of NO_2 during 2016 are not predicted to cause the exceedence of the relevant NAQO at any considered receptor with or without the development. The greatest 2016 annual mean NO_2 concentration is predicted to be experienced at 1 Station Road. Predicted annual mean NO_2 concentrations during 2016 do not exceed 60µg/m^3 at any considered receptors suggesting that 1-hour NO_2 NAQO will be achieved.

Annual mean NO_2 concentrations across the study area are predicted to fall from 2012 to 2016 as it is anticipated that measures within the Air Quality Strategy (Defra, 2007) and improvements in vehicle technology should deliver a reduction in NO_x emissions. In all instances additional traffic emissions associated with the proposed development has been predicted to not cause an exceedence of the relevant NAQO.

5.2 Significance of Effects

Table 8 presents the magnitude and significance of predicted impacts to 2014 and 2016 annual mean NO_2 concentrations from additional traffic emissions associated with the proposed development.

Table 8: Magnitude and Significance of Predicted Effects of the Proposed Development to Annual Mean NO_2 Concentrations

Receptor	2014				2016			
	Impact ($\mu g/m^3$)	% of NAQO	Mag. of Impact	Sig. of Impact	Impact ($\mu g/m^3$)	% of NAQO	Mag. of Impact	Sig. of Impact
3 Wratting Rd	0.7	1.8%	Small	Slight Adverse	0.7	1.7%	Small	Slight Adverse
7 Wratting Rd	0.8	1.9%	Small	Slight Adverse	0.7	1.9%	Small	Slight Adverse
15 Wratting Rd	0.8	2.1%	Small	Slight Adverse	0.8	2.0%	Small	Negligible
1 Station Rd	1.0	2.5%	Small	Slight Adverse	1.0	2.4%	Small	Slight Adverse
5 Station Rd	0.8	1.9%	Small	Slight Adverse	0.8	1.9%	Small	Slight Adverse
N. Cangle Junc	0.8	2.1%	Small	Slight Adverse	0.8	2.1%	Small	Slight Adverse
W. Cangle Junc	0.7	1.7%	Small	Slight Adverse	0.7	1.6%	Small	Negligible
S. Cangle Junc	0.7	1.8%	Small	Slight Adverse	0.9	2.1%	Small	Slight Adverse
35 Queens St	0.6	1.4%	Small	Slight Adverse	0.8	2.0%	Small	Slight Adverse
3 Withersfield Rd	0.7	1.8%	Small	Slight Adverse	0.7	1.7%	Small	Negligible
1 The Pightle	0.5	1.2%	Small	Negligible	0.5	1.2%	Small	Negligible

The predicted impact of traffic emissions associated with the proposed development to annual mean NO_2 concentration at all considered receptors is described by EPUK as small. Depending on the total annual mean NO_2 concentration reported in Section 5.1 the significance of the effect of traffic emissions to air quality at considered receptors is predicted to be slight adverse or negligible during both the anticipated first year and third year of operation (2014 and 2016). Slight adverse and negligible effects to air quality are considered to be not significant.

The assessment predicts that in most cases the effect of the proposed development to air quality within the study area will reduce from 2014 (first year of operation) to 2016 (third year of operation) due to expected improvements in vehicle technology. However this reduction is slight.

Pollution contours of the annual mean NO_2 concentration for the 2014 “do nothing” and 2014 “do something” scenarios are presented in Appendix D. Comparison of the pollution contours show that the affect of the proposed development to the area of exceedence of the relevant NAQO is slight and would not affect the number of receptors within the study area that are exposed to annual mean NO_2 concentrations greater than the relevant NAQO.

6. Conclusion

Monitoring data from the Withersfield Road diffusion tube site and predictions of baseline air quality show that existing annual mean NO_2 concentrations are likely to exceed the relevant NAQO at some considered receptors within the study area. The number of considered receptors predicted to experience annual mean NO_2 concentrations that exceed the relevant NAQO falls from seven out of eleven during 2014 to five in 2016 due to measures within the AQS (Defra, 2007) and improvements in vehicle emissions technology (i.e. Euro VI standards) are likely to result in reductions in NO_x emissions. The annual mean NO_2 concentration is predicted not to exceed $60 \mu g/m^3$ at any considered receptor suggesting that it is likely the 1-hour NO_2 NAQO is achieved.

The predicted impact additional traffic, associated with the proposed development, has upon annual mean NO_2 concentrations at considered receptors ranges from $0.5\text{-}1.0 \mu g/m^3$. The magnitude of the impact remains broadly similar from 2014 to 2016 and is considered to be small according to EPUK guidance. The significance of impacts is considered to be slight adverse in most cases. This is not considered significant. Pollution contours of the annual mean NO_2 concentrations for 2014 show that traffic associated with the development is unlikely to increase the number of receptors within the study are experiencing annual mean concentrations of NO_2 that exceed the relevant NAQO.

In conclusion, this air quality assessment has not identified any significant effects of the proposed development to air quality within the Cangle Junction area. In addition to this, any effect is likely to be temporary once the relief road is constructed. Air quality should not be a material consideration to the proposed phasing of the development in the current planning application.

Appendix A
Traffic Data

Traffic data is based upon an Automatic Traffic Counts (ATC) survey undertaken in March 2013. Traffic data was projected to the assessment years using factors derived from Tempro (v6.2). It was assumed that the average speed of traffic at junctions and on roundabouts is 10mph. Traffic data used in this assessment is presented in Table 9.

Table 9: Traffic Data

Road	2012 Baseline		2014 Future "do nothing"		2014 Future "do something"		2016 Future "do nothing"		2016 Future "do something"		Speed (kph)
	AADT	%HGV	AADT	%HGV	AADT	%HGV	AADT	%HGV	AADT	%HGV	
Wratting Rd	14393	5.0%	14546	5.0%	16058	4.5%	14834	5.0%	16346	4.5%	47
Lords Croft	12677	4.1%	12812	4.1%	13452	3.9%	13065	4.1%	13705	3.9%	28
Cangle	15812	4.3%	15980	4.3%	16852	4.1%	16297	4.3%	17169	4.1%	34
Queens St	1275	5.6%	1289	5.6%	1291	5.6%	1314	5.6%	1316	5.6%	19
Withersfield Rd	15718	4.1%	15885	4.1%	16755	3.9%	16199	4.1%	17069	3.9%	38

Appendix B
Queue Length Data

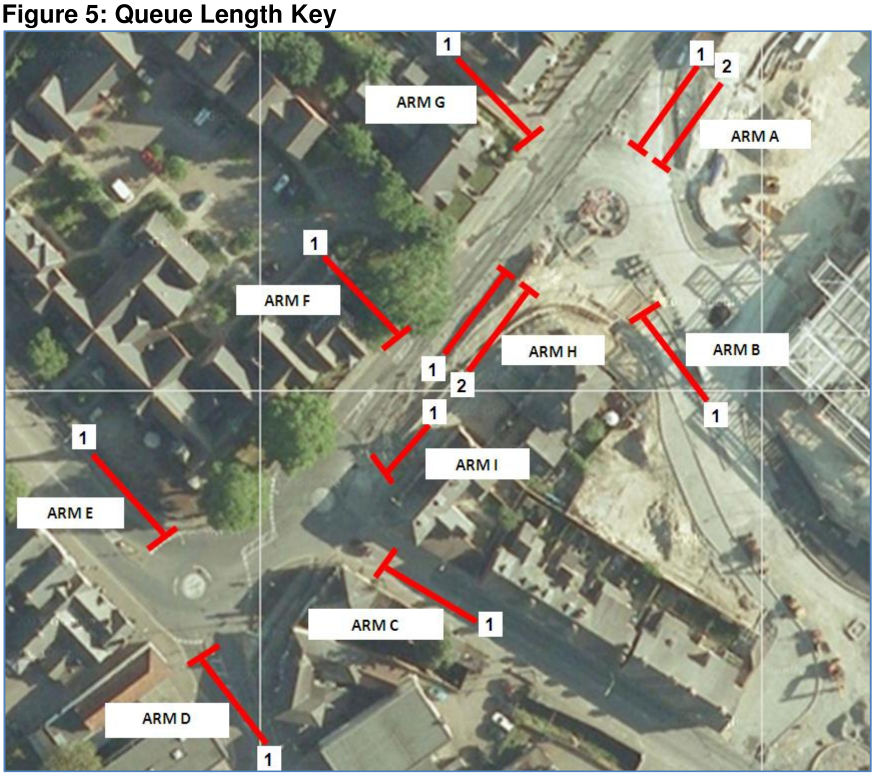
The CERC Helpdesk Note 60 (Modelling Queuing Traffic) was used to provide guidance when characterising emissions from queuing traffic within the detailed dispersion model. Average queue length data around the Cangle Junction used within this assessment is based on a traffic survey undertaken on 27th September 2012 and is presented in Table 10. To calculate the emission rate from the queuing traffic a representative AADT must first be estimated. It has been assumed that the vehicles are travelling at the lowest possible speed (5kph) and the average vehicle length is four metres. The AADT can then be calculated as shown in Equation 1.

Equation 1: Estimate of Representative AADT for Queuing Traffic

$$AADT = \left(\frac{Speed\ (\frac{m}{hr})}{Vehicle\ Length\ (m)} \right) \times 24$$

Figure 5 presents a key for queue length data around the Cangle Junction. It clarifies the location of the queuing traffic the data refers to.

Figure 5: Queue Length Key



Source: Quality Traffic Surveys

Table 10 presents the average morning and afternoon peak hour queue lengths from a survey undertaken by Quality Traffic Surveys on the 27th of September 2012. The data has been rounded to the nearest integer.

Table 10: Queue Length Data

Queue ID*	AM (07:00-10:00) Average Queue Length (vehicle lengths)	PM (16:00-19:00) Average Queue Length (vehicle lengths)
Arm A (1)	1	1
Arm A (2)	1	2
Arm B	1	2
Arm C	0	0
Arm D	1	1
Arm E	1	2
Arm F	0	0
Arm G	0	0
Arm H (1)	1	2
Arm H (2)	1	3
Arm I	1	1

*As described in Figure 5

Appendix C
Verification Study

The model verification factor for NO_x has been calculated following the methodology in LAQM.(TG09). Comparison of the monitored and modelled concentrations from 2010, 2011 and 2012 at the Withersfield Road diffusion tube monitoring site is given in Table 11. Traffic data has been adjusted using Tempro 6.2 to project backwards expected traffic flows on considered roads during 2010, 2011 and 2012.

Table 11: Comparison of Modelled and Monitored NO_2 Concentrations at Withersfield Road Diffusion Tube Monitoring Site

Year	Monitored Total Annual Mean NO_2 (µg/m^3)	Modelled Total Annual Mean NO_2 (µg/m^3)	% Difference
2010	36.0	24.7	-31
2011	40.6	23.6	-42
2012	38.8	23.5	-40

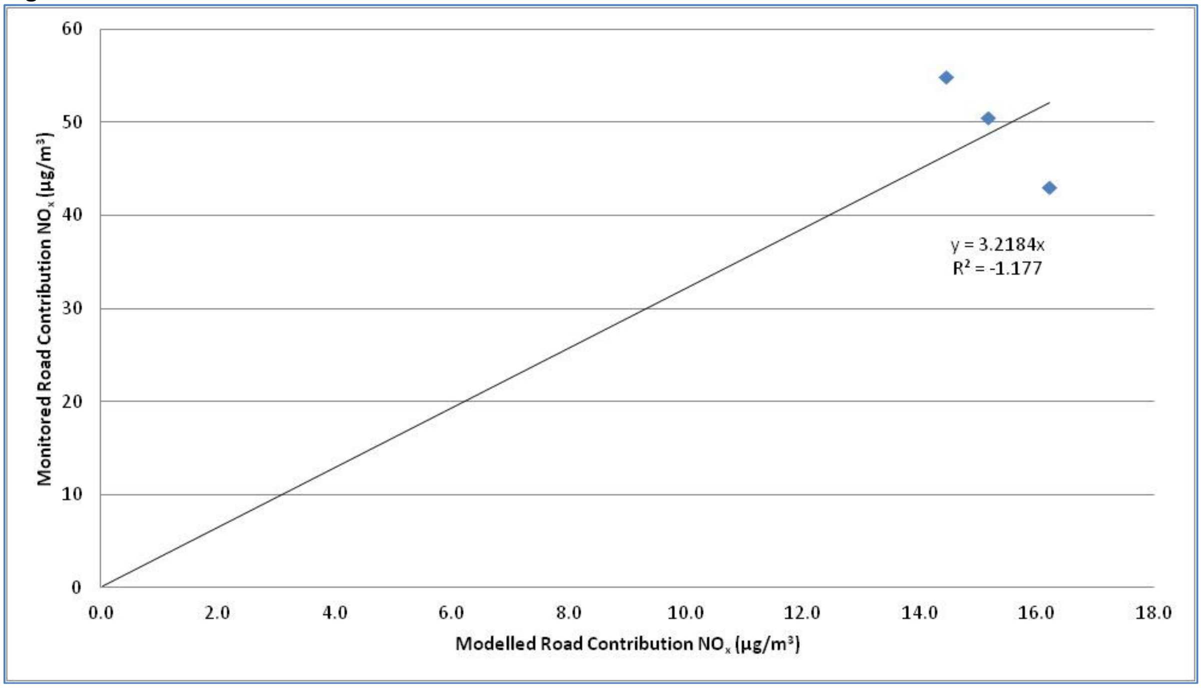
Table 11 shows that the percentage difference between the modelled and monitored NO_2 is greater than 25% in some cases and therefore adjustment of the modelled data is necessary. Table 12 presents the data used to calculate the verification factor.

Table 12: Model Verification Data

Year	Monitored Road Annual Mean NO_2 (µg/m^3)	Monitored Road Annual Mean NO_x (µg/m^3)	Modelled Road Annual Mean NO_x (µg/m^3)	Ratio
2010	19.0	43.0	16.2	2.7
2011	24.2	54.9	14.4	3.8
2012	22.9	50.5	15.1	3.3

The monitored and modelled road contributions to NO_x have been plotted in Figure 6. The gradient of the linear trend line forced through the origin is the verification factor.

Figure 6: Determination of Verification Factor



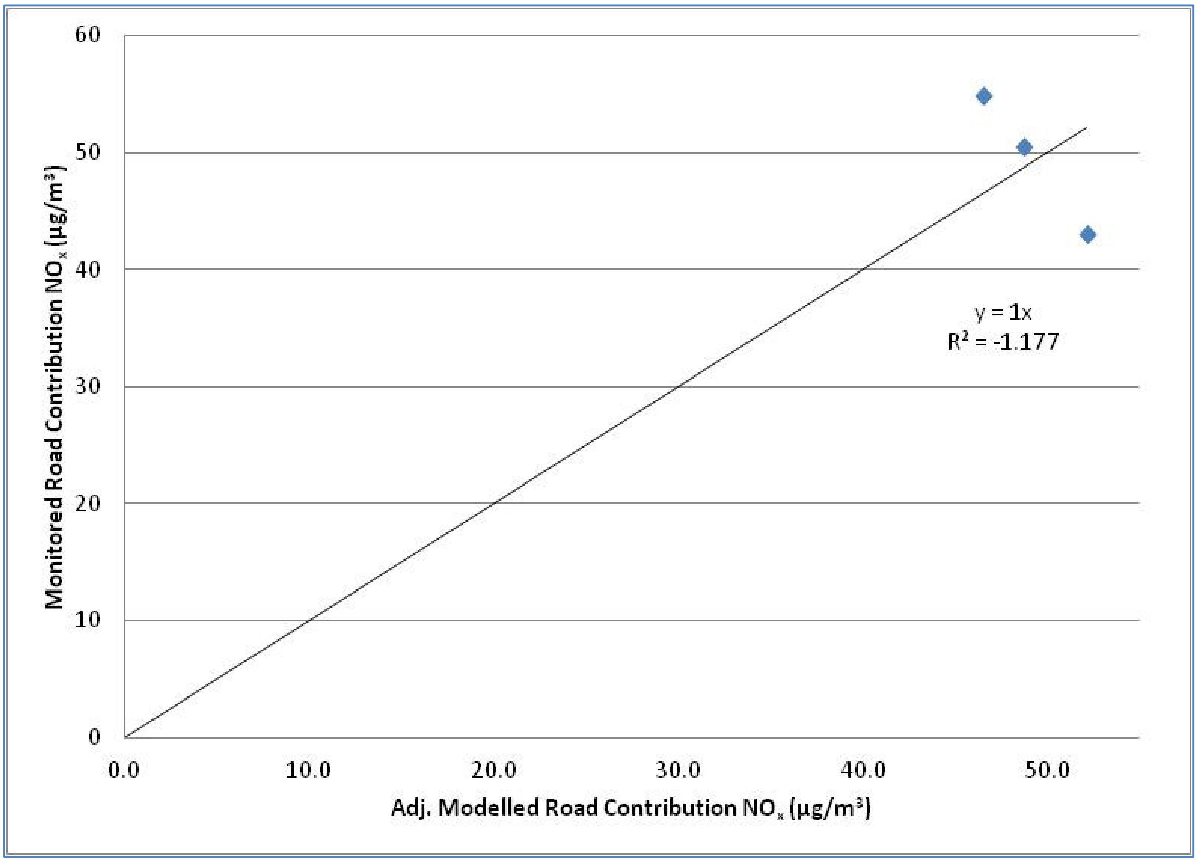
Source: Capita Symonds

The calculated verification factor is 3.2. The verification factor has been applied to the predicted contribution of traffic emissions to the annual mean NO_x concentrations. The monitored NO_2 concentrations are compared to the adjusted modelled NO_2 concentrations in Table 13. The new relationship between the monitored and adjusted modelled road contribution of NO_x is shown in Figure 7.

Table 13: Comparison between Monitored NO_2 and Adjusted Modelled NO_2 Concentrations

Year	Adjusted Modelled Road Annual Mean NO_x (µg/m^3)	Adjusted Modelled Total Annual Mean NO_x (µg/m^3)	Adjusted Modelled Total Annual Mean NO_2 (µg/m^3)	Monitored Total Annual Mean NO_2 (µg/m^3)	% Difference
2010	52.1	79.4	39.4	36.0	10
2011	46.5	72.8	37.4	40.6	-8
2012	48.8	74.1	38.1	38.8	-2

Figure 7: Relationship between Monitored Road NO_x and Adjusted Modelled Road NO_x Concentrations



Source: Capita Symonds

Appendix D
Annual Mean NO_2 Contours

Figure 8: Annual Mean NO_2 Contour, 2014 "Do Nothing" Scenario

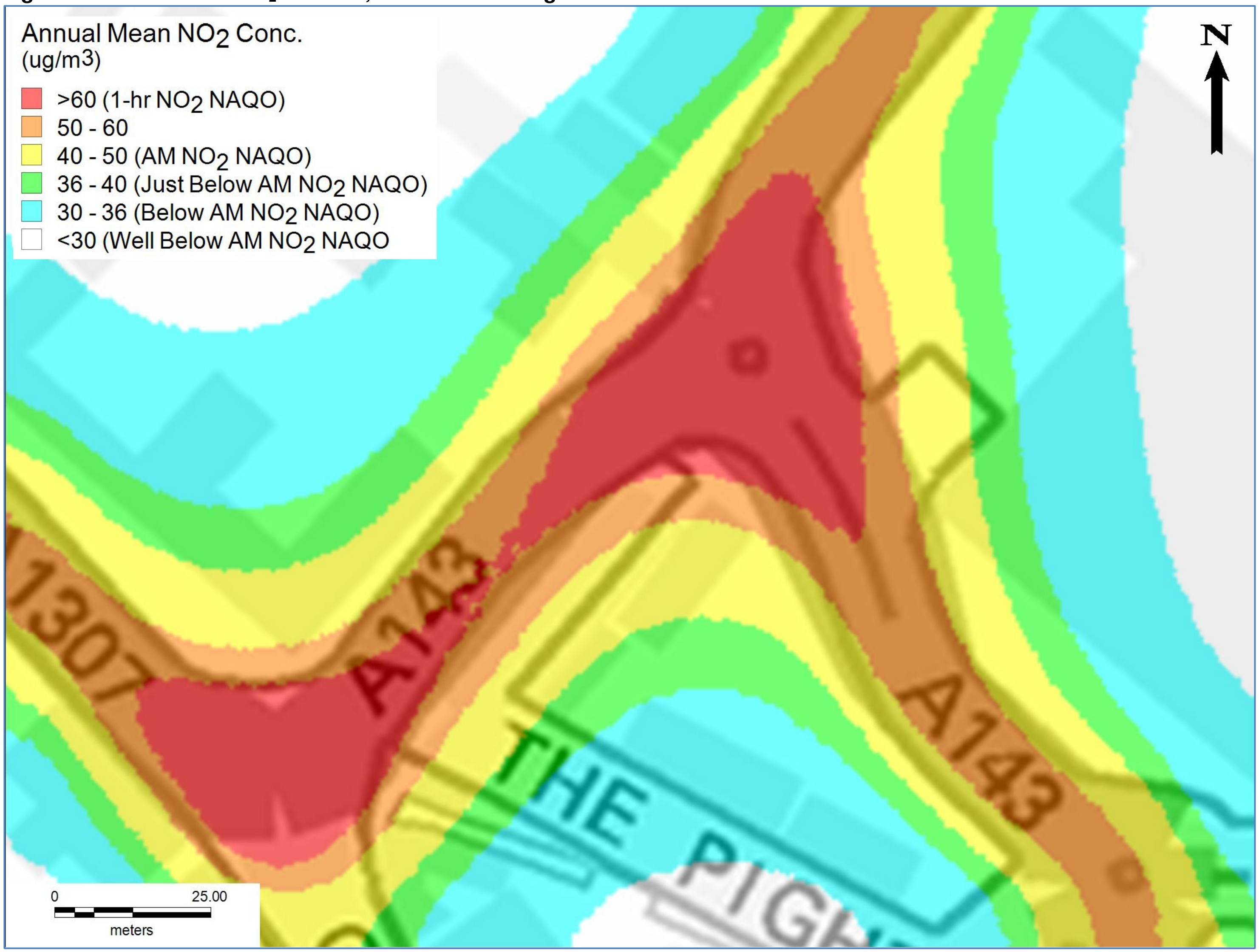
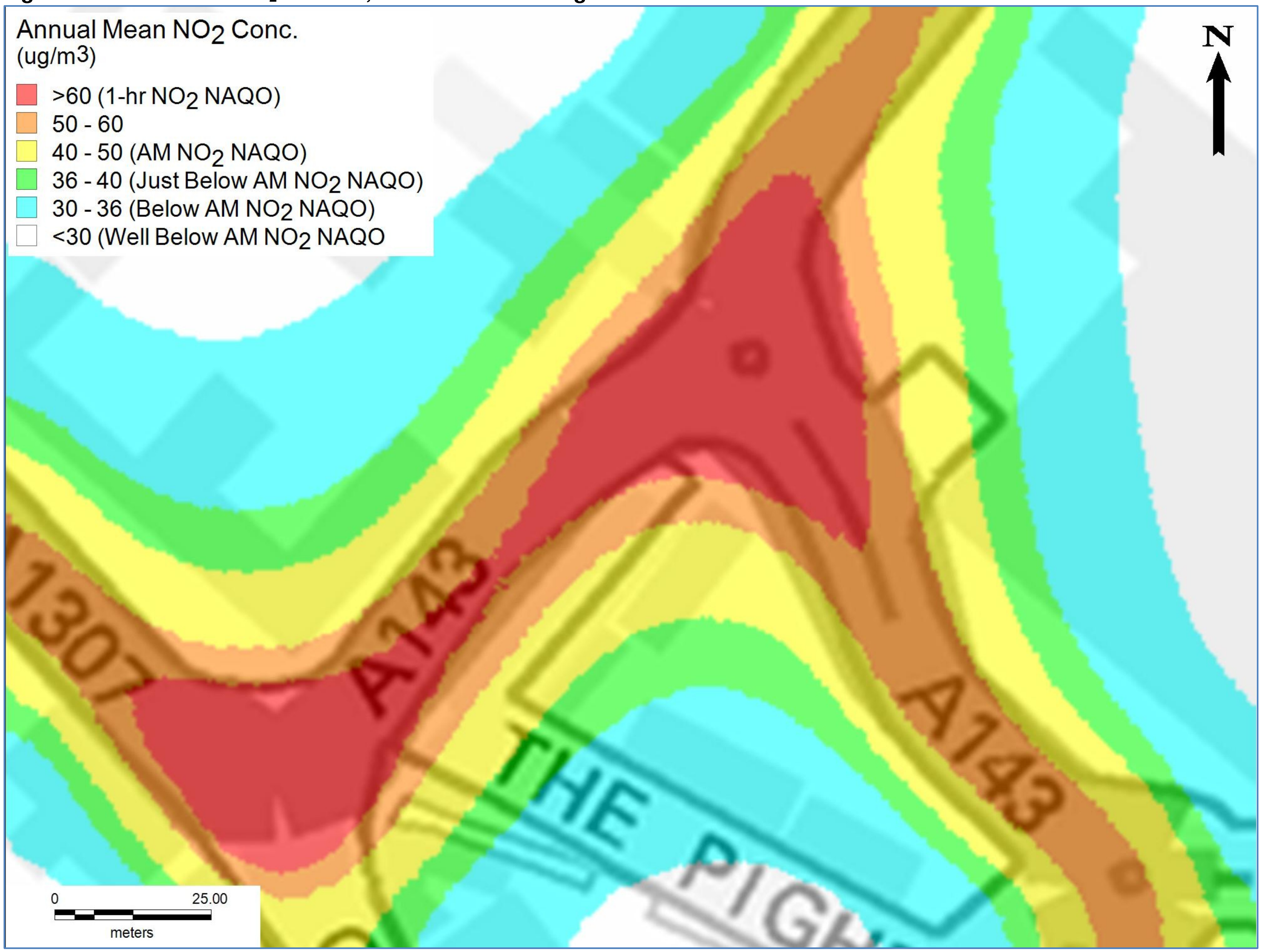


Figure 9: Annual Mean NO_2 Contour, 2014 "Do Something" Scenario



CAPITA SYMONDS

Capita Symonds Ltd
Level Seven
52 Grosvenor Gardens
Belgravia
London
SW1W 0AU

Tel +44 (0)20 7808 4520
Fax+44 (0)207 901 9901

www.capitasymonds.com