Land South of Allington Lane
Eastleigh

Air Quality Assessment

Hallam Land Management, The Davies Family

& Bovis Homes Ltd

Brookbanks

Document Control Sheet

Document Title: Air Quality Assessment

Document Ref: 10440/AQ01

Project Name: Land South of Allington Lane

Project Number: 10440

Client: Hallam Land Management, The Davies Family and Bovis Homes Ltd

Document Status

Rev	Issue Status	Prepared / Date	Checked / Date	Approved / Date
0	Draft	ND 30/11/16	LW 30/11/16	PAB 30/11/16

Issue Record

Name / Date & Revision	30/11/16					
Ruth McKeown - HLM	0					
Tom Wilsher - HLM	0					
Lucy Atkins – Bovis Homes Ltd	0					
The Davies Family – Greg Davies	0					

Contents

Appendix

1 Introduction

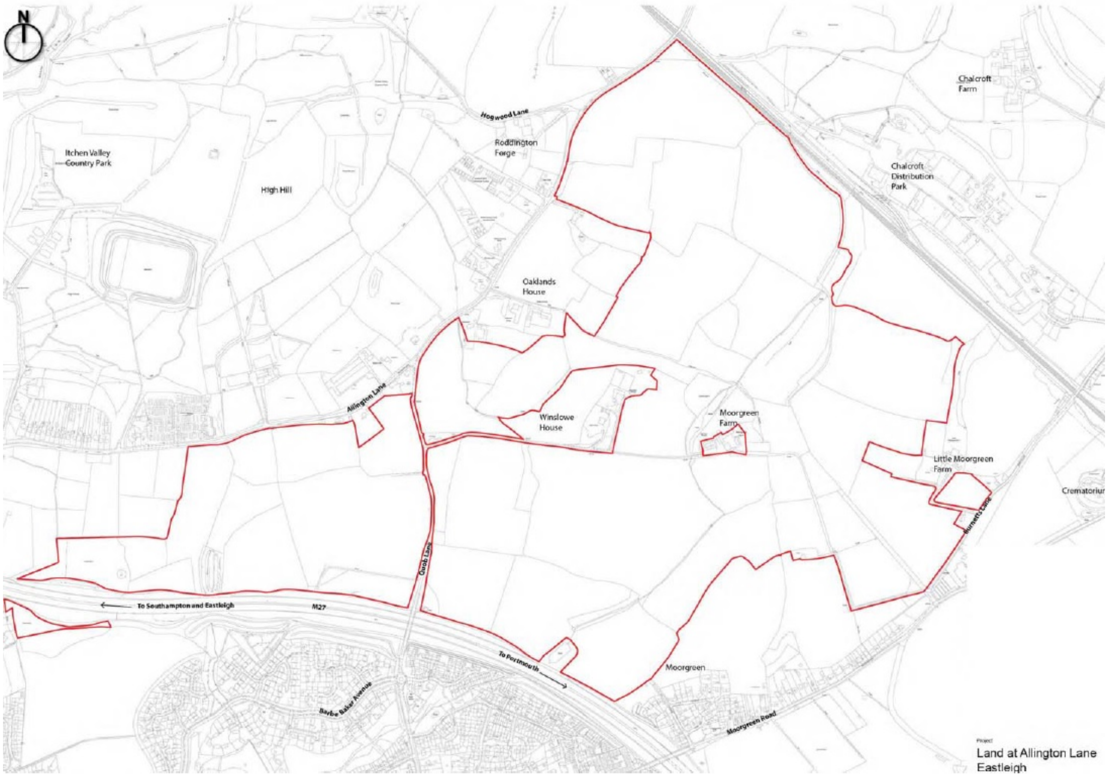
1.1 Brookbanks Consulting was commissioned by Hallam Land Management, The Davies Family and Bovis Homes Ltd to undertake an air quality assessment for the proposed development of land off Allington Way, Eastleigh. The Site location is identified in Figure 1a.

1.2 The Site falls within the borough of Eastleigh Borough Council (EBC) and is located to the south-east of the town of Eastleigh and to the north-east of Southampton. Given the size of the development there is the potential for impacts on local air quality as a result of operational traffic. The impact of the development on local air quality has therefore been considered.

1.3 This report presents the findings of a detailed air quality assessment of the potential impacts of the proposed development on local air quality during the operational phase. The assessment considers the type, source and significance of potential impacts and the measures that should be employed to minimise any identified impacts and exposure to elevated pollution are described.

1.4 A glossary of common air quality terminology is provided in Appendix A.

Figure 1a: Site Location



2 Legislation and Policy

Air Quality Strategy for England, Scotland, Wales & Northern Ireland

2.1 The Government's policy on air quality within the UK is set out in the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland (AQS) published in July 2007[1] , pursuant to the requirements of Part IV of the Environment Act 1995. The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in the UK. The AQS is designed to be an evolving process that is monitored and regularly reviewed.

2.2 The AQS sets standards and objectives for ten main air pollutants to protect health, vegetation and ecosystems. These are benzene (C_6H_6), 1,3-butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter (PM_{10}, $PM_{2.5}$), sulphur dioxide (SO_2), ozone (O_3) and polycyclic aromatic hydrocarbons (PAHs).

2.3 The air quality standards are long-term benchmarks for ambient pollutant concentrations which represent negligible or zero risk to health, based on medical and scientific evidence reviewed by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO). These are general concentration limits, above which sensitive members of the public (e.g. children, the elderly and the unwell) might experience adverse health effects.

2.4 The air quality objectives are medium-term policy based targets set by the Government which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e. a limited number of permitted exceedances of the standard over a given period.

2.5 For some pollutants there is both a long-term (annual mean) standard and a short-term standard. In the case of NO_2, the short-term standard is for a 1-hour averaging period, whereas for PM_{10} it is for a 24-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants (e.g. temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road).

2.6 The current statutory standards and objectives are set out in the table presented in Appendix B.

2.7 Of the pollutants included in the AQS, NO_2 and PM_{10} will be the most relevant to this project as these are the primary pollutants associated with road traffic.

Local Air Quality Management (LAQM)

2.8 Part IV of the Environment Act 1995 also requires local authorities to periodically review and assess the quality of air within their administrative area. The Reviews have to consider the present and future air quality and whether any air quality objectives prescribed in Regulations are being achieved or are likely to be achieved in the future.

2.9 Where any of the prescribed air quality objectives are not likely to be achieved the authority concerned must designate that part an Air Quality Management Area (AQMA).

2.10 For each AQMA, the local authority has a duty to draw up an Air Quality Action Plan (AQAP) setting out the measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the air quality objectives. Local authorities are not statutorily obliged to meet the objectives, but they must show that they are working towards them.

2.11 The Department of Environment, Food and Rural Affairs (DEFRA) has published technical guidance for use by local authorities in their Review and Assessment work[2]. This guidance, referred to in this chapter as LAQM.TG(16), has been used where appropriate in the assessment.

[1] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland – July 2007
[2] Department for Environment, Food and Rural Affairs (DEFRA), (2016): Part IV The Environment Act 1995 Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(16)

National Planning Policy Framework

2.12 Published on 27th March 2012, the National Planning Policy Framework (NPPF)[3] sets out the Government's planning policies for England and how these are expected to be applied. It replaces Planning Policy Statement 23: Planning and Pollution Control[4], which provided planning guidance for local authorities with regards to air quality.

2.13 At the heart of the NPPF is a presumption in favour of sustainable development. It requires Local Plans to be consistent with the principles and policies set out in the Framework with the objective of contributing to the achievement of sustainable development.

2.14 Current planning law requires that applications for planning permissions must be determined in accordance with the relevant up to date development plan (i.e. Local Plan or Neighbourhood Plan). The NPPF should be taken into account in the preparation of development plans or in the absence of any up to date Local Plan, and therefore the policies set out within the Framework are a material consideration in planning decisions.

2.15 The NPPF identifies 12 core planning principles that should underpin both plan-making and decision-taking, including a requirement for planning to *'contribute to conserving and enhancing the natural environment and reducing pollution'*.

2.16 Under Policy 11: Conserving and Enhancing the Natural Environment the Framework requires the planning system to *'prevent both new and existing developments from contributing to or being put at unacceptable risk or being adversely affected by unacceptable levels of air pollution'*.

2.17 In dealing specifically with air quality the Framework states that *'planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan'*.

Eastleigh Local Plan

2.18 The Eastleigh Local Plan[5] was adopted in May 2006 and the majority of the policies set out in the Plan have been 'saved' until the new Local Plan is adopted. The Local Plan Chapter 3 deals with environmental sustainability setting out policies aimed at minimising any adverse impacts on the environment while meeting the social and economic needs of the community.

2.19 Policy 32.ES states that *'proposals for uses which may generate air, land or water pollution, will only be permitted if the Borough Council is satisfied that they have been designed to control their impacts to an acceptable level'*.

2.20 In dealing specifically with air quality Policy 33.ES of the Local Plan requires a suitable air quality assessment to be undertaken prior to consideration of the proposals where new development may have a significant impact on local air quality or where future occupants of a development are at risk of being exposed to unacceptable air quality..

[3] Communities and Local Government: National Planning Policy Framework (March 2012)
[4] Office of the Deputy Prime Minister: Planning Policy Statement 23: Planning and Pollution Control (Oct 2004)
[5] Eastleigh Borough Council (2006) Eastleigh Borough local Plan Review 2001 - 2011

3 Methodology

Scope of Assessment

3.1 The scope of the assessment has been determined in the following way:

- Review of development proposals in the context of the surrounding area;
- Review of air quality data for the area surrounding the site and background pollutant maps
- Review of the traffic flow data, which has been used as an input to the air quality modelling assessment

3.2 The development proposals will provide upto 2500 dwellings; therefore there is the potential for impacts on local air quality during the operational phases of the proposed development. An assessment of operational impacts has been undertaken.

3.3 Details of the assessment methodology and the specific issues considered are provided below.

Operational Phase Methodology

Operational Traffic Impacts

3.4 The prediction of air quality at the Site has been undertaken using the ADMS Roads dispersion model. This is a commercially available dispersion model and has been widely validated for this type of assessment and used extensively in the Air Quality Review and Assessment process.

3.5 The model uses detailed information regarding traffic flows on the local road network and local meteorological conditions to predict pollution concentrations at specific locations selected by the user. Meteorological data from the Middle Wallop Meteorological Station from 2014 has been used for the assessment.

3.6 The model uses traffic flow data and vehicle related emission factors to predict road specific concentrations of oxides of nitrogen (NO_x) and PM_{10} at sensitive receptors selected by the user. The predicted concentrations of NO_x have been converted to NO_2 using the LAQM calculator on the DEFRA air quality website[6].

3.7 Traffic data for the road network in the vicinity of the Site have been provided by the transport consultants for the 2014 base year and the anticipated completion year of 2036 with and without development scenarios.

3.8 A review of the traffic data provided by the Transport Consultant has been carried out to identify which road links would experience a significant change in traffic flows based on criteria set out within the EPUK/IAQM guidance. Those road links experiencing a change in annual average daily traffic flows (AADT) of more than 500 have been included in the modelling assessment. Those experiencing a change of less than 500 AADT have been excluded from the assessment as impacts on local air quality are not expected to be significant in these locations.

3.9 To predict local air quality, traffic emissions predicted by the model must be added to local background concentrations. Background concentrations of NO_2 have been taken from the Steel Close background monitoring site for receptors located within the Eastleigh AQMA and from the Oxburgh Close background site for sites located outside the AQMA. A background concentration of 30.8 $\mu g/m^3$ has been obtained from the 2014 monitoring data for Steel Close and a concentrations of 24.4 $\mu g/m^3$ from the Oxburgh Close site.

3.10 The assessment has assumed no change in background concentrations between 2014 and 2036 which represents a worst-case prediction of future concentrations.

[6] http://uk-air.defra.gov.uk

3.11 The emission factors released by DEFRA in July 2016, provided in the emissions factor toolkit EFT2016_7.0 and have been used within the ADMS model (Version 4.0.1.0, released in December 2015) to predict existing and future traffic emissions. The EFT only provides emission factors up to 2030 therefore these have been used for the 2036 future year scenario.

3.12 It is recommended, following guidance set out in LAQM.TG(16), that the model results are compared with measured data to determine whether the model results need adjusting to more accurately reflect local air quality. This process is known as verification.

3.13 LAQM.TG(16) recommends that model predictions should be within 25% (preferably 10%) of monitored concentrations for the model to be predicting with any degree of accuracy. The model has been used to predict NO_2 concentrations at the monitoring sites located within the Eastleigh AQMA on Leigh Road and Wide Lane and outside the AQMA on Fairoak Road and Twyford Road..

3.14 The comparison of monitored and modelled concentrations indicates that the model is under-predicting annual mean NO_2 concentrations at all monitoring sites. It is therefore considered appropriate to adjust the model results to better represent local concentrations. The results of the modelling assessment have been adjusted using the methodology given in LAQM.TG(16). Full details of the verification and calculation of adjustment factors are provided in Appendix C.

3.15 LAQM.TG(16) does not provide a method for the conversion of annual mean NO_2 concentrations to 1-hour mean NO_2 concentrations. However, research[7] has concluded that exceedances of the 1-hour mean objective are generally unlikely to occur where annual mean concentrations do not exceed 60 $\mu g/m^3$. Care has been taken to ensure that locations where the 1-hour mean objective is relevant are included in the assessment.

3.16 Quantitative assessment of the impacts on local air quality from road traffic emissions associated with the operation of the development have been completed against the current statutory standards and objectives set out in Appendix B for NO_2.

Significance Criteria

3.17 The guidance issued by EPUK &IAQM relates to Air Quality considerations within the planning process and sets criterion which identify the need for an Air Quality Assessment, the type of Air Quality assessment required, and the significance of any predicted impact.

3.18 The guidance suggests expressing the magnitude of incremental change in concentrations as a proportion of an Air Quality Assessment Level (AQAL) such as the air quality objectives set out in Appendix B. The significance of impact is then identified based on the incremental change in the context of the new total concentrations and its relationship with the assessment criteria, noting whether the impact is adverse or beneficial based on a positive or negative change in concentrations. The criteria suggested for assigning significance is set out in Figure 3a below.

[7] D Laxen and B Marner: Analysis of the relationship between 1-hour and annual mean nitrogen dioxide at UK roadside and kerbside monitoring sites (July 2003).

Long-term average concentration at receptor in assessment year	% Change in Concentration relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Minor	Moderate
76-94% of AQAL	Negligible	Minor	Moderate	Moderate
95-102% of AQAL	Minor	Moderate	Moderate	Major
103-109% of AQAL	Moderate	Moderate	Major	Major
110% or more of AQAL	Moderate	Major	Major	Major
AQAL – Air Quality Assessment Level which in this assessment refers to the Air Quality Objectives set out in Appendix A The percentage change in concentration should be rounded to a whole number The table should only be used with annual mean concentrations The descriptors are for individual receptors only: overall significance should be based on professional judgment When defining the concentrations as a percentage of the AQAL use the 'without scheme' concentration where there is a decrease in pollutant concentrations and the 'with scheme' concentrations for an increase The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value i.e. well below, the degree of harm is likely to be small. As exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year, it is impossible to define the new total concentrations without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.				

Figure 3a: Impact Descriptors for Individual Receptors

Sensitive Receptors

3.19 LAQM.TG(16) describes in detail typical locations where consideration should be given to pollutants defined in the Regulations. Generally, the guidance suggests that all locations 'where members of the public are regularly present' should be considered. At such locations, members of the public will be exposed to pollution over the time that they are present, and the most suitable averaging period of the pollutant needs to be used for assessment purposes.

3.20 For instance, on a footpath, where exposure will be transient (for the duration of passage along that path) comparison with short-term standards (i.e. 15 minute mean or 1 hour mean) may be relevant. In a school, or adjacent to a private dwelling, however; where exposure may be for longer periods, comparison with long-term standards (such as 24 hour mean or annual mean) may be most appropriate. In general terms, concentrations associated with long-term standards are lower than short-term standards owing to the chronic health effects associated with exposure to low level pollution for longer periods of time.

3.21 For the completion of this assessment, consideration of the potential impacts of the proposed development on local air quality has been undertaken by predicting pollutant concentrations at receptors adjacent to the surrounding road network. Concentrations have also been predicted at 2 receptor locations within the Development Site to assess the suitability of the Site for residential development.

3.22 Details of the receptors are provided below in Figure 3b.

Receptor Number	Receptor Name/Location	OS Grid Reference
1	Grange Road	449723, 113365
2	Grange Road	449526, 113526
3	Grange Road	449253, 113827
4	Upper Northam Road	447920, 112719
5	Grove Farm	447963, 112449
6	Thorny Down Farm	447301, 113072
7	Moorhill	446990, 113595
8	Moorhill	446335, 114371
9	Moorgreen Lane	447312, 114529
10	Moorgreen lane	447368, 114728
11	Moorgreen lane	447607, 114893
12	Swathing Road	446170, 114594
13	Swathing Road	446090, 114731
14	Swathing Road	445991, 114943
15	Allington Lane	445818, 115250
16	Allington Lane	446274, 115722
17	Allington Lane	446583, 115722
18	Mansbridge Road	446583, 115729
19	Mansbridge Road	445563, 115313
20	Mansbridge Road	445319, 115550
21	Mansbridge Road	444434, 115856
22	Wide Lane	444196, 115959
23	Wide Lane	444207, 116131
24	Stoneham Way	444311, 116211
25	Stoneham Way	444008, 116179
26	Stoneham Way	443818, 115897
27	Stoneham Way	443689, 115750
28	Stoneham Way	443437, 115658
29	Thomas Lewis Way	443047, 115629
30	Thomas Lewis Way	443730, 115608
31	Thomas Lewis Way	443489, 114965
32	Thomas Lewis Way	443204, 114221
33	Thomas Lewis Way	443106, 113928
34	Maybray King Way	442837, 113598
35	Maybray King Way	444331, 113260
36	Bittern Road	444525, 113167
37	Bittern Road	445494, 112998
38	Bittern Road	445887, 112982
39	Cumberland Way	446285, 113011
40	Dorset Street	44146, 112479
41	Wide Lane	442215, 112787
42	Wide Lane	445320, 117919
43	Leigh Road	445455, 118164
44	Leigh Road	443192, 119672
45	Leigh Road	443741, 119531
46	Leigh Road	444569, 119281
47	Leigh Road	444977, 119168
48	Twyford Lane	444362, 119407
49	Twyford Lane	445685, 119383
50	Twyford Lane	445753, 119842
51	Wide Lane	445599, 118489
52	Fairoak Road	446563, 119157
53	Fairoak Road	446881, 119980
54	Fairoak Road	447211, 118764
55	Fairoak Road	447493, 118759
56	Fairoak Road	447788, 118818

57	Fairoak Road	448256, 118815
58	Fairoak Road	448824, 118535

Figure 3b: Location of Receptors used in Modelling Assessment

4 Assessment of Impact, Mitigation and Residual Effects

Operational Phase Impact

NO_2 Concentrations

4.1 Annual mean NO_2 concentrations predicted at the selected receptor locations are presented below in Figure 5a.

4.2 The modelling assessment shows that predicted annual mean NO_2 concentrations are below the annual mean objective of 40 µg/m^3 (the AQAL) at all the selected receptor locations under both scenarios. Exceedences of the 1-hour objective for NO_2 is also unlikely based on the predicted annual mean concentrations. Guidance referred to earlier in the report indicates that exceedence of the 1-hour objective is unlikely where the annual mean concentration is below 60 µg/m^3.

4.3 Traffic generated by the proposed development is predicted to result in an increase in NO_2 concentrations of between up to 2% of the AQAL. At the majority of locations annual mean NO_2 concentrations are predicted to be less than 75% of the AQAL therefore a 2% change in the AQAL is classed as a negligible impact. However at receptors41 to 47 and 51, all of which are located within the Eastleigh AQMA, concentrations are predicted to be between 76-94% of the AQAL. At these receptors NO_2 concentrations are predicted to change by the equivalent of 1% of the AQAL, therefore based on the criteria set out in Figure 2b the impact of the development is classed as negligible.

Receptor Number	2036 Do-Minimum	2036 DM + Development	Change as a % of the AQAL	Significance of Impact
1	26.3	26.4	0	Negligible
2	25.6	25.6	0	Negligible
3	26.9	26.9	0	Negligible
4	24.6	24.6	0	Negligible
5	24.7	24.8	0	Negligible
6	28.2	28.5	1	Negligible
7	25.7	25.8	0	Negligible
8	25.0	25.3	1	Negligible
9	24.6	24.6	0	Negligible
10	24.8	24.9	0	Negligible
11	25.0	25.1	0	Negligible
12	25.1	25.3	0	Negligible
13	25.8	26.0	1	Negligible
14	25.0	25.2	0	Negligible
15	25.1	25.3	1	Negligible
16	25.0	25.2	1	Negligible
17	25.6	26.0	1	Negligible
18	26.8	27.6	2	Negligible
19	26.5	27.2	2	Negligible
20	26.5	27.1	2	Negligible
21	27.0	27.7	2	Negligible
22	25.7	25.7	0	Negligible
23	27.5	27.1	0	Negligible
24	27.1	27.4	1	Negligible
25	25.7	25.9	0	Negligible
26	25.7	25.9	0	Negligible
27	25.4	25.6	0	Negligible
28	25.9	26.1	1	Negligible

29	25.9	26.1	1	Negligible
30	25.9	26.1	1	Negligible
31	25.9	26.0	0	Negligible
32	24.5	24.5	0	Negligible
33	25.1	25.2	0	Negligible
34	27.8	27.9	0	Negligible
35	27.1	27.2	0	Negligible
36	25.5	25.6	0	Negligible
37	25.4	25.5	0	Negligible
38	25.3	25.4	0	Negligible
39	26.9	27.0	0	Negligible
40	24.9	25.0	0	Negligible
41	34.3	34.5	1	Negligible
42	35.0	35.3	1	Negligible
43	33.4	33.6	0	Negligible
44	33.1	33.3	0	Negligible
45	33.8	34.1	1	Negligible
46	33.8	34.1	1	Negligible
47	32.2	32.4	0	Negligible
48	25.9	25.9	0	Negligible
49	25.5	25.5	0	Negligible
50	26.5	26.5	0	Negligible
51	34.7	35.0	1	Negligible
52	26.1	26.4	1	Negligible
53	26.4	26.7	1	Negligible
54	25.3	25.5	1	Negligible
55	25.8	26.1	1	Negligible
56	26.4	26.8	1	Negligible
57	25.7	26.0	1	Negligible
58	26.7	27.0	1	Negligible

Figure 5a: Predicted Annual Mean NO_2 Concentrations at Selected Receptors ($\mu g/m^3$)

Mitigation

Operational Phase

4.4 Traffic generated by the operational development is predicted to result in a negligible impact at receptors located both within and outside the Eastleigh AQMA. No mitigation measures are therefore considered necessary.

5 Conclusions

5.1 An air quality impact assessment has been carried out to assess both construction and operational impacts of the proposed development.

5.2 The ADMS model has been used to predict the impact of the development on local NO_2 concentrations. The modelling has predicted concentrations below the annual mean objective in 2036 both within and outside the Eastleigh AQMA. Traffic generated by the operational development is predicted to increase NO_2 concentrations by up to 2% of the AQAL, which is classed as a negligible impact based on criteria set out within EPUK/IAQM air quality planning guidance.

Appendix A – Air Quality Terminology

Term	Definition
Accuracy	A measure of how well a set of data fits the true value.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. This period avoids splitting winter season between 2 years, which is useful for pollutants that have higher concentrations during the winter months.
AQMA	Air Quality Management Area.
DEFRA	Department for Environment, Food and Rural Affairs.
Exceedence	A period of time where the concentrations of a pollutant is greater than, or equal to, the appropriate air quality standard.
Fugitive emissions	Emissions arising from the passage of vehicles that do not arise from the exhaust system.
LAQM	Local Air Quality Management.
NO	Nitrogen monoxide, a.k.a. nitric oxide.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
O_3	Ozone.
Percentile	The percentage of results below a given value.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
ppb parts per billion	The concentration of a pollutant in the air in terms of volume ratio. A concentration of 1 ppb means that for every billion (10^9) units of air, there is one unit of pollutant present.
ppm parts per million	The concentration of a pollutant in the air in terms of volume ratio. A concentration of 1 ppm means that for every billion (10^6) units of air, there is one unit of pollutant present.
Ratification (Monitoring)	Involves a critical review of all information relating to a data set, in order to amend or reject the data. When the data have been ratified they represent the final data to be used (see also validation).
$\mu g/m^3$ micrograms per cubic metre	A measure of concentration in terms of mass per unit volume. A concentration of 1ug/m3 means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
UKAS	United Kingdom Accreditation Service.
Uncertainty	A measure, associated with the result of a measurement, which characterizes the range of values within which the true value is expected to lie. Uncertainty is usually expressed as the range within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more clearly defined than the closely related parameter 'accuracy', and has replaced it on recent European legislation.
USA	Updating and Screening Assessment.
Validation (modelling)	Refers to the general comparison of modelled results against monitoring data carried out by model developers.
Validation (monitoring)	Screening monitoring data by visual examination to check for spurious and unusual measurements (see also ratification).
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.

Appendix B – Air Quality Standards and Objectives

Air Quality Objectives currently included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the purpose of Local Air Quality Management (LAQM)						
Pollutant	Applies to	Standard		Objective		EU AQ Daughter Directive
		Concentration	*Measured as*	*Annual exceedances allowed*	Target date	
Nitrogen dioxide (NO_2)	All UK	200 µg/m^3	1 hour mean	18	31.12.2005	As objective. target: 01.01.2010
	All UK	40 µg/m^3	annual mean		31.12.2005	As standard. target: 01.01.2010
Particulate Matter (PM_{10}) (gravimetric)	All UK	40 µg/m^3	annual mean		31.12.2004	As standard. target: 01.01.2005
	All UK	50 µg/m^3	24 hour mean	35	31.12.2004	As objective. target: 01.01.2005
	Scotland	50 µg/m^3	24 hour mean	7	31.12.2010	As objective. target: 01.01.2010
	Scotland	18 µg/m^3	annual mean		31.12.2010	

Appendix C – Model Verification

Within AQMA

Most nitrogen dioxide (NO2) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions. Verification of concentrations predicted by the ADMS model has followed the methodology presented in LAQM.TG(16).

The model has been run to predict annual mean road-NOx concentrations at the monitoring sites located adjacent to Leigh Road and Wide Lane.

The model output of road-NOx (i.e. the component of total NOx coming from road traffic) has been compared to the 'measured' road-NOx (Figure C1). The 'measured' road NOx has been calculated from the measured NO2 concentrations by using the DEFRA NOx from NO2 calculator available on the UK-AIR website.

Figure C1: Comparison of Modelled Road NOx with measured Road NOx

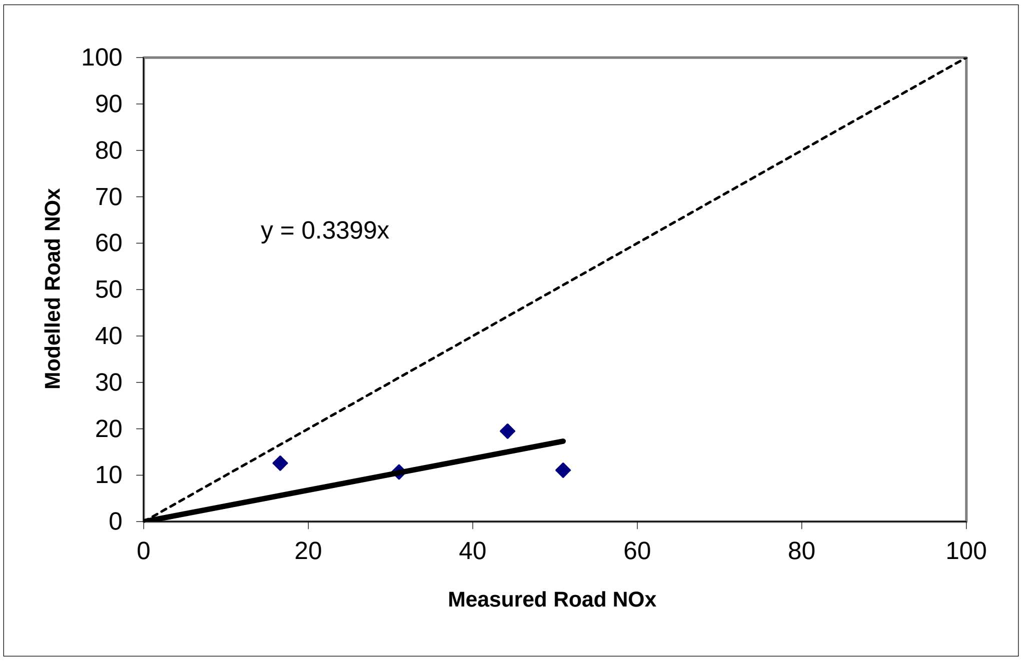
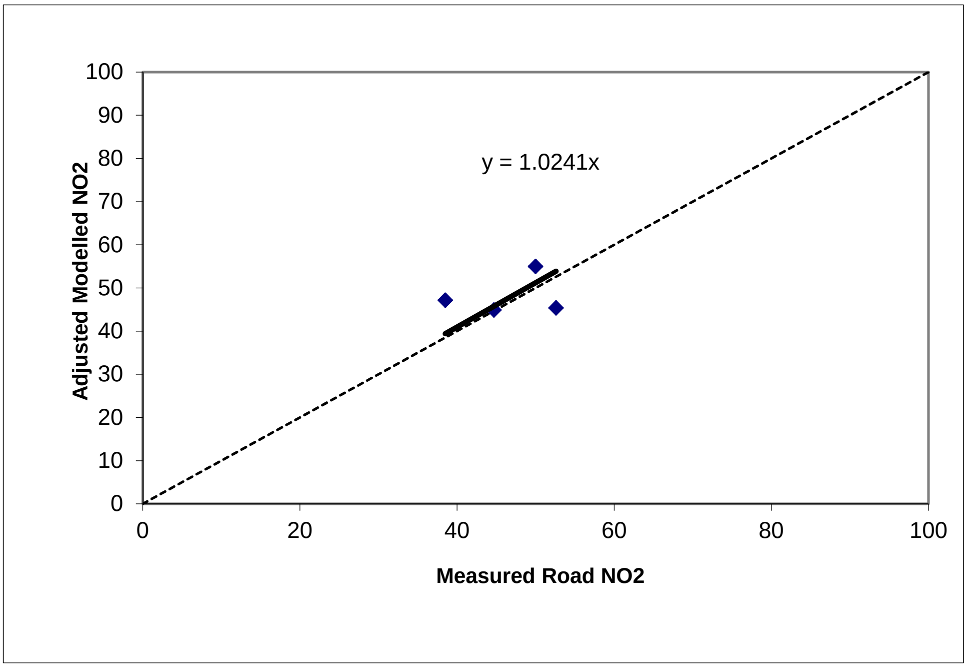


Figure C1 shows that the ADMS model under-predicted the road NOx concentrations at the selected monitoring sites. An adjustment factor was therefore determined as the ratio between the measured road-NOx contribution and the modelled road-NOx contribution, forced through zero (1/0.3399 = 2.94). This factor has then been applied to the modelled road-NOx concentration for each location to provide an adjusted modelled road-NOx concentration.

The annual mean road-NO2 concentration was determined using the DEFRA NOx:NO2 spread sheet calculation tool and added to the background NO2 concentration to produce a total adjusted NO2 concentration.

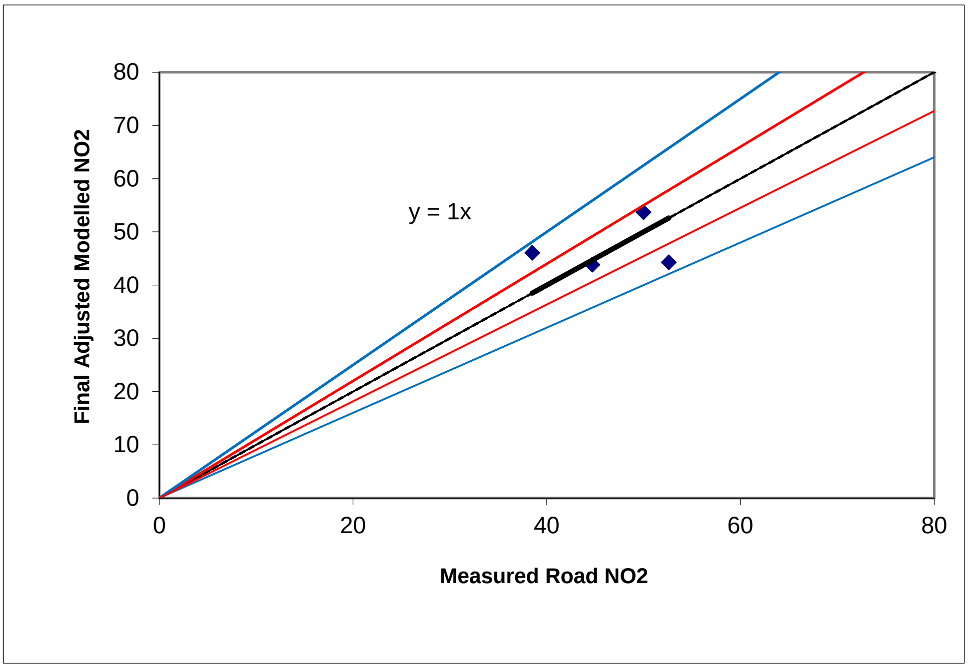
Figure C2 shows the adjusted modelled total NO2 vs monitored NO2. There is good agreement, but the best fit line forced through zero still has a slight departure from a 1:1 line, thus a secondary adjustment factor, to be applied to the adjusted modelled total NO2, was calculated(1/1.0241 = 0.976)..

Figure C2: Comparison of Modelled NO2 with measured NOx



After carrying out an initial adjustment there was a need for only a very small secondary adjustment of NO2. The final adjustment modelled values are shown in Figure C3.

Figure C3: Comparison of Adjusted Modelled NO2 with measured NOx



The adjustment factor of 2.94 has been applied to the modelled NOx-road concentrations predicted within the AQMA. The predicted NO2-road concentrations, calculated using the NOx-NO2 converter tool, have subsequently been added to background NO2 concentrations and adjusted by 0.976 to provide the final predicted annual mean NO2 concentrations at each receptor.

Within AQMA

The model has been run to predict annual mean road-NOx concentrations at the monitoring sites located adjacent to Twyford Lane and Fairoak Road.

Figure C4: Comparison of Modelled Road NOx with measured Road NOx

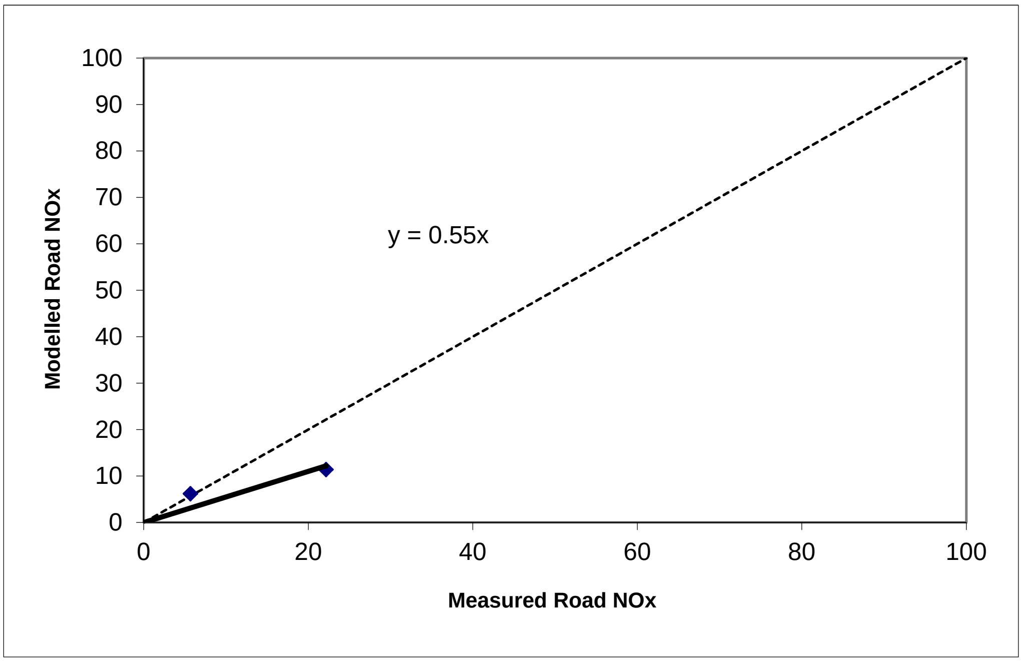
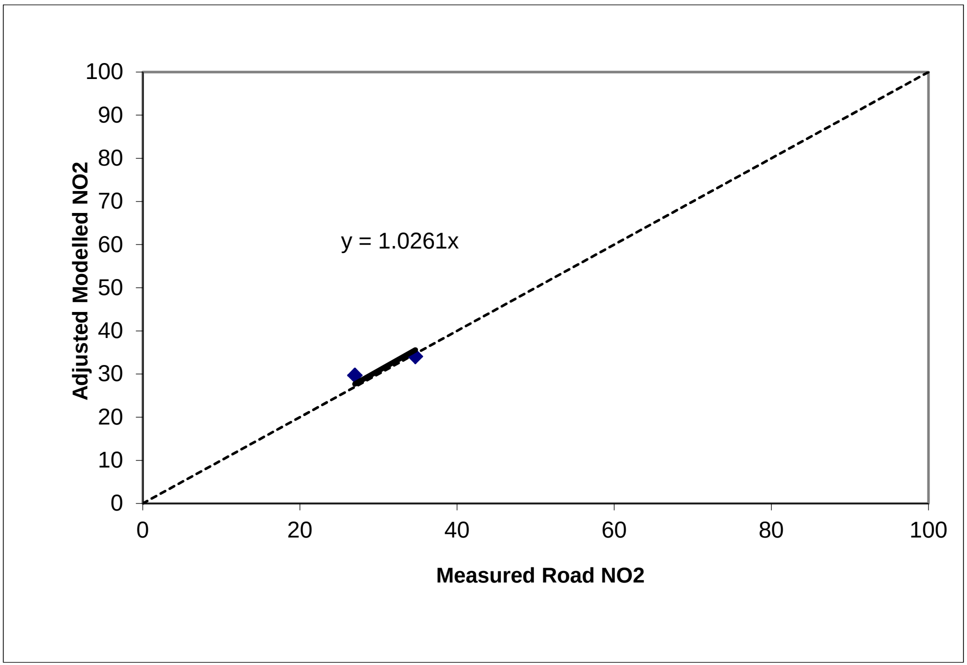


Figure C4 shows that the ADMS model under-predicted the road NOx concentrations at the selected monitoring sites. An adjustment factor was therefore determined as the ratio between the measured road-NOx contribution and the modelled road-NOx contribution, forced through zero (1/0.55 = 1.82). This factor has then been applied to the modelled road-NOx concentration for each location to provide an adjusted modelled road-NOx concentration.

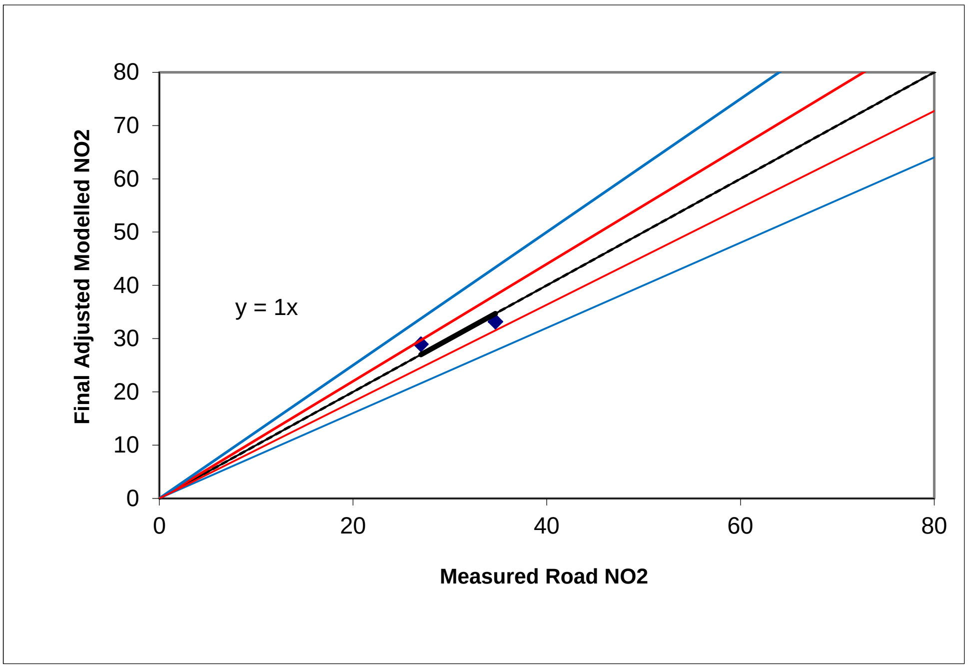
Figure C5 shows the adjusted modelled total NO2 vs monitored NO2. Again, there is good agreement, but the best fit line forced through zero still has a slight departure from a 1:1 line, thus a secondary adjustment factor, to be applied to the adjusted modelled total NO2, was calculated(1/1.0261 = 0.975)..

Figure C5: Comparison of Modelled NO2 with measured NOx



After carrying out an initial adjustment there was a need for only a very small secondary adjustment of NO2. The final adjustment modelled values are shown in Figure C6.

Figure C6: Comparison of Adjusted Modelled NO2 with measured NOx



The adjustment factor of 1.82 has been applied to the modelled NOx-road concentrations predicted outside the AQMA. The predicted NO2-road concentrations, calculated using the NOx-NO2 converter tool, have subsequently been added to background NO2 concentrations and adjusted by 0.975 to provide the final predicted annual mean NO2 concentrations at each receptor.