

Air Quality Assessment
Old Mill Lane, Barnsley

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Executive Summary

Redmore Environmental Ltd was commissioned by Aldi Stores Ltd to undertake an Air Quality Assessment in support of a retail development on land east of Old Mill Lane, Barnsley.

The proposals have the potential to cause air quality impacts as a result of fugitive dust emissions during construction and road traffic exhaust emissions associated with vehicles travelling to and from the site during operation. As such, an Air Quality Assessment was required in order to determine baseline conditions and assess potential effects as a result of the scheme.

Potential construction phase air quality impacts from fugitive dust emissions were assessed as a result of earthworks, construction and trackout activities. It is considered that the use of good practice control measures would provide suitable mitigation for a development of this size and nature and reduce potential impacts to an acceptable level.

Potential impacts during the operational phase of the proposals may occur due to road traffic exhaust emissions associated with vehicles travelling to and from the site. Dispersion modelling was therefore undertaken in order to predict pollutant concentrations at sensitive locations as a result of emissions from the local highway network both with and without the development in place. A sensitivity analysis was also undertaken to allow assessment of development impacts during future year conditions. Results were subsequently verified using local monitoring data.

The results of the dispersion modelling assessment indicated that although an increase in pollutant concentrations was predicted at a small number of sensitive receptors, impacts were not considered to be significant.

A number of mitigation techniques were identified to reduce potential emissions associated with the scheme. These were related to the predicted impacts, as determined in accordance with the relevant best practice guidance.

Based on the assessment results, air quality issues are not considered a constraint to planning consent for the proposals, subject to the inclusion of the stated mitigation measures.

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1.0 INTRODUCTION

1.1 Background

- 1.1.1 Redmore Environmental Ltd was commissioned by Aldi Stores Ltd to undertake an Air Quality Assessment in support of a proposed retail development on land east of Old Mill Lane, Barnsley.
- 1.1.2 The proposed development has the potential to cause air quality impacts at sensitive locations during the construction and operational phases. As such, an Air Quality Assessment was required in order to determine baseline conditions and assess potential effects associated with the scheme.

1.2 Site Location and Context

- 1.2.1 The site is located on land east of Old Mill Lane, Barnsley, at approximate National Grid Reference (NGR): 435192, 407320. Reference should be made to Figure 1 for a map of the site and surrounding area.
- 1.2.2 The proposals comprise the provision of one retail unit, parking and associated infrastructure.
- 1.2.3 The development has the potential to cause impacts at sensitive locations during the construction and operational phases. These may include fugitive dust emissions associated with construction works and road traffic exhaust emissions from vehicles travelling to and from the site during the operational phase. An Air Quality Assessment was therefore undertaken in order to determine baseline conditions and consider potential effects as a result of the proposals. This is detailed in the following report.

2.0 LEGISLATION AND POLICY

2.1 European Directives

2.1.1 European Union (EU) air quality legislation is provided within Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidated previous legislation which was designed to deal with specific pollutants in a consistent manner and provided new Air Quality Limit Values (AQLVs) for particulate matter with an aerodynamic diameter of less than 2.5µm. The consolidated Directives include:

- Directive 99/30/EC - the First Air Quality "Daughter" Directive - sets ambient AQLVs for nitrogen dioxide (NO₂), oxides of nitrogen (NO_x), sulphur dioxide, lead and particulate matter with an aerodynamic diameter of less than 10µm (PM₁₀);
- Directive 2000/69/EC - the Second Air Quality "Daughter" Directive - sets ambient AQLVs for benzene and carbon monoxide; and,
- Directive 2002/3/EC - the Third Air Quality "Daughter" Directive - seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

2.1.2 The fourth daughter Directive was not included within the consolidation and is described as:

- Directive 2004/107/EC - sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

2.2 UK Legislation

2.2.1 The Air Quality Standards Regulations (2010) came into force on 11th June 2010 and transpose EU Directive 2008/50/EC into UK law. AQLVs were published in these regulations for 7 pollutants, as well as Target Values for an additional 5 pollutants.

2.2.2 Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by the Department for

Environment, Food and Rural Affairs (DEFRA) and published in July 2007¹. The AQS sets out Air Quality Objectives (AQOs) that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedences over a specified timescale. These are generally in line with the AQLVs, although the requirements for the determination of compliance vary.

2.2.3 Table 1 presents the AQOs for pollutants considered within this assessment.

Table 1 Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Period
NO ₂	40	Annual mean
	200	1-hour mean, not to be exceeded on more than 18 occasions per annum
PM ₁₀	40	Annual mean
	50	24-hour mean, not to be exceeded on more than 35 occasions per annum

2.2.4 Table 2 summarises the advice provided in DEFRA guidance² on where the AQOs for pollutants considered within this report apply.

Table 2 Examples of Where the Air Quality Objectives Apply

Averaging Period	Objective Should Apply At	Objective Should Not Apply At
Annual mean	All locations where members of the public might be regularly exposed	Building façades of offices or other places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence Gardens of residential properties Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term

¹ The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.

² Local Air Quality Management Technical Guidance (TG16), DEFRA, 2016.

Averaging Period	Objective Should Apply At	Objective Should Not Apply At
24-hour mean	All locations where the annual mean objective would apply, together with hotels Gardens of residential properties	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access

2.3 Local Air Quality Management

- 2.3.1 Under Section 82 of the Environment Act (1995) (Part IV) Local Authorities (LAs) are required to periodically review and assess air quality within their area of jurisdiction under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves comparing present and likely future pollutant concentrations against the AQOs. If it is predicted that levels at locations of relevant exposure, as summarised in Table 2, are likely to be exceeded, the LA is required to declare an Air Quality Management Area (AQMA). For each AQMA the LA is required to produce an Air Quality Action Plan (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.4 Dust

- 2.4.1 The main requirements with respect to dust control from industrial or trade premises not regulated under the Environmental Permitting (England and Wales) Regulations (2010), such as construction sites, is that provided in Section 79 of Part III of the Environmental Protection Act (1990). The Act defines nuisance as:

"any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance."

2.4.2 Enforcement of the Act, in regard to nuisance, is currently under the jurisdiction of the local Environmental Health Department, whose officers are deemed to provide an independent evaluation of nuisance. If the LA is satisfied that a statutory nuisance exists, or is likely to occur or happen again, it must serve an Abatement Notice under Part III of the Environmental Protection Act (1990). Enforcement can insist that there be no dust beyond the boundary of the works. The only defence is to show that the process to which the nuisance has been attributed and its operation are being controlled according to best practice measures.

2.5 National Planning Policy

2.5.1 The National Planning Policy Framework³ (NPPF) was published on 27th March 2012 and sets out the Government's core policies and principles with respect to land use planning, including air quality. The document includes the following considerations which are relevant to the proposed development:

"The planning system should contribute to and enhance the natural and local environment by: [...]

Preventing 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 or land instability"

"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."

2.5.2 The implications of the NPPF have been considered throughout this assessment.

³ NPPF, Department for Communities and Local Government, 2012.

2.6 National Planning Practice Guidance

2.6.1 The National Planning Practice Guidance⁴ (NPPG) web-based resource was launched by the Department for Communities and Local Government on 6th March 2014 to support the NPPF and make it more accessible. The air quality pages are summarised under the following headings:

1. Why should planning be concerned about air quality?
2. What is the role of Local Plans with regard to air quality?
3. Are air quality concerns relevant to neighbourhood planning?
4. What information is available about air quality?
5. When could air quality be relevant to a planning decision?
6. Where to start if bringing forward a proposal where air quality could be a concern?
7. How detailed does an air quality assessment need to be?
8. How can an impact on air quality be mitigated?
9. How do considerations about air quality fit into the development management process?

2.6.2 These were reviewed and the relevant guidance considered as necessary throughout the undertaking of this assessment.

2.7 Local Planning Policy

2.7.1 The Barnsley Metropolitan Borough Council Local Development Plan consists of the Core Strategy, the Barnsley Education Sites Development Plan Document, the Joint Waste Plan and saved policies from the Unitary Development Plan (UDP). The Core Strategy⁵ was adopted in September 2011 and sets out the key elements of the planning framework for Barnsley. Review of the Core Strategy revealed the following policy of relevance to this report:

"CSP 40 Pollution Control and Protection

⁴ <http://planningguidance.planningportal.gov.uk>.

⁵ Core Strategy, Local Development Framework, BMBC, 2011.

Development will be expected to demonstrate that it is not likely to result, directly or indirectly, in an increase in air, surface water and groundwater, noise, smell, dust, vibration, light or other pollution which would unacceptably affect or cause a nuisance to the natural and built environment or to people.

We will not allow development of new housing or other environmentally sensitive development where existing air pollution, noise, smell, dust, vibration, light or other pollution levels are unacceptable and there is no reasonable prospect that these can be mitigated against.

Developers will be expected to minimise the effects of any possible pollution and provide mitigation measures where appropriate."

2.7.2 The Core Strategy supersedes the majority of the UDP⁶. However, some policies from the UDP have been saved until the adoption of the new Local Plan, which is currently in the consultation phase. Review of the UDP saved policies document revealed the following policy of relevance to this report:

"Economic Development and Residential Amenity

Policy ED4

Proposals for economic development adjoin or close to housing will be assessed with particular regard to the likely impact on residential amenity in terms of:

a) Air Pollution, including smell, fumes, smoke, soot, ash, dust or grit.

[...]"

2.7.3 The above policies were taken into consideration throughout the undertaking of the assessment.

⁶ Volume 1: Strategy, Policy and Justification, Barnsley UDP, BMBC, 2000.

3.0 METHODOLOGY

3.1 Introduction

3.1.1 The proposed development has the potential to cause air quality impacts during the construction and operational phases. These have been assessed in accordance with the following methodology, which was agreed via email with Chris Shields, Technical Officer for Pollution Control at BMBC, on 19th May 2016.

3.2 Construction Phase Assessment

3.2.1 There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined within the Institute of Air Quality Management (IAQM) document 'Guidance on the Assessment of Dust from Demolition and Construction'⁷.

3.2.2 Activities on the proposed construction site have been divided into three types to reflect their different potential impacts. These are:

- Earthworks;
- Construction; and,
- Trackout.

3.2.3 The potential for dust emissions was assessed for each activity that is likely to take place and considered three separate dust effects:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and,
- The risk of health effects due to a significant increase in exposure to PM₁₀.

3.2.4 The assessment steps are detailed below.

⁷ Guidance on the Assessment of Dust from Demolition and Construction, IAQM, 2014.

Step 1

- 3.2.5 Step 1 screens the requirement for a more detailed assessment. Should human receptors be identified within 350m from the boundary or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment proceeds to Step 2. Additionally, should ecological receptors be identified within 50m of the site or the construction vehicle route up to 500m from the site entrance, then the assessment also proceeds to Step 2.
- 3.2.6 Should sensitive receptors not be present within the relevant distances then **negligible** impacts would be expected and further assessment is not necessary.

Step 2

- 3.2.7 Step 2 assesses the risk of potential dust impacts. A site is allocated a risk category based on two factors:
- The scale and nature of the works, which determines the magnitude of dust arising as: small, medium or large (Step 2A); and,
 - The sensitivity of the area to dust impacts, which can be defined as low, medium or high sensitivity (Step 2B).
- 3.2.8 The two factors are combined in Step 2C to determine the risk of dust impacts without mitigation applied.
- 3.2.9 Step 2A defines the potential magnitude of dust emission through the construction phase. The relevant criteria are summarised in Table 3.

Table 3 Construction Dust - Magnitude of Emission

Magnitude	Activity	Criteria
Large	Earthworks	• Total site area greater than 10,000m² • Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • More than 10 heavy earth moving vehicles active at any one time • Formation of bunds greater than 8m in height • More than 100,000 tonnes of material moved

Magnitude	Activity	Criteria
	Construction	- Total building volume greater than 100,000m³ - On site concrete batching - Sandblasting
	Trackout	- More than 50 Heavy Duty Vehicle (HDV) trips per day - Potentially dusty surface material (e.g. high clay content) - Unpaved road length greater than 100m
Medium	Earthworks	- Total site area 2,500m² to 10,000m² - Moderately dusty soil type (e.g. silt) 5 to 10 heavy earth moving vehicles active at any one time - Formation of bunds 4m to 8m in height - Total material moved 20,000 tonnes to 100,000 tonnes
	Construction	- Total building volume 25,000m³ to 100,000m³ - Potentially dusty construction material (e.g. concrete) - On site concrete batching
	Trackout	10 to 50 HDV trips per day - Moderately dusty surface material (e.g. high clay content) - Unpaved road length 50m to 100m
Small	Earthworks	- Total site area less than 2,500m² - Soil type with large grain size (e.g. sand) - Less than 5 heavy earth moving vehicles active at any one time - Formation of bunds less than 4m in height - Total material moved less than 20,000 tonnes - Earthworks during wetter months
	Construction	- Total building volume less than 25,000m³ - Construction material with low potential for dust release (e.g. metal cladding or timber)
	Trackout	- Less than 10 HDV trips per day - Surface material with low potential for dust release - Unpaved road length less than 50m

3.2.10 Step 2B defines the sensitivity of the area around the development to potential dust impacts. The influencing factors are shown in Table 4.

Table 4 Construction Dust - Examples of Factors Defining Sensitivity of an Area

Receptor Sensitivity	Examples	
	Human Receptors	Ecological Receptors
High	• Users expect high levels of amenity • High aesthetic or value property • People expected to be present continuously for extended periods of time • Locations where members of the public are exposed over a time period relevant to the AQO for PM₁₀. e.g. residential properties, hospitals, schools and residential care homes	• Internationally or nationally designated site e.g. Special Area of Conservation
Medium	• Users would expect to enjoy a reasonable level of amenity • Aesthetics or value of their property could be diminished by soiling • People or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land e.g. parks and places of work	• Nationally designated site e.g. Sites of Special Scientific Interest
Low	• Enjoyment of amenity would not reasonably be expected • Property would not be expected to be diminished in appearance • Transient exposure, where people would only be expected to be present for limited periods. e.g. public footpaths, playing fields, shopping streets, playing fields, farmland, footpaths, short term car park and roads	• Locally designated site e.g. Local Nature Reserve

3.2.11 The guidance also provides the following factors to consider when determining the sensitivity of an area to potential dust impacts:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;
- Any pre-existing screening between the source and receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which works will take place;
- Any conclusions drawn from local topography;
- Duration of the potential impact, as a receptor may become more sensitive over time; and,

- Any known specific receptor sensitivities which go beyond the classifications given in the document.

3.2.12 These factors were considered in the undertaking of this assessment.

3.2.13 The criteria for determining the sensitivity of the area to dust soiling effects on people and property is summarised in Table 5.

Table 5 Construction Dust - Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 350
High	More than 100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low
	1 - 10	Medium	Low	Low	Low
Medium	More than 1	Medium	Low	Low	Low
Low	More than 1	Low	Low	Low	Low

3.2.14 Table 6 outlines the criteria for determining the sensitivity of the area to human health impacts.

Table 6 Construction Dust - Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
High	Greater than 32µg/m ³	More than 100	High	High	High	Medium	Low
		10 - 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 - 32µg/m ³	More than 100	High	High	Medium	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
	24 - 28µg/m ³	More than 100	High	Medium	Low	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	Less than 24µg/m ³	More than 100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	-	More than 10	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
Low	-	More than 1	Low	Low	Low	Low	Low

3.2.15 Table 7 outlines the criteria for determining the sensitivity of the area to ecological impacts.

Table 7 Construction Dust - Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	Less than 20	Less than 50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

3.2.16 Step 2C combines the dust emission magnitude with the sensitivity of the area to determine the risk of unmitigated impacts.

3.2.17 Table 8 outlines the risk category from earthworks and construction activities.

Table 8 Construction Dust - Dust Risk Category from Earthworks and Construction Activities

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

3.2.18 Table 9 outlines the risk category from trackout activities.

Table 9 Construction Dust - Dust Risk Category from Trackout Activities

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Low	Negligible
Low	Low	Low	Negligible

Step 3

3.2.19 Step 3 requires the identification of site specific mitigation measures within the IAQM guidance⁸ to reduce potential dust impacts based upon the relevant risk categories identified in Step 2. For sites with **negligible** risk, mitigation measures beyond those required by legislation are not required. However, additional controls may be applied as part of good practice.

Step 4

3.2.20 Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step is to determine the significance of any residual impacts. For almost all construction activity, the aim should be to control effects through the use of

⁸ Guidance on the Assessment of Dust from Demolition and Construction, IAQM, 2014.

effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be **not significant**.

3.2.21 The determination of significance relies on professional judgement and reasoning should be provided as far as practicable. The IAQM guidance suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix 2.

3.3 Operational Phase Assessment

3.3.1 The development has the potential to affect existing air quality as a result of road traffic exhaust emissions associated with vehicles travelling to and from the site. Potential impacts have been defined by predicting pollutant concentrations at sensitive locations using dispersion modelling for the following scenarios:

- Verification;
- Opening year Do-Minimum (DM) (predicted traffic flows in 2017 should the proposals not proceed); and,
- Opening year Do-Something (DS) (predicted traffic flows in 2017 should the proposals be completed).

3.3.2 Reference should be made to Appendix 1 for assessment input data and details of the verification process.

3.3.3 Locations sensitive to potential changes in pollutant concentrations were identified within 200m of the highway network in accordance with the guidance provided within the Design Manual for Roads and Bridges (DMRB)⁹ on the likely limits of pollutant dispersion from road sources. The criteria provided within DEFRA guidance¹⁰ on where the AQOs apply, as summarised in Table 2, was utilised to determine appropriate receptor positions.

3.3.4 The significance of predicted air quality impacts was determined in accordance with the guidance provided within the IAQM document 'Land-Use Planning & Development Control: Planning for Air Quality'¹¹. Using this methodology impacts were defined based

⁹ DMRB Volume 11, Section 3, Part 1, HA207/07, Highways Agency, 2007.

¹⁰ Local Air Quality Management Technical Guidance (TG16), DEFRA, 2016.

¹¹ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2015.

on the interaction between the predicted pollutant concentration from the DS scenario and the magnitude of change between the DM and DS scenarios, as outlined in Table 10.

Table 10 Significance of Impact

Concentration at Receptor in Assessment Year	Predicted Concentration Change as Proportion of AQO (%)			
	1	2 - 5	6 - 10	> 10
75% or less of AQO	Negligible	Negligible	Slight	Moderate
76 - 94% of AQO	Negligible	Slight	Moderate	Moderate
95 - 102% of AQO	Slight	Moderate	Moderate	Substantial
103 - 109% of AQO	Moderate	Moderate	Substantial	Substantial
110% or more of AQO	Moderate	Substantial	Substantial	Substantial

3.3.5 The matrix shown in Table 10 is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which makes it clearer which cell the impact falls within. It should be noted that changes of 0%, i.e. less than 0.5%, are described as **negligible**.

3.3.6 Following the prediction of impacts at discrete receptor locations, the IAQM document¹² provides guidance on determining the overall air quality impact significance of the operation of a development. The following factors are identified for consideration by the assessor:

- The existing and future air quality in the absence of the development;
- The extent of current and future population exposure to the impacts; and,
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

3.3.7 The IAQM guidance states that an assessment must reach a conclusion on the likely significance of the predicted impact. It should be noted that this is a binary judgement of either **significant** or **not significant**. The determination of significance relies on professional judgement and reasoning has been provided as far as practicable. The IAQM guidance¹³

¹² Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2015.

¹³ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2015.

suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix 2.

4.0 BASELINE

4.1 Introduction

- 4.1.1 Existing air quality conditions in the vicinity of the proposed development site were identified in order to provide a baseline for assessment. These are detailed in the following Sections.

4.2 Local Air Quality Management

- 4.2.1 As required by the Environment Act (1995), BMBC has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that annual mean concentrations of NO₂ are above the AQO within the borough. Eight AQMAs have therefore been declared, with the closest to the development described as:

"An area encompassing the junction of the A61 Wakefield Road and Burton Road"

- 4.2.2 The development is located approximately 100m south of the AQMA. As such, there is the potential for vehicles travelling to and from the site to increase pollution levels in this sensitive area. This has been considered throughout the assessment.

- 4.2.3 Two further AQMAs are located less than 1.0km south and east of the development, respectively. These are described as:

"An area encompassing the southbound carriageway of the A61 Harborough Hill Road from the "PC World" gyratory to the southbound slip road of the A61 near to its junction with Queens Road."

- 4.2.4 And;

"An area encompassing the junction of Rotherham Road and Burton Road."

- 4.2.5 Due to the proximity of these locations to the development, both AQMAs were also taken into consideration during the undertaking of the assessment.

- 4.2.6 BMBC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs. As such, no further AQMAs have been designated.

4.3 Air Quality Monitoring

- 4.3.1 Monitoring of pollutant concentrations is undertaken by BMBC using continuous and periodic methods throughout their area of jurisdiction. Recent results from sites in the vicinity of the development are shown in Table 11.

Table 11 Monitoring Results

Monitoring Site		Monitored NO ₂ Concentration (µg/m ³)	
		2014	2015
DT37	Wakefield Road - opposite Burton Road junction	32.8	30.58
DT38	Wakefield Road - opposite Burton Road junction	33.8	31.20
DT39	Wakefield Road - Burton Road junction	33.4	32.77
DT43	Old Mill Lane/Honeywell Street	44.0	41.48
DT44	Old Mill Lane/Eldon Street	36.2	34.15
DT46	Burton Road - opposite Wakefield Road junction	27.5	- (b)
DT47	Burton Road - opposite Wakefield Road junction	23.8	25.55
DT95	40 Harborough Hill Road	- (a)	67.41
DT100	Harborough Hill Road - near to bakery	68.1	65.02
DT101	Harborough Hill Road/Meadow Street	37.6	34.58
DT102	Harborough Hill Road/Redfearn	38.2	34.60
DT103	Harborough Hill	42.5	42.96

NOTE: (a) Insufficient data capture for annualisation at this location

(b) Data was not provided for this location

- 4.3.2 As shown in Table 11, annual mean NO₂ concentrations were above the AQO at several monitoring sites in recent years. Reference should be made to Figure 2 for a map of the diffusion tube locations.

4.4 **Background Pollutant Concentrations**

- 4.4.1 Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist LAs in their Review and Assessment of air quality. The proposed development site is located in grid square NGR: 435500, 407500. Data for this location was downloaded from the DEFRA website¹⁴ for the purpose of the assessment and is summarised in Table 12.

Table 12 Background Pollutant Concentration Predictions

Pollutant	Predicted Background Pollutant Concentration ($\mu\text{g}/\text{m}^3$)		
	2015	2016	2017
NO ₂	19.96	19.38	18.80
PM ₁₀	16.66	16.52	16.38

- 4.4.2 As shown in Table 12, predicted background NO₂ and PM₁₀ concentrations are below the relevant AQOs at the development site.

4.5 **Sensitive Receptors**

- 4.5.1 A sensitive receptor is defined as any location which may be affected by changes in air quality as a result of a development. These have been defined for dust and road vehicle exhaust emission impacts in the following Sections.

Construction Phase Sensitive Receptors

- 4.5.2 Receptors sensitive to potential dust impacts during earthworks and construction were identified from a desk-top study of the area up to 350m from the development boundary. These are summarised in Table 13.

¹⁴ <http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2011>.

Table 13 Earthworks and Construction Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Up to 20	1 - 10	1
Up to 50	1 - 10	1
Up to 100	10 - 100	-
Up to 350	More than 100	-

- 4.5.3 Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 50m from the road network within 500m of the site access. These are summarised in Table 14. For the purpose of the assessment it was assumed construction phase traffic would access the site from Old Tannery Road.

Table 14 Trackout Dust Sensitive Receptors

Distance from Site Access Route (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Up to 20	10 - 100	1
Up to 50	More than 100	1

- 4.5.4 A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in Table 15.

Table 15 Additional Area Sensitivity Factors

Guidance	Comment
Whether there is any history of dust generating activities in the area	The desk top study did not indicate any dust generating activities in the local area
The likelihood of concurrent dust generating activity on nearby sites	A review of the planning portal did not indicate any additional development proposals likely to result in concurrent dust generation in the vicinity of the site
Pre-existing screening between the source and the receptors	There is no significant screening around the site boundary
Conclusions drawn from analysing local meteorological data which accurately represent the area: and if relevant the season during which works will take place	As shown in Figure 3, the predominant wind bearing at the site is from the south-west. As such, receptors to the north-east of the site are most likely to be affected by dust releases

Guidance	Comment
Conclusions drawn from local topography	There are no significant topographical constraints to dust dispersion
Duration of the potential impact, as a receptor may become more sensitive over time	Currently it is unclear as to the duration of the construction phase. However, it is possible that it will extend over one year
Any known specific receptor sensitivities which go beyond the classifications given in the document.	No specific receptor sensitivities identified during the baseline

4.5.5 Based on the criteria shown in Table 4, the sensitivity of people to dust soiling and health effects to was determined as **high**. This was because users would expect to enjoy a reasonable level of amenity, aesthetics or value of their property could be diminished by soiling and people would be expected to be present for extended periods of time e.g. residential properties.

4.5.6 Based on the criteria shown in Table 4, the sensitivity of receptors to ecological affects was determined as **low**. This was because the identified receptor is a Local Nature Reserve (LNR).

4.5.7 The sensitivity of the receiving environment to specific potential dust impacts, based on the criteria shown in Section 3.2, is shown in Table 16.

Table 16 Sensitivity of the Surrounding Area

Potential Impact	Sensitivity of the Surrounding Area		
	Earthworks	Construction	Trackout
Dust Soiling	Medium	Medium	High
Human Health	Low	Low	Low
Ecological	Low	Low	Low

Operational Phase Sensitive Receptors

4.5.8 Locations sensitive to potential operational phase road vehicle exhaust emission impacts were identified from a desk-top study and are summarised in Table 17. Receptors were selected within, or in close proximity to, the AQMAs within the modelling area in order to assess impacts at these particularly sensitive locations.

Table 17 Road Vehicle Exhaust Emission Sensitive Receptor Locations

Receptor		NGR (m)	
		X	Y
R1	Residential - Wakefield Road	435097.0	407777.9
R2	Residential - Wakefield Road	435092.5	407676.8
R3	Residential - Wakefield Road Burton Road Junction	435178.1	407502.6
R4	School - Burton Road	435265.3	407419.8
R5	Residential - Burton Road	435360.2	407370.0
R6	Residential - Burton Road	435462.3	407327.5
R7	Residential - Burton Road	435335.6	407353.9
R8	Residential - Canal Street	434896.9	407081.3
R9	Residential - Twibell Street	435048.4	407032.0
R10	Residential - Meadows	434952.8	406985.0
R11	Residential - Old Mill Lane	434783.9	407012.3
R12	Residential - Old Mill Lane	434640.4	406923.9
R13	Residential - Harborough Hill Road	434985.1	406844.9
R14	Residential - Harborough Hill Road	434956.6	406754.5
R15	Residential - Harborough Hill Road	434971.5	406903.0
R16	Residential - Wakefield Road	435145.9	407573.7
R17	Residential - Rotherham Road/Burton Road Junction	436062.2	407322.9
R18	Residential - Rotherham Road/Burton Road Junction	436102.2	407322.2
R19	Residential - Rotherham Road	435829.8	407717.6

4.5.9 The sensitive receptors identified in Table 17 represent worst-case locations. However, this is not an exhaustive list and there may be other locations within the vicinity of the site that may experience air quality impacts as a result of the proposals that have not been individually identified above. Reference should be made to Figure 4 for a graphical representation of road vehicle exhaust emission sensitive receptor locations.

5.0 ASSESSMENT

5.1 Introduction

- 5.1.1 There is the potential for air quality impacts as a result of the construction and operation of the proposed development. These are assessed in the following Sections.

5.2 Construction Phase Assessment

Step 1

- 5.2.1 The undertaking of activities such as excavation, ground works, cutting, construction, concrete batching and storage of materials has the potential to result in fugitive dust emissions throughout the construction phase. Vehicle movements both on-site and on the local road network also have the potential to result in the re-suspension of dust from haul road and highway surfaces.
- 5.2.2 The potential for impacts at sensitive locations depends significantly on local meteorology during the undertaking of dust generating activities, with the most significant effects likely to occur during dry and windy conditions.
- 5.2.3 The desk-study undertaken to inform the baseline identified a number of sensitive receptors within 350m of the site boundary. As such, a detailed assessment of potential dust impacts was required.

Step 2

Earthworks

- 5.2.4 Earthworks will primarily involve excavating material, haulage, tipping and stockpiling, as well as site levelling and landscaping. The proposed development site is estimated to cover an area between 2,500m² and 10,000m². In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from earthworks is therefore **medium**.

5.2.5 Table 16 indicates the sensitivity of the area to dust soiling effects on people and property is **medium**. In accordance with the criteria outlined in Table 8, the development is considered to be a **medium** risk site for dust soiling as a result of earthworks activities.

5.2.6 Table 16 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 8, the development is considered to be a **low** risk site for human health as a result of earthwork activities.

5.2.7 Table 16 indicates the sensitivity of the area to ecological impacts is **low**. In accordance with the criteria outlined in Table 8, the development is considered to be a **low** risk site for ecological impacts as a result of earthwork activities.

Construction

5.2.8 Due to the size of the development site the total building volume is likely to be between 25,000m³ and 100,000m³. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from construction is therefore **medium**.

5.2.9 Table 16 indicates the sensitivity of the area to dust soiling effects on people and property is **medium**. In accordance with the criteria outlined in Table 8, the development is considered to be a **medium** risk site for dust soiling as a result of construction activities.

5.2.10 Table 16 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 8, the development is considered to be a **low** risk site for human health as a result of construction activities.

5.2.11 Table 16 indicates the sensitivity of the area to ecological impacts is **low**. In accordance with the criteria outlined in Table 8, the development is considered to be a **low** risk site for ecological impacts as a result of construction activities.

Trackout

5.2.12 Information on the number of HDV trips to be generated during the construction phase of the development was not available at the time of assessment. Similarly, the surface material and unpaved road length was not known at this stage of the project.

- 5.2.13 Based on the site area, it is anticipated that the unpaved road length will be less than 50m. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from trackout is therefore **small**.
- 5.2.14 Table 16 indicates the sensitivity of the area to dust soiling effects to people and property is **high**. In accordance with the criteria outlined in Table 9, the development is considered to be a **low** risk site for dust soiling as a result of trackout activities.
- 5.2.15 Table 16 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **negligible** risk site for human health as a result of trackout activities.
- 5.2.16 Table 16 indicates the sensitivity of the area to ecological impacts is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **negligible** risk site for ecological impacts as a result of trackout activities.

Summary of the Risk of Dust Effects

- 5.2.17 A summary of the risk from each dust generating activity is provided in Table 18.

Table 18 Summary of Potential Unmitigated Dust Risks

Potential Impact	Risk		
	Earthworks	Construction	Trackout
Dust Soiling	Medium	Medium	Low
Human Health	Low	Low	Negligible
Ecological	Low	Low	Negligible

- 5.2.18 As indicated in Table 18, the potential risk of dust soiling is **medium** from earthworks and construction and **low** from trackout. The potential risk of human health effects and ecological impacts is **low** from earthworks and construction and **negligible** from trackout.
- 5.2.19 It should be noted that the potential for impacts depends significantly on the distance between the dust generating activity and receptor location. Risk was predicted based on a worst-case scenario of works being undertaken at the site boundary closest to each

sensitive area. Therefore, actual risk is likely to be lower than that predicted during the majority of the construction phase.

Step 3

5.2.20 The IAQM guidance¹⁵ provides potential mitigation measures to reduce impacts as a result of fugitive dust emissions during the construction phase. These have been adapted for the development site as summarised in Table 19.

Table 19 Fugitive Dust Emission Mitigation Measures

Issue	Control Measure
Communications	• Develop and implement a stakeholder communications plan that includes community engagement before work commences on site • Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager • Display the head or regional office contact information
Site management	• Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken • Make the complaints log available to the LA upon request • Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book
Monitoring	• Undertake daily on-site and off-site inspection to monitor dust, record inspection results, and make the log available to the LA upon request • Increase the frequency of site inspections when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions
Site preparation	• Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible • Fully enclose specific operations where there is a high potential for dust production and they are active for an extensive period • Avoid site runoff of water or mud • Keep site fencing, barriers and scaffolding clean using wet methods • Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used • Cover, seed or fence stockpiles to prevent wind whipping

¹⁵ Guidance on the Assessment of Dust from Demolition and Construction, IAQM, 2014.

Issue	Control Measure
Operating vehicle/machinery and sustainable travel	• Ensure all vehicles switch off engines when stationary - no idling vehicles • Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable • Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas
Operations	• Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques • Ensure an adequate water supply on the site for effective dust suppression, using non-potable water where possible and appropriate • Use enclosed chutes and conveyors and covered skips • Minimise drop heights and use fine water sprays wherever appropriate • Ensure equipment is available to clean any dry spillages, and clean up spillages as soon as reasonably practicable using wet cleaning methods
Waste management	• Avoid bonfires and burning of waste materials
Earthworks	• Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable • Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil as soon as practicable
Construction	• Avoid scabbling (roughening of concrete surfaces) if possible • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out • Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos
Trackout	• Use water-assisted dust sweeper on access and local roads • Avoid dry sweeping of large areas • Ensure vehicles entering and leaving site are covered to prevent escape of materials • Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable • Implement a wheel washing system • Access gates to be located at least 10m from receptors where possible

Step 4

5.2.21 Assuming the relevant mitigation measures outlined in Table 19 are implemented, the residual impacts from all dust generating activities is predicted to be **not significant**, in accordance with IAQM guidance¹⁶.

5.3 Operational Phase Assessment

5.3.1 Vehicle movements associated with the operation of the proposal will generate exhaust emissions on the local and regional road networks. An assessment was therefore undertaken using dispersion modelling in order to quantify potential changes in pollutant concentrations at sensitive locations in the vicinity of the site.

5.3.2 The assessment considered the following scenarios:

- 2015 - Verification;
- 2017 - DM; and,
- 2017 - DS.

5.3.3 The DM (i.e. without development) scenario included predicted baseline traffic data, inclusive of anticipated growth, for the relevant assessment year. The DS scenario (i.e. with development) included predicted baseline traffic data, inclusive of anticipated growth, for the relevant assessment year in addition to traffic associated with the operation of the development.

Worst Case Assessment

5.3.4 For the purpose of the assessment traffic data for 2017 was utilised as the development opening year. Air quality is predicted to improve in the future. However, in order to provide a robust assessment, emission factors and background concentrations for 2015 were utilised within the dispersion model. The use of 2017 traffic data and 2015 emission factors is considered to provide a worst-case scenario and therefore predicted pollution concentrations are likely to overestimate actual levels during the operation of the development.

¹⁶ Guidance on the Assessment of Dust from Demolition and Construction, IAQM, 2014.

5.3.5 Reference should be made to Appendix 1 for full assessment input details.

Predicted Concentrations

5.3.6 Annual mean NO₂ concentrations were predicted at the sensitive receptor locations for the DM and DS scenarios. These are summarised in Table 20.

Table 20 Predicted Annual Mean NO₂ Concentrations

Receptor		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		DM	DS	Change
R1	Residential - Wakefield Road	40.79	41.09	0.30
R2	Residential - Wakefield Road	40.07	40.36	0.29
R3	Residential - Wakefield Road Burton Road Junction	35.68	35.92	0.24
R4	School - Burton Road	26.74	26.94	0.20
R5	Residential - Burton Road	29.81	30.06	0.25
R6	Residential - Burton Road	37.18	37.46	0.28
R7	Residential - Burton Road	29.06	29.29	0.23
R8	Residential - Canal Street	36.34	36.49	0.15
R9	Residential - Twibell Street	41.86	42.05	0.19
R10	Residential - Meadows	33.95	34.07	0.12
R11	Residential - Old Mill Lane	40.05	40.27	0.22
R12	Residential - Old Mill Lane	32.88	33.03	0.15
R13	Residential - Harborough Hill Road	43.37	43.56	0.19
R14	Residential - Harborough Hill Road	43.34	43.53	0.19
R15	Residential - Harborough Hill Road	39.49	39.66	0.17
R16	Residential - Wakefield Road	38.04	38.31	0.27
R17	Residential - Rotherham Road/Burton Road Junction	41.00	41.21	0.21
R18	Residential - Rotherham Road/Burton Road Junction	38.15	38.26	0.11

Receptor		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		DM	DS	Change
R19	Residential - Rotherham Road	27.68	27.77	0.09

5.3.7 As indicated in Table 20, predicted annual mean NO₂ concentrations were below the relevant AQO at 12 receptors and above the AQO at 7 locations. It should be noted that there were no new exceedences in the DS scenario when compared with the DM.

5.3.8 Reference should be made to Figure 5 and Figure 6 for graphical representations of annual mean NO₂ concentrations across the assessment area for the DM and DS scenarios, respectively.

Predicted Impacts

5.3.9 Predicted impacts on annual mean NO₂ concentrations at the sensitive receptor locations are summarised in Table 21.

Table 21 Predicted Impacts

Receptor		Predicted Annual Mean NO ₂ Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R1	Residential - Wakefield Road	103 - 109% of AQO	1	Moderate
R2	Residential - Wakefield Road	95 - 102% of AQO	1	Slight
R3	Residential - Wakefield Road Burton Road Junction	76 - 94% of AQO	1	Negligible
R4	School - Burton Road	Below 75% of AQO	1	Negligible
R5	Residential - Burton Road	76 - 94% of AQO	1	Negligible
R6	Residential - Burton Road	76 - 94% of AQO	1	Negligible
R7	Residential - Burton Road	Below 75% of AQO	1	Negligible
R8	Residential - Canal Street	76 - 94% of AQO	0	Negligible
R9	Residential - Twibell Street	103 - 109% of AQO	0	Negligible
R10	Residential - Meadows	76 - 94% of AQO	0	Negligible

Receptor		Predicted Annual Mean NO ₂ Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R11	Residential - Old Mill Lane	95 - 102% of AQO	1	Slight
R12	Residential - Old Mill Lane	76 - 94% of AQO	0	Negligible
R13	Residential - Harborough Hill Road	103 - 109% of AQO	0	Negligible
R14	Residential - Harborough Hill Road	103 - 109% of AQO	0	Negligible
R15	Residential - Harborough Hill Road	95 - 102% of AQO	0	Negligible
R16	Residential - Wakefield Road	95 - 102% of AQO	1	Slight
R17	Residential - Rotherham Road/Burton Road Junction	103 - 109% of AQO	1	Moderate
R18	Residential - Rotherham Road/Burton Road Junction	95 - 102% of AQO	0	Negligible
R19	Residential - Rotherham Road	Below 75% of AQO	0	Negligible

5.3.10 As indicated in Table 21, impacts on annual mean NO₂ concentrations as a result of the proposed development were predicted to be **negligible** at 14 receptors, **slight** at three locations and **moderate** at two receptors. It should be noted that the predicted change in concentration as a proportion of the AQO was 1% or less at all positions.

Sensitivity Analysis

5.3.11 The use of 2015 emission factors and background concentrations provides a worst case method to determine the impacts of the development. However, air quality is predicted to improve in the future and therefore a sensitivity analysis was undertaken in order to further assess the influence of the proposals.

5.3.12 The sensitivity analysis involved the use of 2017 traffic data, 2017 emission factors and 2017 background pollutant concentrations. This method of assessment therefore utilises currently available predictions from DEFRA for anticipated future year conditions.

5.3.13 Reference should be made to Appendix 1 for full assessment input details.

Predicted Concentrations

5.3.14 Annual mean NO₂ concentrations were predicted at the sensitive receptor locations for the DM and DS scenarios. These are summarised in Table 22.

Table 22 Predicted Annual Mean NO₂ Concentrations - Sensitivity Analysis

Receptor		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		DM	DS	Change
R1	Residential - Wakefield Road	36.78	37.04	0.26
R2	Residential - Wakefield Road	36.16	36.41	0.25
R3	Residential - Wakefield Road Burton Road Junction	32.37	32.59	0.22
R4	School - Burton Road	24.71	24.88	0.17
R5	Residential - Burton Road	27.35	27.56	0.21
R6	Residential - Burton Road	33.66	33.90	0.24
R7	Residential - Burton Road	26.69	26.89	0.20
R8	Residential - Canal Street	32.75	32.88	0.13
R9	Residential - Twibell Street	37.41	37.58	0.17
R10	Residential - Meadows	30.64	30.73	0.09
R11	Residential - Old Mill Lane	35.99	36.18	0.19
R12	Residential - Old Mill Lane	29.80	29.92	0.12
R13	Residential - Harborough Hill Road	37.96	38.12	0.16
R14	Residential - Harborough Hill Road	37.88	38.04	0.16
R15	Residential - Harborough Hill Road	35.18	35.33	0.15
R16	Residential - Wakefield Road	34.41	34.64	0.23
R17	Residential - Rotherham Road/Burton Road Junction	36.87	37.04	0.17
R18	Residential - Rotherham Road/Burton Road Junction	34.46	34.55	0.09
R19	Residential - Rotherham Road	25.34	25.42	0.08

5.3.15 As indicated in Table 22, predicted annual mean NO₂ concentrations were below the relevant AQO at all sensitive receptors in both scenarios.

Predicted Impacts

5.3.16 Predicted impacts on annual mean NO₂ concentrations at the sensitive receptor locations are summarised in Table 23.

Table 23 Predicted Impacts - Sensitivity Analysis

Receptor		Predicted Annual Mean NO ₂ Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R1	Residential - Wakefield Road	76 - 94% of AQO	1	Negligible
R2	Residential - Wakefield Road	76 - 94% of AQO	1	Negligible
R3	Residential - Wakefield Road Burton Road Junction	76 - 94% of AQO	1	Negligible
R4	School - Burton Road	Below 75% of AQO	0	Negligible
R5	Residential - Burton Road	Below 75% of AQO	1	Negligible
R6	Residential - Burton Road	76 - 94% of AQO	1	Negligible
R7	Residential - Burton Road	Below 75% of AQO	0	Negligible
R8	Residential - Canal Street	76 - 94% of AQO	0	Negligible
R9	Residential - Twibell Street	76 - 94% of AQO	0	Negligible
R10	Residential - Meadows	76 - 94% of AQO	0	Negligible
R11	Residential - Old Mill Lane	76 - 94% of AQO	0	Negligible
R12	Residential - Old Mill Lane	Below 75% of AQO	0	Negligible
R13	Residential - Harborough Hill Road	95 - 102% of AQO	0	Negligible
R14	Residential - Harborough Hill Road	95 - 102% of AQO	0	Negligible
R15	Residential - Harborough Hill Road	76 - 94% of AQO	0	Negligible
R16	Residential - Wakefield Road	76 - 94% of AQO	1	Negligible
R17	Residential - Rotherham Road/Burton Road Junction	76 - 94% of AQO	0	Negligible

Receptor		Predicted Annual Mean NO ₂ Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R18	Residential - Rotherham Road/Burton Road Junction	76 - 94% of AQO	0	Negligible
R19	Residential - Rotherham Road	Below 75% of AQO	0	Negligible

5.3.17 As indicated in Table 23, impacts on annual mean NO₂ concentrations as a result of the proposed development were predicted to be **negligible** at all receptor locations when using 2017 background concentrations and emission rates.

Barnsley Air Quality and Emissions Good Practice Guidance

5.3.18 BMBC have produced Air Quality and Emissions Good Practice Planning Guidance¹⁷ which includes direction on when an air quality assessment will be required and the associated scope of works. The recommendations outlined in the document were applied as necessary throughout the assessment.

5.3.19 The guidance provides a methodology for determining the scale of a development as minor, medium or major and the required air quality mitigation for the relevant banding. Review of the relevant criteria indicated the proposals were classified as **medium**, as it meets the requirement shown in Table 24.

Table 24 Development Classification Requirement

Land Use	Description
Food Retail (A1)	Retail sale of food goods to the public - supermarkets, superstore, convenience food store

5.3.20 The triggers for **major** development classification and associated response are summarised in Table 25.

¹⁷ Air Quality and Emissions Good Practice Planning Guidance, BMBC, 2014.

Table 25 Major Development Classification

Guidance	Comment
Where the proposed development falls within the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 2011 and includes air quality and/or transport as a specific likely impact	The proposals are not subject to an Environmental Impact Assessment (EIA)
Proposals located within the area identified in Map 1	Although the development is located adjacent to the area highlighted in Map 1, it does not appear to be within it
Proposals that include additional Heavy Goods Vehicle (HGV) movements by more than 10% of total trips.	The proposals are not anticipated to result in HGV movements in excess of 10% of total trips
Where significant demolition and construction works are proposed	The area of development is relatively small and sufficient measures will be put in place to mitigate construction dust

5.3.21 As shown in Table 25, the proposals do not meet any of the triggers for **major** development classification. As such, the scheme was determined as **medium**, in accordance with the Barnsley guidance¹⁸.

Mitigation

5.3.22 The document provides a number of mitigation options that should be included on all **medium** scale developments. These include the following:

- Inclusion of electric vehicle charging points;
- Provision of a Travel Plan;
- Provision of secure cycle storage;
- Consider air quality in the site design and layout; and,
- Include use of green infrastructure.

5.3.23 It is confirmed the above mitigation measures have been included within the development.

¹⁸ Air Quality and Emissions Good Practice Planning Guidance, BMBC, 2014.

Overall Impact Significance

5.3.24 The overall significance of operational phase road traffic emission impacts was determined as **slight**. This was based on the overall predicted impacts at discrete receptor locations when considered in the context of the worst case assessment and sensitivity analysis, the proposed mitigation measures and the considerations outlined in Section 3.3. Further justification is provided in Table 26.

Table 26 Overall Impact Significance

Guidance	Comment
The existing and future air quality in the absence of the development	Predicted annual mean NO ₂ concentrations were above the relevant AQO at several locations in the absence of the development. This is consistent with recent monitoring data from the area. The sensitivity analysis revealed that with improvements in technology and the associated reduction in vehicle emissions, concentrations at all receptors are predicted to drop below the relevant AQO by 2017
The extent of current and future population exposure to the impacts	The development is not predicted to affect the population exposed to exceedences of the AQOs as slight and moderate impacts were only predicted in locations where concentrations were already above the AQO. Further to this, emissions generated by development traffic will not result in any new exceedences in the DS scenario when compared with the DM
The influence and validity of any assumptions adopted when undertaking the prediction of impacts	The assessment included both worst-case and sensitivity analysis methodologies in order to obtain a full understanding of potential road vehicle exhaust emission impacts The assessment assumed that all trips generated by the development were new. However, it is possible that a proportion of traffic generated by the scheme will be a redistribution of existing traffic travelling elsewhere to purchase groceries Due to the adopted assumptions it is considered the presented results are sufficiently robust for an assessment of this nature
Other notes	The predicted change in pollution levels was 1% of the AQO or less at all receptor locations. This level of impact is considered to be within annual variations

5.3.25 The IAQM guidance¹⁹ states that only if the impact is greater than **slight**, the effect is considered significant. As impacts were predicted to be **slight**, overall effects are considered **not significant**, in accordance with the stated methodology.

¹⁹ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2015.

6.0 CONCLUSION

- 6.1.1 Redmore Environmental Ltd was commissioned by Aldi Stores Ltd to undertake an Air Quality Assessment in support of a proposed retail development on land east of Old Mill Lane, Barnsley.
- 6.1.2 The proposals have the potential to cause air quality impacts as a result of construction and operational phase activities. An Air Quality Assessment was therefore undertaken to assess potential effects at sensitive locations in the vicinity of the site.
- 6.1.3 During the construction phase of the development there is the potential for air quality impacts as a result of fugitive dust emissions from the site. These were assessed in accordance with the IAQM methodology. Assuming good practice dust control measures are implemented, the residual significance of potential air quality impacts from dust generated by earthworks, construction and trackout activities was predicted to be **not significant**.
- 6.1.4 Potential impacts during the operational phase of the proposed development may occur due to road traffic exhaust emissions associated with vehicles travelling to and from the site. An assessment was therefore undertaken using detailed dispersion modelling to quantify NO₂ concentrations both with and without the proposals under worst-case conditions. A sensitivity analysis was also undertaken in order to quantify the impacts of the development when considering future reductions in background pollutant concentrations and vehicle emissions.
- 6.1.5 The worst case assessment indicated that impacts on NO₂ concentrations as a result of operational phase road vehicle exhaust emissions were predicted to be **negligible** at 14 receptors, **slight** at three locations and **moderate** at two receptors.
- 6.1.6 The sensitivity analysis indicated that impacts on NO₂ concentrations as a result of operational phase road vehicle exhaust emissions were predicted to be **negligible** at all receptors.
- 6.1.7 A number of mitigation options were identified in order to reduce vehicle exhaust emissions associated with the development. Based on the range of predicted impacts, as well as the proposed control techniques, the overall significance of potential air quality

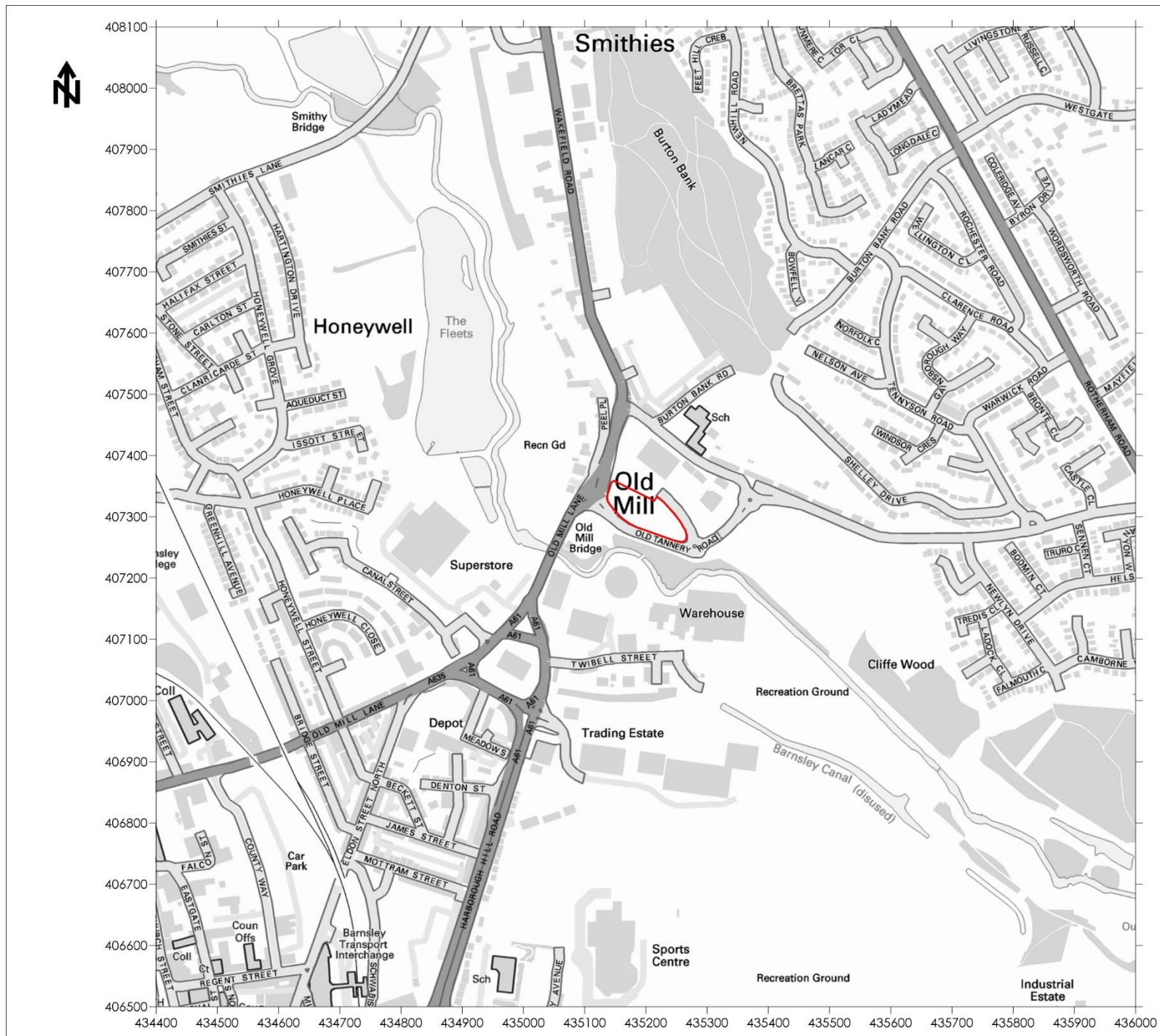
impacts was determined as **slight**. Following consideration of the relevant issues, residual impacts as a result of the operation of the development were considered to be **not significant**, in accordance to the IAQM guidance.

- 6.1.8 Based on the assessment results, air quality issues are not considered a constraint to planning consent for the development, subject to the inclusion of the specified mitigation measures.

7.0 **ABBREVIATIONS**

AADT	Annual Average Daily Traffic
ADM	Atmospheric Dispersion Modelling
AQAP	Air Quality Action Plan
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
BMBC	Barnsley Metropolitan Borough Council
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DM	Do-Minimum
DMRB	Design Manual for Roads and Bridges
DPD	Development Plan Document
DS	Do-Something
EIA	Environmental Impact Assessment
EU	European Union
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
LAQS	Local Air Quality Strategy
LNR	Local Nature Reserve
NGR	National Grid Reference
NPPF	National Planning Policy Framework
NPPG	National Planning Policy Guidance
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
PM ₁₀	Particulate Matter with an aerodynamic diameter of less than 10µm
UDP	Unitary Development Plan
Z ₀	Roughness length

Figures



Legend



Site Boundary

Title

Figure 1 - Site Location Plan

Project

Air Quality Assessment
Old Mill Lane, Barnsley

Project Reference

1272

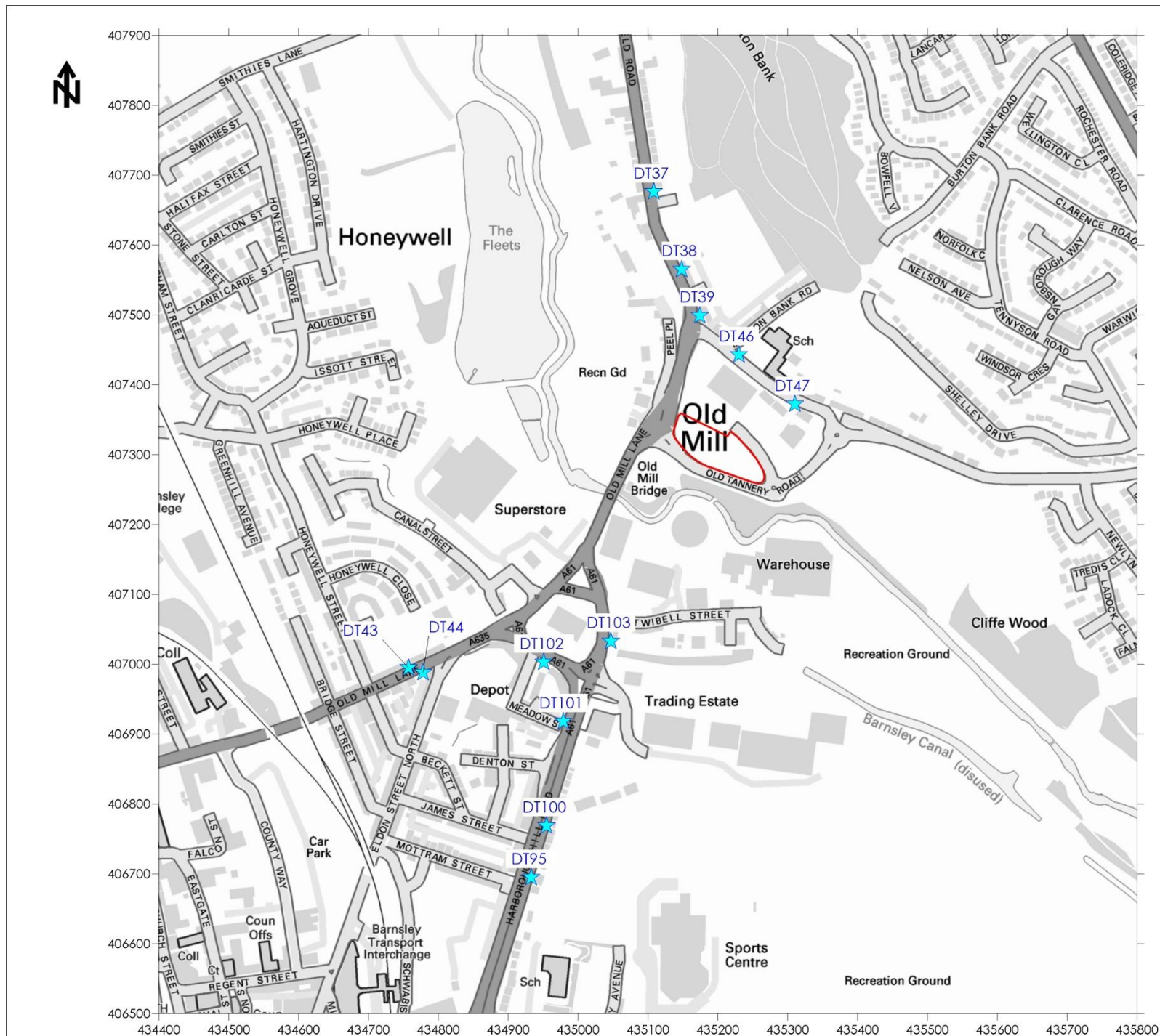
Client

Aldi Stores Ltd

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Legend

-  Site Boundary
-  Monitoring Location

Title

Figure 2 - Monitoring Locations

Project

Air Quality Assessment
Old Mill Lane, Barnsley

Project Reference

1272

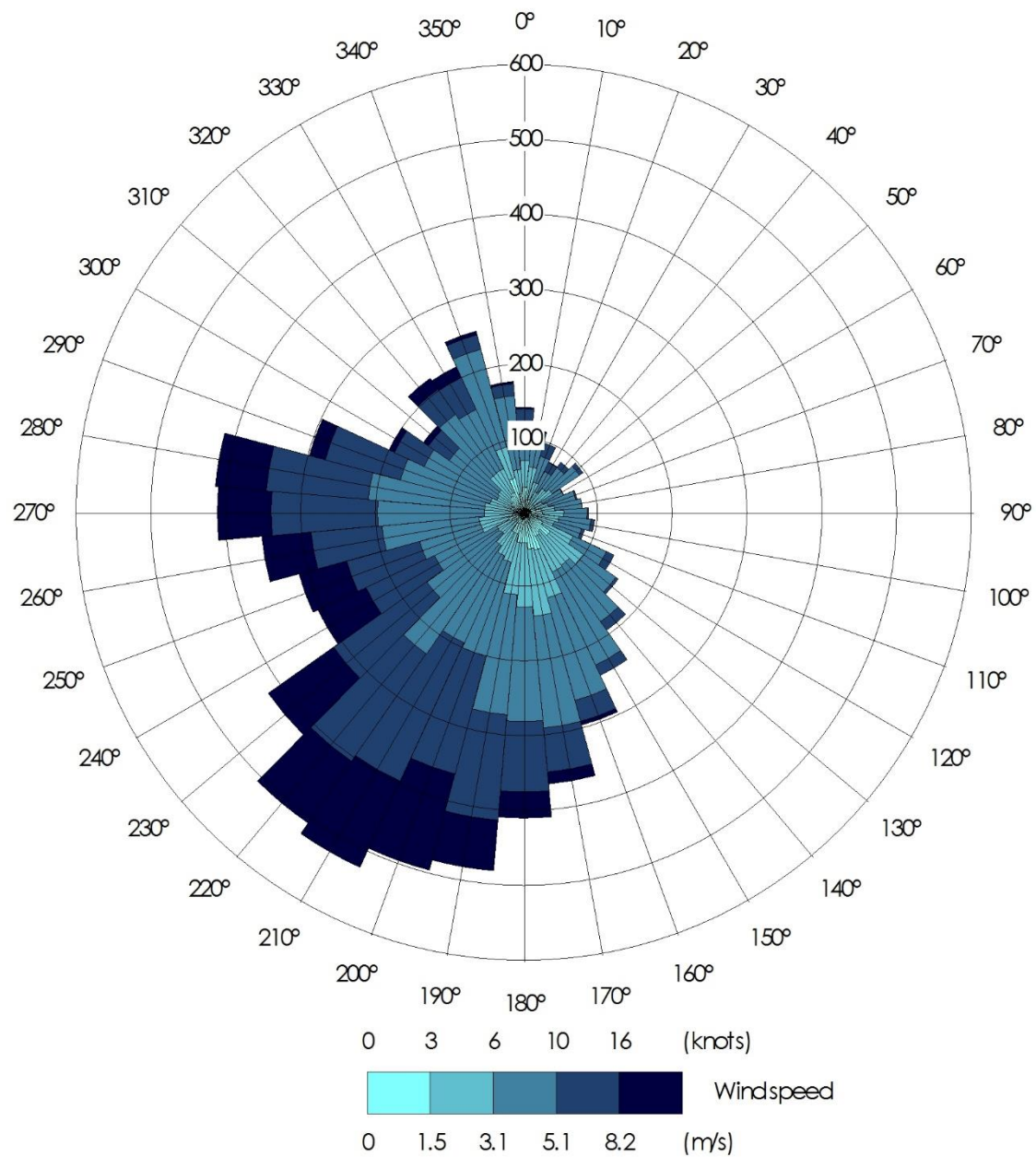
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Legend

Title
Figure 3 - Wind Rose of 2015
Robin Hood Airport
Meteorological Data

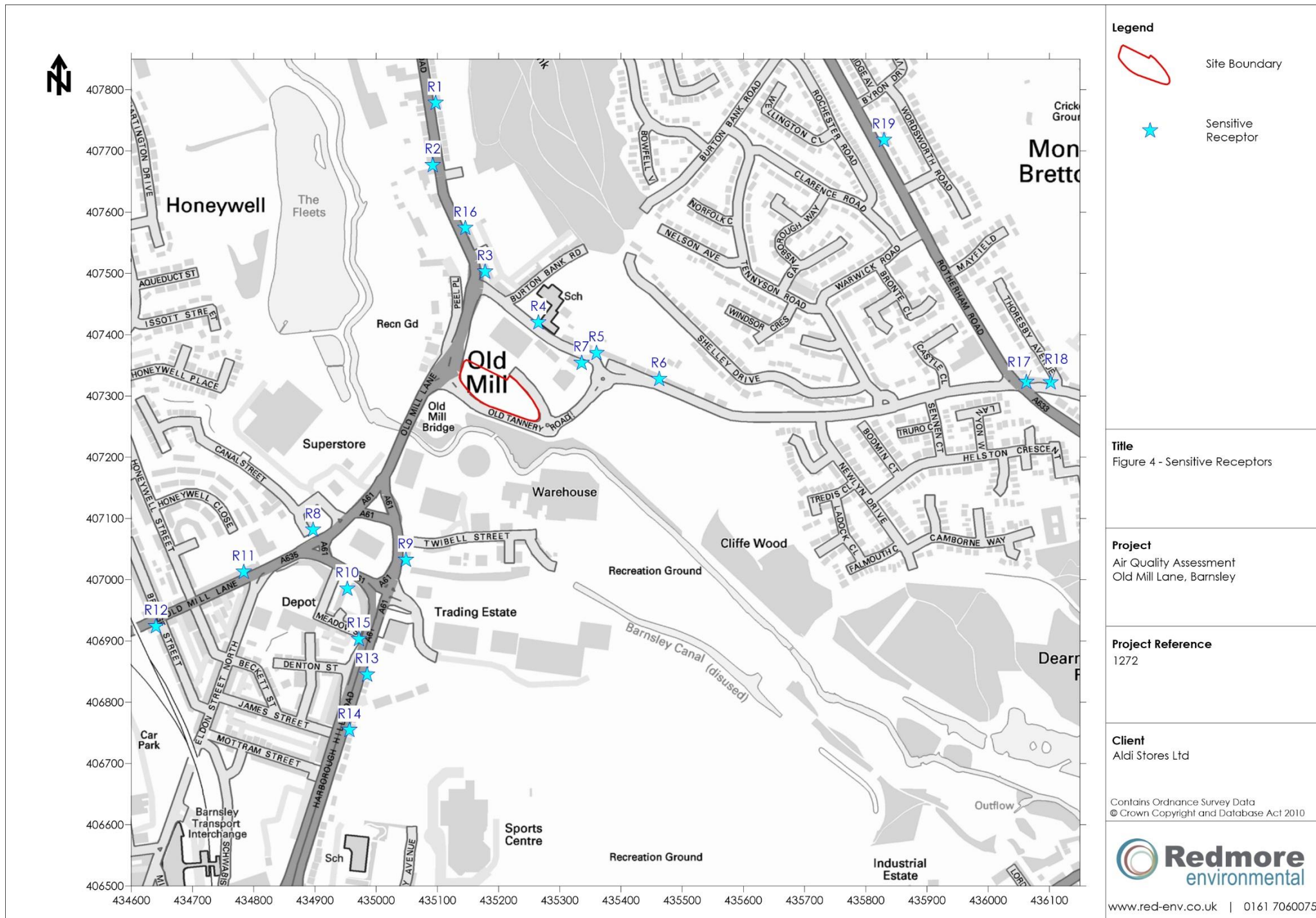
Project
Air Quality Assessment
Old Mill Lane, Barnsley

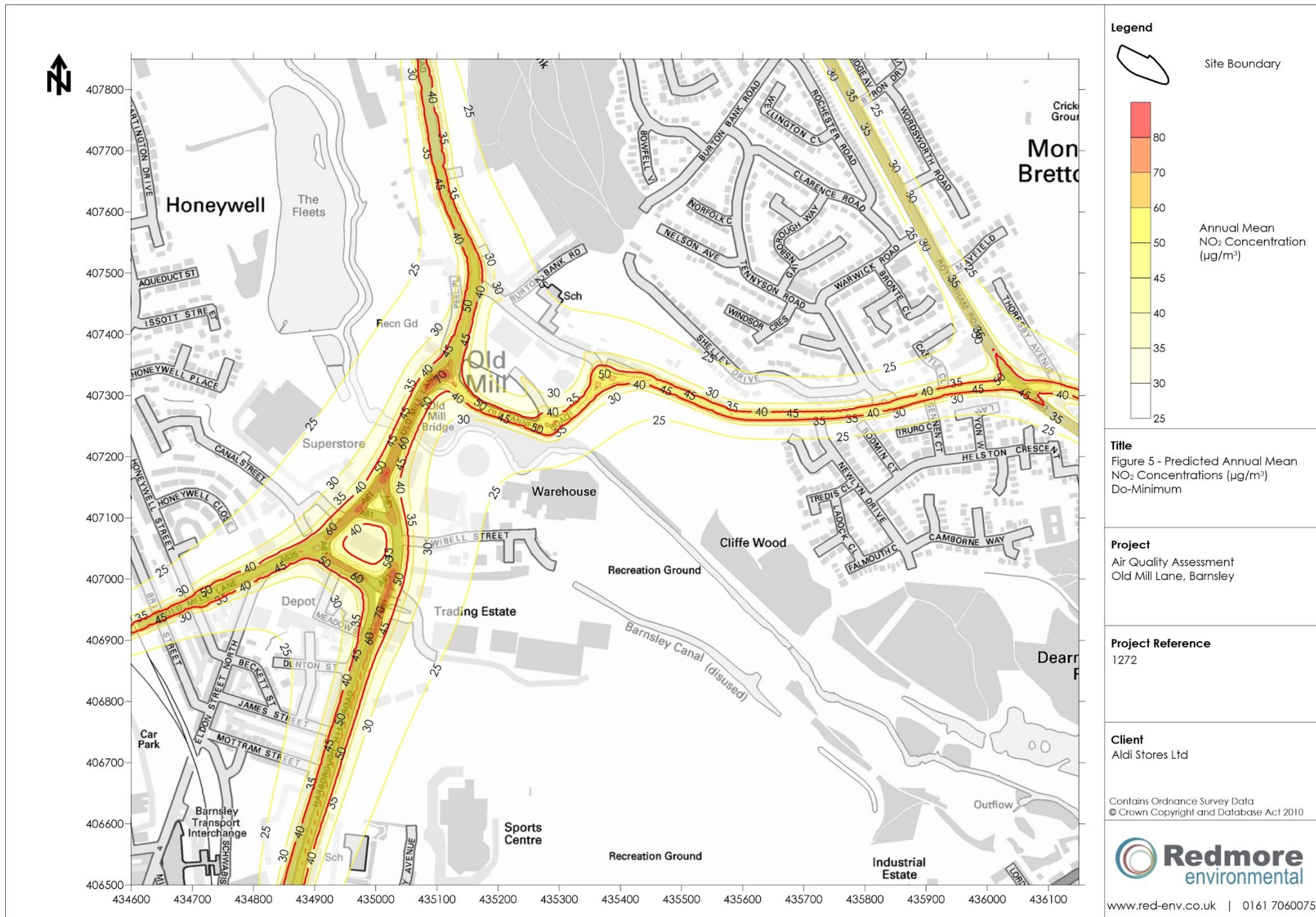
Project Reference
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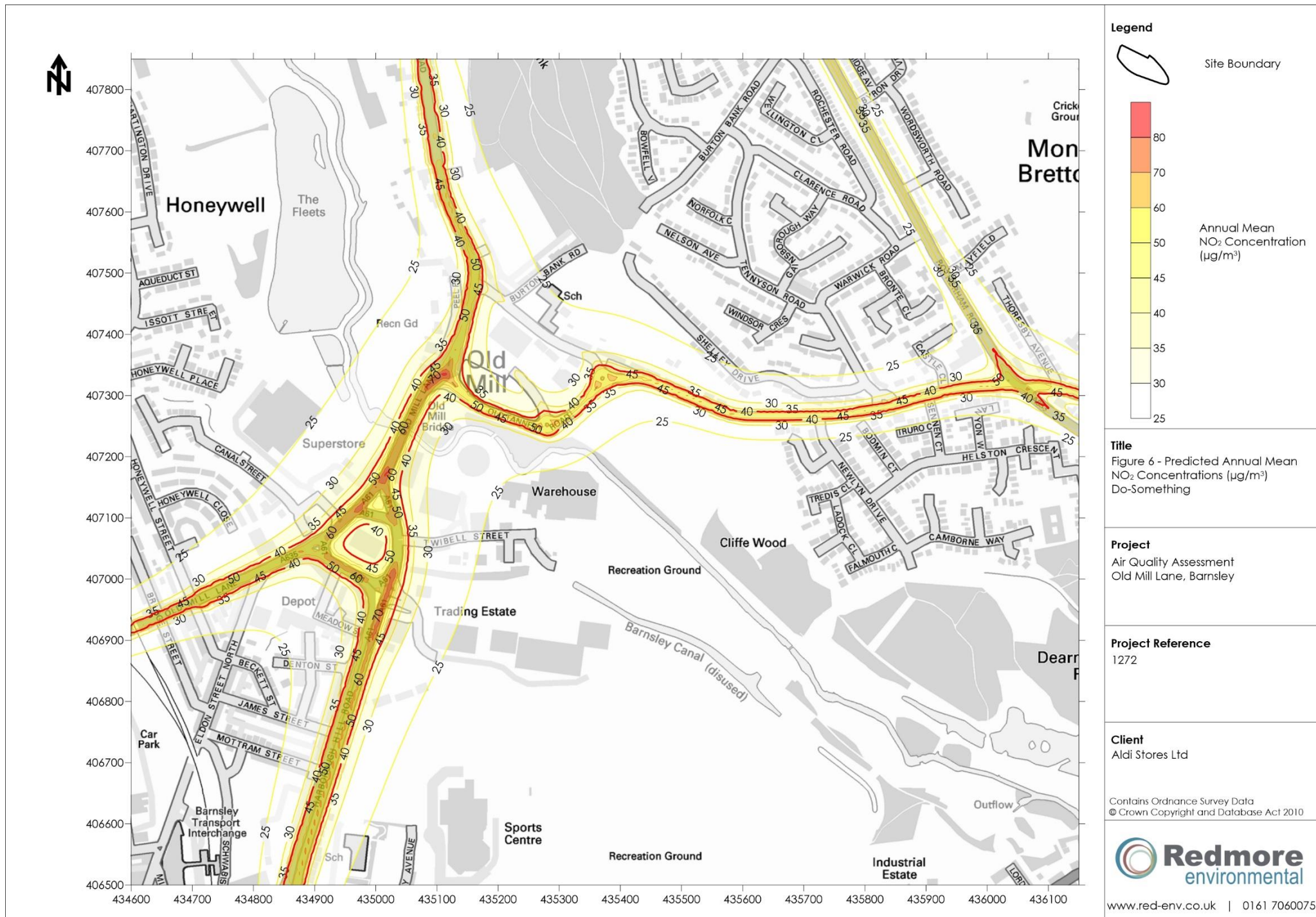
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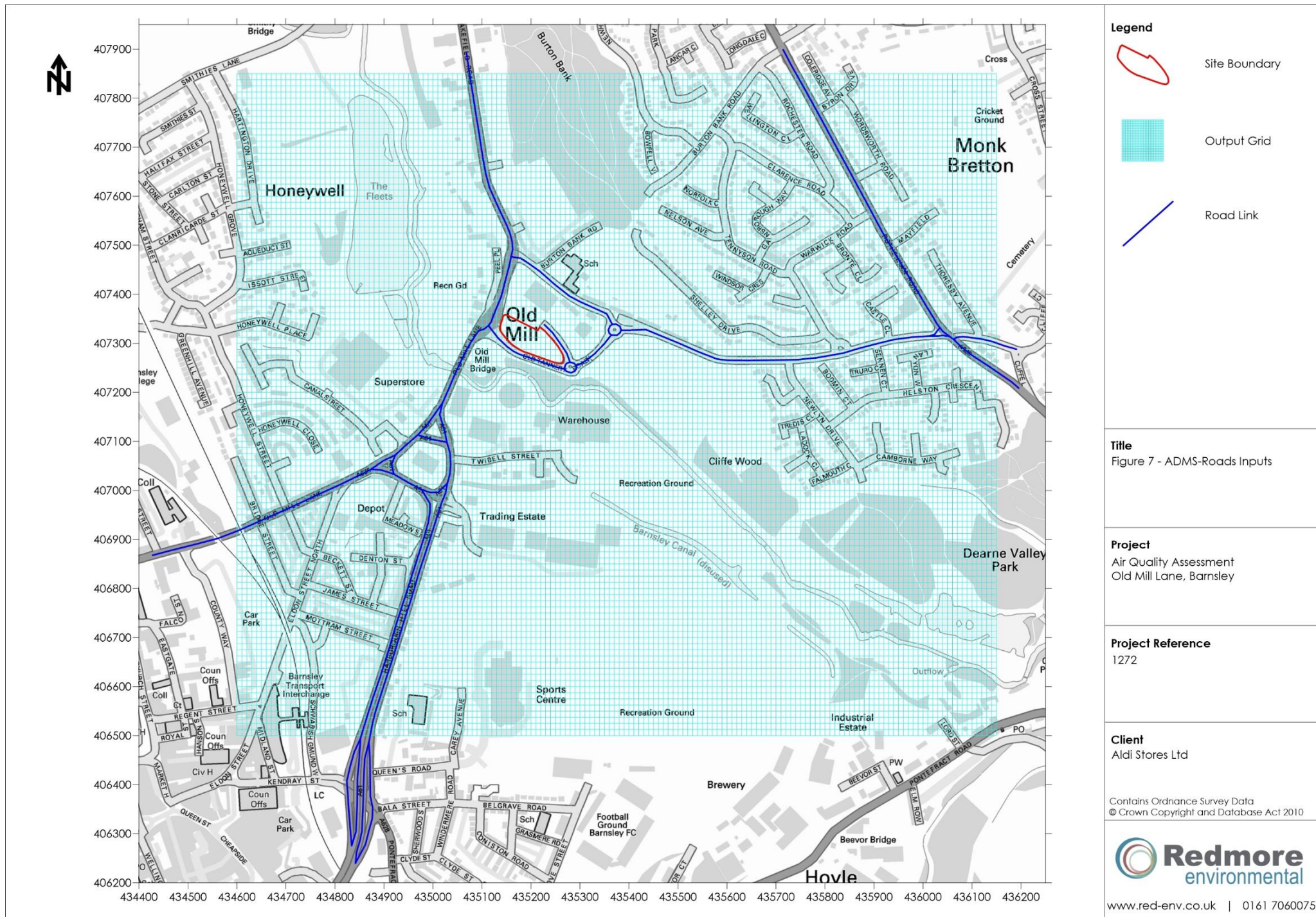


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Appendix 1 - Assessment Input Data

Introduction

The proposed development has the potential to cause air quality impacts as a result of vehicles travelling to and from the site. In order to assess NO₂ concentrations at sensitive locations, detailed dispersion modelling was undertaken in accordance with the following methodology.

Dispersion Model

Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 4.0.1.0). ADMS-Roads is developed by Cambridge Environmental Research Consultants (CERC) and is routinely used throughout the world for the prediction of pollutant dispersion from road sources. Modelling predictions from this software package are accepted within the UK by the Environment Agency and DEFRA.

The model requires input data that details the following parameters:

- Traffic flow data;
- Vehicle emission factors;
- Spatial co-ordinates of emissions;
- Street width;
- Meteorological data;
- Roughness length; and,
- Monin-Obukhov length.

These are detailed in the following Sections.

Traffic Flow Data

Baseline traffic data and predicted development trip generation for use in the assessment, including 24-hour Annual Average Daily Traffic (AADT) flows and fleet composition as HDV proportion, were obtained from Exigo Transport Solutions, the Transport Consultants for the project.

Traffic data for Old Mill Lane south of the A61 junction, Harborough Hill Road and Rotherham Road was not available from the Transport Consultants and was therefore supplemented with

information from the Department for Transport (DfT)²⁰. The DfT web tool enables the user to view and download traffic flows on every link of the 'A' road and motorway network in Great Britain for the years 1999 to 2014. It should be noted that the DfT is referenced in DEFRA guidance²¹ as being a suitable source of data for air quality assessments and it is therefore considered to provide a reasonable estimate of traffic flows in the vicinity of the site.

Baseline traffic data was converted to 2017 flows utilising factors obtained from TEMPro. This software package has been developed by the DfT to calculate traffic growth throughout the UK.

A summary of the traffic data is provided in Table A1.1.

Table A1.1 Traffic Data

Link		24-hour AADT Flow			HDV Proportion of Fleet (%)
		Verification	2017 DM	2017 DS	
L1	Old Mill Lane South	17,228	17,834	19,272	2.06
L2	Old Mill Lane South to A61	17,228	17,834	19,272	2.06
L3	Old Mill Lane South Junction A61 Nbnd	8,614	8,917	9,636	2.06
L4	Old Mill Lane South Junction A61 Sbnd	8,614	8,917	9,636	2.06
L5	Harborough Hill Road Nbnd	11,122	11,514	12,405	2.81
L6	Harborough Hill Road Sbnd	11,122	11,514	12,388	2.81
L7	Harborough Hill Road Nbnd A61 Junction	11,122	11,514	12,405	2.81
L8	Harborough Hill Road Sbnd A61 Junction	11,122	11,514	12,388	2.81
L9	Wakefield Road North	17,137	18,084	19,000	0.80
L10	Wakefield Road North	17,137	18,084	19,000	0.80
L11	Wakefield Road Burton Road Slow Phase	17,137	18,084	19,000	0.80

²⁰ <http://www.dft.gov.uk/traffic-counts/>.

²¹ Local Air Quality Management Technical Guidance (TG16), DEFRA, 2016.

Link		24-hour AADT Flow			HDV Proportion of Fleet (%)
		Verification	2017 DM	2017 DS	
L12	Wakefield Road Burton Road Slow Phase South	16,986	17,924	18,730	1.50
L13	Old Mill Lane North Burton Road Junction	16,986	17,924	18,730	1.50
L14	Old Mill Lane Old Tannery Road Junction Slow	16,986	17,924	18,730	1.50
L15	Old Mill Lane Old Tannery Road Junction Slow	33,189	35,023	36,663	1.30
L16	Old Mill Lane	33,189	35,023	36,663	1.30
L17	Old Mill Lane North A61 Junction Sbnd	14,114	14,894	15,609	1.30
L18	Old Mill Lane North A61 Junction Nbnd	19,075	20,129	21,053	1.30
L19	Burton Road East	17,079	18,023	18,954	0.80
L20	Burton Road East Roundabout Approach	17,079	18,023	18,954	0.80
L21	Burton Road West Roundabout Approach	1,599	1,565	1,722	0.00
L22	Burton Road West	1,599	1,565	1,722	0.00
L23	Burton Road West Junction Old Mill Lane	1,599	1,565	1,722	0.00
L24	Mini Roundabout	17,540	12,298	12,999	0.90
L25	Old Tannery Road Burton Road Slow	16,402	17,308	18,322	0.90
L26	Old Tannery Road	16,402	17,308	18,322	0.90
L27	Old Tannery Road Roundabout Slow Phase	16,402	17,308	18,322	0.90
L28	Old Tannery Road Roundabout	11,413	12,044	13,047	0.90
L29	Old Tannery Road Roundabout Slow Phase	16,635	17,554	18,812	0.80
L30	Old Tannery Road	16,635	17,554	18,812	0.80
L31	Old Tannery Road Old Mill Lane Slow Phase	16,635	17,554	18,812	0.80

Link		24-hour AADT Flow			HDV Proportion of Fleet (%)
		Verification	2017 DM	2017 DS	
L32	Industrial Estate Entrance Road	1,202	1,269	2,007	0.00
L33	Old Mill Lane Large Junction Nbound	24,503	26,070	27,256	2.06
L34	Old Mill Lane Large Junction Sbound	18,318	19,495	20,427	1.30
L35	Old Mill Lane Large Junction Ebound	12,252	13,035	13,628	2.06
L36	Old Mill Lane Large Junction Wbound	20,015	21,630	22,619	2.81
L37	Old Mill Lane Large Junction	9,159	9,747	10,214	2.06
L38	Old Mill Lane Large Junction	10,008	10,815	11,309	2.81
L39	Burton Road Rotherham Road Approach	5,636	5,947	6,255	0.80
L40	Burton Road Rotherham Road Approach	11,272	11,895	12,510	0.80
L41	Rotherham Road	8,709	9,016	9,725	3.25
L42	Rotherham Road Junction Burton Road	8,709	9,016	9,725	3.25
L43	Rotherham Road Junction Burton Road	8,709	9,016	9,725	3.25
L44	Rotherham Road	8,709	9,016	9,725	3.25
L45	Burton Road East Rotherham Road	17,079	18,023	18,757	0.80
L46	Burton Road East Rotherham Road	17,079	18,023	18,757	0.80
L47	Old Mill Lane South	17,228	17,834	19,272	2.06
L48	Wakefield Road North	17,137	18,084	19,000	0.80
L49	Harborough Hill Road Junction	2,781	2,878	3,097	2.81
L50	Harborough Hill Road Junction	2,781	2,878	3,097	2.81
L51	Harborough Hill Road Junction	8,342	8,635	9,291	2.81
L52	Harborough Hill Road Junction	8,342	8,635	9,291	2.81

Reference should be made to Figure 7 for a graphical representation of the road link locations.

Road widths were estimated from aerial photography and UK highway design standards. Road widths, average vehicle speeds and canyon heights are shown in Table A1.2.

Table A1.2 Road Parameters

Link		Road Width (m)	Average Vehicle Speed (km/h)	Canyon Height
L1	Old Mill Lane South	7.6	40	0.0
L2	Old Mill Lane South to A61	12.2	20	0.0
L3	Old Mill Lane South Junction A61 Nbnd	6.7	20	0.0
L4	Old Mill Lane South Junction A61 Sbnd	6.5	20	0.0
L5	Harborough Hill Road Nbnd	6.8	50	0.0
L6	Harborough Hill Road Sbnd	6.8	40	0.0
L7	Harborough Hill Road Nbnd A61 Junction	11.1	20	0.0
L8	Harborough Hill Road Sbnd A61 Junction	6.5	20	0.0
L9	Wakefield Road North	21.9	40	7.5
L10	Wakefield Road North	8.0	40	0.0
L11	Wakefield Road Burton Road Slow Phase	9.7	20	0.0
L12	Wakefield Road Burton Road Slow Phase South	9.7	20	0.0
L13	Old Mill Lane North Burton Road Junction	9.7	35	0.0
L14	Old Mill Lane Old Tannery Road Junction Slow	11.0	20	0.0
L15	Old Mill Lane Old Tannery Road Junction Slow	12.4	20	0.0
L16	Old Mill Lane	11.9	40	0.0
L17	Old Mill Lane North A61 Junction Sbnd	9.8	20	0.0
L18	Old Mill Lane North A61 Junction Nbnd	7.1	20	0.0
L19	Burton Road East	6.7	40	0.0
L20	Burton Road East Roundabout Approach	6.7	20	0.0
L21	Burton Road West Roundabout Approach	6.7	20	0.0
L22	Burton Road West	8.8	40	0.0

Link		Road Width (m)	Average Vehicle Speed (km/h)	Canyon Height
L23	Burton Road West Junction Old Mill Lane	8.8	20	0.0
L24	Mini Roundabout	6.7	20	0.0
L25	Old Tannery Road Burton Road Slow	6.7	20	0.0
L26	Old Tannery Road	6.7	40	0.0
L27	Old Tannery Road Roundabout Slow Phase	6.7	20	0.0
L28	Old Tannery Road Roundabout	6.7	20	0.0
L29	Old Tannery Road Roundabout Slow Phase	6.7	20	0.0
L30	Old Tannery Road	6.7	40	0.0
L31	Old Tannery Road Old Mill Lane Slow Phase	6.7	20	0.0
L32	Industrial Estate Entrance Road	6.7	25	0.0
L33	Old Mill Lane Large Junction Nbound	10.6	25	0.0
L34	Old Mill Lane Large Junction Sbound	13.6	25	0.0
L35	Old Mill Lane Large Junction Ebound	11.0	25	0.0
L36	Old Mill Lane Large Junction Wbound	12.6	25	0.0
L37	Old Mill Lane Large Junction	8.2	25	0.0
L38	Old Mill Lane Large Junction	8.2	25	0.0
L39	Burton Road Rotherham Road Approach	4.3	25	0.0
L40	Burton Road Rotherham Road Approach	7.2	25	0.0
L41	Rotherham Road	7.4	60	0.0
L42	Rotherham Road Junction Burton Road	9.3	25	0.0
L43	Rotherham Road Junction Burton Road	7.0	25	0.0
L44	Rotherham Road	7.0	60	0.0
L45	Burton Road East Rotherham Road	7.0	25	0.0
L46	Burton Road East Rotherham Road	7.4	45	0.0
L47	Old Mill Lane South	16.4	20	7.5
L48	Wakefield Road North	8.0	40	0.0

Link		Road Width (m)	Average Vehicle Speed (km/h)	Canyon Height
L49	Harborough Hill Road Junction	5.8	35	0.0
L50	Harborough Hill Road Junction	5.9	35	0.0
L51	Harborough Hill Road Junction	6.7	50	0.0
L52	Harborough Hill Road Junction	6.7	60	0.0

Some of the roads within the assessment extents are flanked by buildings on either side. These locations were included as street canyons within the model in order to provide consideration of reduced pollutant dispersion in these areas.

Review of the modelling area also revealed that Harborough Hill Road includes a significant gradient. This was measured using Google Earth Pro (version 7.1.5.1557) for the relevant links. These are shown in Table A1.3.

Table A1.3 Road Gradients

Link		Gradient (%)
L5	Harborough Hill Road Nbnd	11.8
L6	Harborough Hill Road Sbnd	12.8
L7	Harborough Hill Road Nbnd A61 Junction	12.8
L8	Harborough Hill Road Sbnd A61 Junction	15.8

Significant road gradients cause additional vehicle emissions, particularly from HDVs, due to increased engine load associated with travelling up a hill. The emission factors for the above links were therefore adjusted using the formula provided within DEFRA guidance²² to take account of increased releases on Harborough Hill Road.

²² Local Air Quality Management (TG16), DEFRA, 2016.

Emission Factors

Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 6.0.2). This has been produced by DEFRA and incorporates updated COPERT4v10 vehicle emissions factors for NO_x and vehicle fleet information.

There is current uncertainty over NO₂ concentrations within the UK, with the implementation of new vehicle emission standards not resulting in the previously expected reduction in roadside levels. Therefore, a worst-case assessment and sensitivity analysis were undertaken, using 2015 and 2017 emission factors respectively, to provide two comparative data sets.

Meteorological Data

Meteorological data used in the assessment was taken from Robin Hood Airport meteorological station over the period 1st January 2015 to 31st December 2015 (inclusive). Robin Hood Airport is located at NGR: 465930, 398920, which is approximately 32.0km south-east of the development. It is considered that conditions are likely to be reasonably similar over a distance of this magnitude and the information is a suitable source of data for an assessment of this magnitude.

All meteorological records used in the assessment were provided by Atmospheric Dispersion Modelling (ADM) Ltd, which is an established distributor of data within the UK. Reference should be made to Figure 3 for a wind rose of utilised meteorological data.

Roughness Length

A roughness length (z_0) of 1.5m was used to describe the modelling extents. This value of z_0 is considered appropriate for the morphology of the area and is suggested within ADMS-Roads as being suitable for 'large urban areas'.

A z_0 of 0.3m was used to describe the meteorological site. This value of z_0 is considered appropriate for the morphology of the area due to the large expanse of flat land use and is suggested within ADMS-Roads as being suitable for 'agricultural areas (max)'.

Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 30m was used to describe the modelling extents. This value is considered appropriate for the nature of the area and is suggested within ADMS-Roads as being suitable for 'cities and large towns'.

A minimum Monin-Obukhov length of 1m was used to describe the meteorological site. This value is considered appropriate for the nature of the area and is suggested within ADMS-Roads as being suitable for 'rural areas'.

Background Concentrations

Due to the large area covered in the model, an analysis of data from the DEFRA mapping study was undertaken to identify the most appropriate background concentration for use in the assessment. This considered the four grid squares encompassing the modelling area. These are shown in Table A1.4

Table A1.4 Background Concentrations

Grid Square (NGR)		Predicted Background NO ₂ Concentration (µg/m ³)	
X	Y	2015	2017
434500	406500	32.30	31.32
435500	406500	20.96	19.85
434500	407500	18.38	17.30
435500	407500	19.96	18.80

The grid square NGR: 434500, 406500 was found to have the highest background concentration. However, review of the sectors contributing to this value revealed that the proportion from 'domestic sources' was unusually high. Due to this, and the considerably lower background concentrations in adjacent locations, as well as review of recent monitoring results, the background from the grid square NGR: 435500, 406500, was used throughout the assessment.

The background concentrations from 2015 and 2017 were utilised for the worst-case and sensitivity analysis, respectively.

NO_x to NO₂ Conversion

Predicted annual mean NO_x concentrations were converted to NO₂ concentrations using the spreadsheet (version 4.1) provided by DEFRA, which is the method detailed within DEFRA guidance²³.

Verification

The predicted results from a dispersion model may differ from measured concentrations for a large number of reasons, including:

- Estimates of background concentrations;
- Uncertainties in source activity data such as traffic flows and emission factors;
- Variations in meteorological conditions;
- Overall model limitations; and,
- Uncertainties associated with monitoring data, including locations.

Model verification is the process by which these and other uncertainties are investigated and where possible minimised. In reality, the differences between modelled and monitored results are likely to be a combination of all of these aspects.

For the purpose of the assessment, model verification was undertaken for 2015 using traffic data, meteorological data and monitoring results from this year.

BMBC undertook diffusion tube monitoring of NO₂ concentrations at 12 locations within the modelling extents during 2015. DT46 - Burton Road - opposite Wakefield Road junction was omitted due data unavailability. Results for the remaining 11 monitors were obtained and the road contribution to total NO_x concentration calculated following the methodology contained within DEFRA guidance²⁴. The monitored annual mean NO₂ concentrations and calculated road NO_x concentrations are summarised in Table A1.5.

²³ Local Air Quality Management Technical Guidance (TG16), DEFRA, 2016.

²⁴ Local Air Quality Management Technical Guidance (TG16), DEFRA, 2016.

Table A1.5 Verification - Monitoring Results

Monitoring Location		Monitored NO ₂ Concentration (µg/m ³)	Calculated Road NO _x Concentration (µg/m ³)
DT37	Wakefield Road - opposite Burton Road junction	30.58	19.98
DT38	Wakefield Road - opposite Burton Road junction	31.20	21.35
DT39	Wakefield Road - Burton Road junction	32.77	24.85
DT43	Old Mill Lane/Honeywell Street	41.48	45.63
DT44	Old Mill Lane/Eldon Street	34.15	27.99
DT47	Burton Road - opposite Wakefield Road junction	25.55	9.26
DT95	40 Harbrough Hill Road	67.41	123.33
DT100	Harbrough Hill Road - near to bakery	65.02	115.15
DT101	Harbrough Hill Road/Meadow Street	34.58	28.98
DT102	Harbrough Hill Road/Redfearn	34.60	29.03
DT103	Harbrough Hill	42.96	49.41

The annual mean road NO_x concentrations predicted from the dispersion model and the 2015 road NO_x concentration calculated from the monitoring results are summarised in Table A1.6.

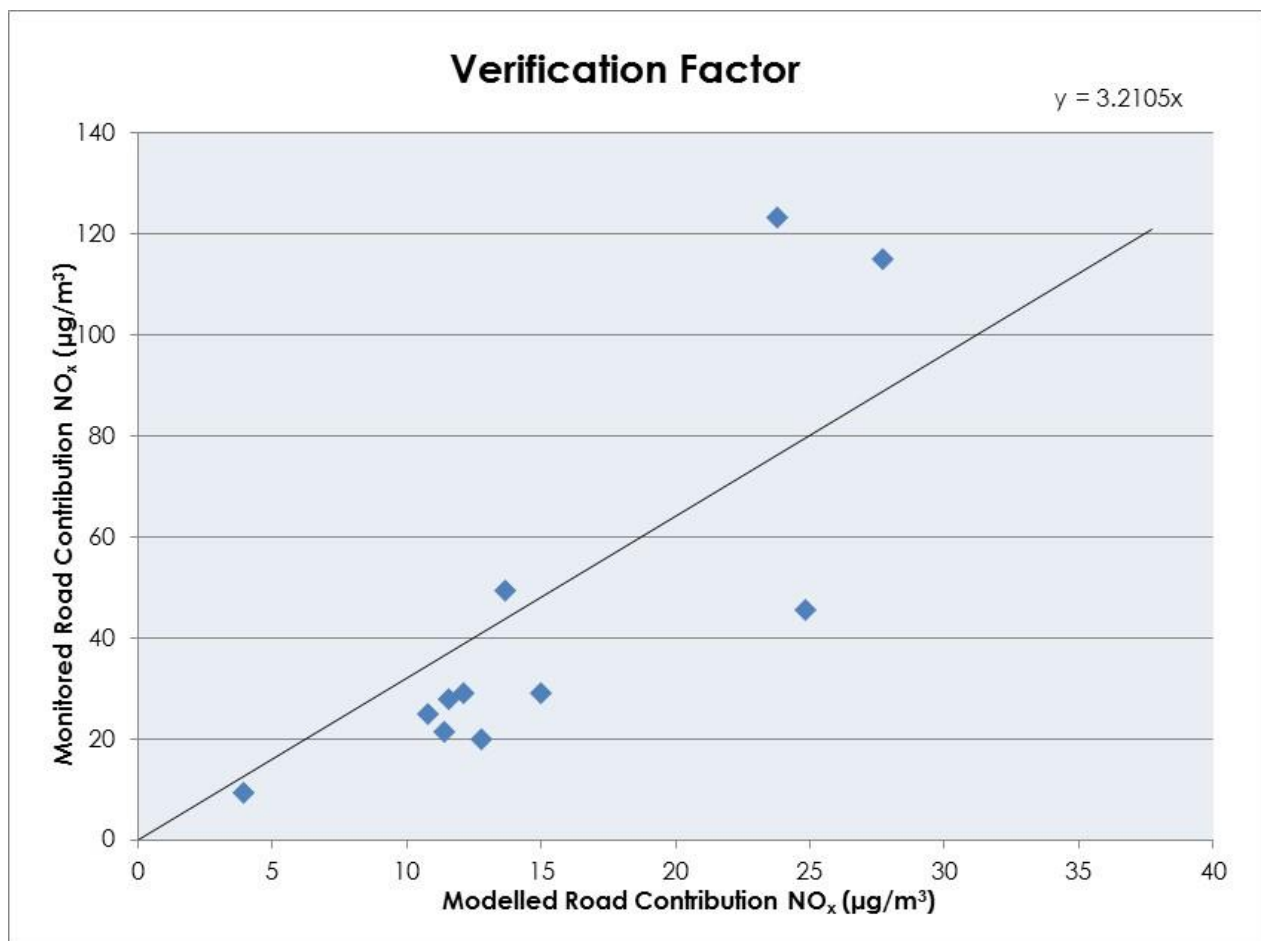
Table A1.6 Verification - Modelling Results

Monitoring Location		Calculated Road NO _x Concentration (µg/m ³)	Modelled Road NO _x Concentration (µg/m ³)
DT37	Wakefield Road - opposite Burton Road junction	19.98	12.80
DT38	Wakefield Road - opposite Burton Road junction	21.35	11.46
DT39	Wakefield Road - Burton Road junction	24.85	10.87
DT43	Old Mill Lane/Honeywell Street	45.63	24.95
DT44	Old Mill Lane/Eldon Street	27.99	11.70
DT47	Burton Road - opposite Wakefield Road junction	9.26	3.98

Monitoring Location		Calculated Road NO _x Concentration (µg/m ³)	Modelled Road NO _x Concentration (µg/m ³)
DT95	40 Harborough Hill Road	123.33	23.88
DT100	Harborough Hill Road - near to bakery	115.15	27.94
DT101	Harborough Hill Road/Meadow Street	28.98	19.84
DT102	Harborough Hill Road/Redfearn	29.03	13.59
DT103	Harborough Hill	49.41	17.34

The monitored and modelled road NO_x contribution concentrations were graphed and the equation of the trendline based on linear progression through zero calculated. This indicated that a verification factor of 3.2105 was required to be applied to all modelling results, as shown in Graph 1.

Graph 1 Verification



Date: 1st June 2016

Ref: 1272

Appendix 2 - Curricula Vitae

KEY EXPERIENCE:

Jethro is a Chartered Environmentalist and Director of Redmore Environmental with specialist experience in the air quality and odour sectors. His key capabilities include:

- Production and management of Air Quality, Dust and Odour Assessments for a wide-range of clients from the retail, residential, infrastructure, commercial and industrial sectors.
- Production and co-ordination of Environmental Permit applications for a variety of industrial sectors.
- Detailed dispersion modelling of road vehicle and industrial emissions using ADMS-Roads, ADMS-5, AERMOD-PRIME and BREEZE-ROADS. Studies have included impact assessment of ground level pollutant and odour concentrations and assessment of suitability of development sites for proposed end-use.
- Project management and co-ordination of Environmental Impact Assessments and scoping reports for developments throughout the UK.
- Provision of expert witness services at Planning Inquiries.
- Design and project management of pollutant monitoring campaigns.
- Co-ordination and management of large-scale multi-disciplinary projects and submissions.
- Provision of expert advice to local government and international environmental bodies, as well as involvement in production of industry guidance.

SELECT PROJECTS SUMMARY:

Industrial

Shanks Waste Management - Odour Assessments of two waste management facilities to support Environmental Permit Applications.

Tatweer Petroleum - dispersion modelling of Bahrain oil field.

Doha South Sewage Treatment Works - AQA for works extension in Qatar.

IRIS Environmental Appraisal Report Reviews, Isle of Man Government - odour assessment reviews.

Lankem, Greater Manchester - Environmental Permit Application for chemical manufacturing plant.

Newport Docks Bulk Drying, Pelleting and CHP Facility - air quality EIA for gas CHP.

Springshades, Leicester - Environmental Permit Variation Application for textile manufacturing plant.

Valspar, Chester - Odour Assessment and production of Odour Management Plan for a paint manufacturing plant in response to neighbour complaints.

Agrivert - dispersion modelling of odour and CHP emissions from numerous AD plants.

James Cropper Paper Mill, Cumbria - air quality EIA, Environmental Permit Variation and Human Health Risk Assessment for new biomass boiler adjacent to SSSI.

Rigg Approach, Leyton - Air Quality Assessment in support of waste transfer site.

Lynchford Lane Waste Transfer Station - biomass facility energy recovery plant.

Barnes Wallis Heat and Power, Cobham - biomass facility adjacent to AQMA.

Residential

Wood St Mill, Bury - residential development adjacent to scrap metal yard.

Hyams Lane, Holbrook - Odour Assessment to support residential development adjacent to sewage works.

North Wharf Gardens, London - peer review of EIA undertaken for large residential development.

Loxford Road, Alford - Air Quality EIA for residential development, included consideration of impacts from associated package sewage works

Elephant and Castle Leisure Centre - baseline AQA for redevelopment.

Carr Lodge, Doncaster - EIA for large residential development.

Queensland Road, Highbury - residential scheme including CHP.

Bicester Ecotown - dispersion modelling of energy centre.

Castleford Growth Delivery Plan - baseline air quality constraints assessment for town redevelopment.

York St, Bury - residential development adjacent to AQMA.

Temple Point Leeds - residential development adjacent to M1.

Commercial and Retail

Etihad Stadium - Air Quality EIA for the extension to the capacity of the Etihad Stadium, Manchester.

Wakefield College - redevelopment of city centre campus in AQMA.

Manchester Airport Cargo Shed - commercial development.

Manchester Airport Apron Extension - EIA including aircraft emission modelling.

National Youth Theatre, Islington - redevelopment to provide new arts space and accommodation.

KEY EXPERIENCE:

Elen is a Graduate Environmental Consultant with specialist experience in the air quality sector. Her key capabilities include:

- Production of Air Quality Assessments in accordance with Department for Environment, Food and Rural Affairs (DEFRA) methodologies for a range of residential, commercial and industrial sectors.
- Detailed dispersion modelling of road vehicle exhaust emissions using ADMS-Roads. Studies have included assessment of road traffic exhaust emissions on sensitive receptors and exposure of new residents to poor air quality.
- Advanced Canyon Modelling to evaluate the impact of altered urban topography on air quality in built up areas.
- Assessment of construction dust impacts from a range of development sizes.
- Production of air quality mitigation strategies specifically tailored to address issues at individual sites.
- Definition of baseline air quality and identification of sensitive areas across the UK.
- ADMS-5 modelling of industrial sources including Anaerobic Digestion (AD) plants to determine impacts of stack emissions on local air quality.
- Odour surveys to assess amenity and suitability of sites for potential future development for residential use.

SELECT PROJECTS SUMMARY:

Potion Redevelopment, Erith

Air Quality Assessment of a residential development in an Air Quality Management Area (AQMA). Concerns were raised regarding the exposure of future occupants to poor air quality. Detailed dispersion modelling was undertaken using ADMS-roads to assess PM₁₀ and NO₂ concentrations across the site. Results revealed that pollution levels were below the air quality standards across the development.

Magdalen Street, Colchester

Air Quality Assessment in support of a planning application for a cluster of student accommodation buildings. The site was located in a built up area of Colchester and was already occupied by a bus depot. The assessment included a comparison of concentrations at sensitive receptors in areas where the urban topography would be altered as a result of the development. Review of the results revealed that canyon effects would be reduced in the presence of the student accommodation, when compared to the existing land use. A detailed report was produced and the local authority accepted the air quality findings.

Greenbridge Road, Swindon

Air Quality Assessment for a mixed-use development in Swindon. The proposals involved demolition of a large building prior to construction. An assessment of fugitive dust emissions was undertaken and revealed that the use of good practice control measures would provide suitable mitigation for the impacts of the scheme.

Gonerby Moor Anaerobic Digestion Plant

Air Quality and Odour Assessments in support of an AD plant in Grantham. Combustion products from the combined heat and power unit have the potential to result in air quality impacts. Further to this, storage and transfer of biomass materials can lead to odour emissions from the site. ADMS-5 was used to model both odour and air quality impacts. Results revealed that emissions would not lead to exceedences of the relevant air quality standards across the site, and odour emissions remained below benchmark levels at all identified sensitive locations.

Coral Mill, Rochdale

Air Quality Assessment for a residential scheme partially located in an AQMA. Due to the size of the development, it was possible that traffic generation by future occupants travelling to and from the site may cause negative impacts on sensitive receptors nearby. NO₂ and PM₁₀ concentrations were quantified at specific receptor points to ensure there would be no significant increases in pollutant levels. Results revealed negligible impacts at all locations.

Stone Street, Kent

Air Quality Assessment for redevelopment of existing buildings in Gravesend, Kent. Road layout changes had been proposed in the vicinity of the site, which would alter the routes used by road traffic and thereby influence the location of vehicle emissions. Modelling took account of the impact of the new road layout on concentrations at the development. Results revealed pollutant concentrations were below the relevant standards across the site.