Air Quality Assessment

Hemingfield Road, Barnsley

Client: Ptarmigan Land North Ltd.

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Executive Summary

Redmore Environmental Ltd was commissioned by Ptarmigan Land North Ltd to undertake an Air Quality Assessment in support of a planning application for a residential development on land off Hemingfield Road, 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 during operation. As such, an Air Quality Assessment was undertaken 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 demolition, 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 highway network both with and without the development in place. Results were subsequently verified using local monitoring data.

Review of the dispersion modelling results indicated that predicted air quality impacts as a result of traffic generated by the development were not significant at any sensitive location in the vicinity of the site.

A number of mitigation measures were identified within the Barnsley Air Quality and Emissions Good Practice Guidance in order to reduce vehicle exhaust emissions associated with the proposals. It is considered these are appropriate for a development of this scale and nature and will further control impacts during the operational phase.

Based on the assessment results, air quality factors are not considered a constraint to planning consent for the development.

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1.0 INTRODUCTION

1.1 Background

1.1.1 Redmore Environmental Ltd was commissioned by Ptarmigan Land North Ltd to undertake an Air Quality Assessment in support of a planning application for a residential development on land off Hemingfield Road, Barnsley.

1.1.2 The proposals have the potential to cause air quality impacts as a result of fugitive dust emissions during construction and road traffic exhaust emissions during operation. As such, an Air Quality Assessment was undertaken to determine baseline conditions and assess potential effects as a result of the scheme.

1.2 Site Location and Context

1.2.1 The site is located on land north and east of Hemingfield Road, Barnsley, at approximate National Grid Reference NGR): 439307, 401798. Reference should be made to Figure 1 for a map of the site and surrounding area.

1.2.2 The proposals comprise an application for outline planning permission for the demolition of existing structures and the erection of residential dwellings with associated infrastructure and open space. All matters reserved except for means of access to, but not within, the site.

1.2.3 The proposals have the potential to cause air quality impacts at sensitive locations. These may include fugitive dust emissions associated with construction works and road vehicle exhaust emissions from vehicles travelling to and from the site during the operational phase. An Air Quality Assessment has therefore been undertaken to define baseline conditions, assess the potential effects as a result of the proposals and identify the requirement for mitigation to reduce any effects to an acceptable level. This is summarised in the following report.

2.0 LEGISLATION AND POLICY

2.1 Legislation

2.1.1 The Air Quality Standards Regulations (2010) and subsequent amendments include Air Quality Limit Values (AQLVs) for the following pollutants:

- Nitrogen dioxide (NO_2);
- Sulphur dioxide;
- Lead;
- Particulate matter with an aerodynamic diameter of less than 10µm (PM_{10});
- Particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$);
- Benzene; and,
- Carbon monoxide.

2.1.2 Air Quality Target Values were also provided for several additional pollutants. It should be noted that the AQLV for $PM_{2.5}$ stated in the Air Quality Standards Regulations (2010) was amended in the Environment (Miscellaneous Amendments) (EU Exit) Regulations (2020).

2.1.3 The Air Quality Strategy (AQS) was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published on 28th April 2023[1]. The document contains standards, objectives and measures for improving ambient air quality, including a number of Air Quality Objectives (AQOs). These 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.

2.1.4 The Environmental Improvement Plan 2023[2] was published in January 2023, providing long term and Interim Targets in order to reduce population exposure to $PM_{2.5}$. The concentration target for 2040 was subsequently adopted in the Environmental Targets (Fine Particulate Matter) (England) Regulations (2023).

[1] The AQS: Framework for Local Authority Delivery, DEFRA, 2023.

[2] Environmental Improvement Plan 2023, DEFRA, 2023.

2.1.5 Table 1 presents the AQOs and Interim Target for pollutants considered within this assessment.

Table 1 Air Quality Objectives/Interim Target

Pollutant	Air Quality Objective/Interim Target	
	Concentration (µg/m³)	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
$PM_{2.5}$	12(a)	Annual mean

Note: (a) Interim Target to be achieved by end of January 2028.

2.1.6 Table 2 summarises the advice provided in DEFRA guidance[3] 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 residential properties, schools, hospitals, care homes etc.	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
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

[3] Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

Averaging Period	Objective Should Apply At	Objective Should Not Apply At
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

2.2 Local Air Quality Management

2.2.1 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.

2.3 Dust

2.3.1 The main requirements with respect to dust control from industrial or trade premises not regulated under the Environmental Permitting (England and Wales) Regulations (2016) and subsequent amendments, 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."

2.3.2 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). 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 practicable means.

2.4 National Planning Policy

2.4.1 The revised National Planning Policy Framework[4] (NPPF) was published in December 2023 and sets out the Government's planning policies for England and how these are expected to be applied.

2.4.2 The purpose of the planning system is to contribute to the achievement of sustainable development. In order to ensure this, the NPPF recognises three overarching objectives, including the following of relevance to air quality:

> "c) an environmental objective - to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."

2.4.3 Chapter 15 of the NPPF details objectives in relation to conserving and enhancing the natural environment. It states that:

> "Planning policies and decisions should contribute to and enhance the natural and local environment by:
>
> […]
>
> e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality […]."

[4] NPPF, Ministry of Housing, Communities and Local Government, 2023.

2.4.4 The NPPF specifically recognises air quality as part of delivering sustainable development and states that:

> "Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

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

2.5 National Planning Practice Guidance

2.5.1 The National Planning Practice Guidance[5] (NPPG) web-based resource was launched by the Department for Communities and Local Government on 6th March 2014 and the guidance relating to air quality was most recently updated on 1st November 2019. The NPPG supports the NPPF and make it more accessible. The air quality pages are summarised under the following headings:

1. What air quality considerations does planning need to address?
2. What is the role of plan-making 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 considerations be relevant to the development management process?
6. What specific issues may need to be considered when assessing air quality impacts?
7. How detailed does an air quality assessment need to be?
8. How can an impact on air quality be mitigated?

[5] https://www.gov.uk/guidance/air-quality--3.

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

2.6 Local Planning Policy

2.6.1 The Barnsley Local Plan[6] was adopted by Barnsley Metropolitan Borough Council (BMBC) on 3rd January 2019. A review of the document indicated the following of relevance to this assessment:

> "Policy GD1 General Development
>
> Proposals for development will be approved if:
>
> […]
>
> Any adverse impact on the environment, natural resources, waste and pollution is minimised and mitigated;
>
> […]."
>
> "Policy Poll 1 Pollution Control and Protection
>
> 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."

6 Barnsley local Plan, BMBC, 2019.

"Policy AQ1 Development in Air Quality Management Areas

"Development which impacts on areas sensitive to air pollution in air quality management areas will be expected to demonstrate that it will not have a harmful effect on the health or living conditions of any future users of the development in terms of air quality (including residents, employees, visitors and customers), taking into account any suitable and proportionate mitigation required for the development.

We will only allow residential development which impacts on areas sensitive to air pollution, where the developer provides an assessment that shows living conditions will be acceptable for future residents, subject to any required mitigation.

We will only allow development which impacts on areas sensitive to air pollution which could cause more air pollution, where the developer provides an assessment that shows there will not be a significantly harmful effect on air quality, subject to any required mitigation.

Furthermore, development which impacts on areas sensitive to air pollution due to traffic emissions will be expected to demonstrate suitable and proportionate mitigation relative to the increased traffic emissions generated by the development."

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

2.6.3 BMBC has produced Air Quality and Emissions Good Practice Planning Guidance[7] which provides a template for integrating air quality considerations into land-use planning and development management policies. This was taken into consideration throughout the assessment.

[7] Air Quality and Emissions Good Practice Planning Guidance, BMBC, 2021.

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.

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 V1.1'[8].

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

- Demolition;
- 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 PM_{10}.

3.2.4 The assessment steps are detailed below.

[8] Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

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	Demolition	• Total volume of building to be demolished greater than 50,000m^3 • Potentially dusty material (e.g. concrete) • On-site crushing and screening • Demolition activities more than 20m above ground level

Magnitude	Activity	Criteria
	Earthworks	• Total site area greater than 10,000m^2 • 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
	Construction	• Total building volume greater than 100,000m^3 • 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	Demolition	• Total volume of building to be demolished between 20,000m^3 and 50,000m^3 • Potentially dusty construction material • Demolition activities 10m to 20m above ground level
	Earthworks	• Total site area 2,500m^2 to 10,000m^2 • 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
	Construction	• Total building volume 25,000m^3 to 100,000m^3 • 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	Demolition	• Total volume of building to be demolished less than 20,000m^3 • Construction material with low potential for dust release (e.g. metal cladding or timber) • Demolition activities less than 10m above ground and during wetter months
	Earthworks	• Total site area less than 2,500m^2 • 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

Magnitude	Activity	Criteria
	Construction	• Total building volume less than 25,000m^3 • 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, shopping streets, playing fields, farmland, short term car parks 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	Background 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/m³	More than 100	High	High	High	Medium	Low
		10 - 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 - 32µg/m³	More than 100	High	High	Medium	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24 - 28µg/m³	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/m³	More than 100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	Greater than 32µg/m³	More than 10	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	28 - 32µg/m³	More than 10	Medium	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	24 - 28µg/m³	More than 10	Low	Low	Low	Low	Low
		1 -10	Low	Low	Low	Low	Low
	Less than 24µg/m³	More than 10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Low	-	1 or more	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 demolition activities.

Table 8 Construction Dust - Dust Risk Category from Demolition Activities

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

3.2.18 Table 9 outlines the risk category from earthworks and construction activities.

Table 9 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

3.2.19 Table 10 outlines the risk category from trackout activities.

Table 10 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

3.2.20 Step 3 requires the identification of site specific mitigation measures within the IAQM guidance[9] 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

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

3.2.22 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.

[9] Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

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 therefore been defined by predicting pollutant concentrations at sensitive locations using dispersion modelling for the following scenarios:

- 2019 - Verification;
- Opening year Do-Minimum (DM) (predicted traffic flows in 2026 should the proposals not proceed); and,
- Opening year Do-Something (DS) (predicted traffic flows in 2026 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 off-site 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)[10] on the likely limits of pollutant dispersion from road sources. The criteria provided within DEFRA guidance[11] on where the AQOs apply, as summarised in Table 2, was utilised to determine worst-case receptor positions in the vicinity of links likely to be affected by changes in traffic flows as a result of the development.

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'[12]. Using this methodology impacts were defined based 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 11.

10 LA 105: Air Quality, Highways England, 2019.

11 Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

12 Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

Table 11 Significance of Operational Phase Road Vehicle Exhaust Emissions Impact

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

3.3.5 The matrix shown in Table 11 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 document[13] 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. Where the overall effect is **moderate** or **substantial**, the effect is likely to be considered **significant**, whilst if the impact is **slight** or **negligible**, the impact is likely to be considered **not significant**. It should be noted that this is a binary judgement of either it is **significant** or it is **not significant**.

13 Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

3.3.8 The determination of significance relies on professional judgement and reasoning has been provided as far as practicable. The IAQM guidance[14] suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix 2.

[14] Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

4.0 BASELINE

4.1 Introduction

4.1.1 Existing air quality conditions in the vicinity of the 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), as amended by the Environment Act (2021), BMBC has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that annual and 1-hour mean NO_2 concentrations are above the relevant AQOs within the borough. As such, five AQMAs have been declared. The closest of these to the development is described as follows:

> "AQMA No. 1 - An area along the M1 between Junction 35a and Junction 38, including Haigh, Darton, Cawthorne Dike, Higham, Dodworth, Gilroyd, Rockley, Birdwell, and Tankersley. The area extends 100m either side of the central reservation."

4.2.2 The site is located approximately 4.4km north-east of the AQMA. As such, there is the potential for emissions from the development to increase pollution concentrations in this sensitive area. This has been considered throughout the assessment.

4.2.3 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 throughout their area of jurisdiction. Recent NO_2 results recorded in the vicinity of the development are shown in Table 12. Exceedences of the AQO are shown in **bold**.

Table 12 Monitoring Results

Monitoring Site		Monitored NO_2 Concentration (µg/m³)		
		2019	2020	2021
24	A6135 Hoyland	30.2	30.3	20.6
25	A61 Sheffield Road, Birdwell	34.3	38.6	26.0
26	A61 Sheffield Road, Birdwell	**40.1**	**40.3**	25.7
27	A61 Sheffield Road, Birdwell	39.1	39.8	23.9
28	Tankersley School	23.9	23.6	15.1
29	Moor Lane, Birdwell	27.6	28.3	17.8
30	The Walk, Birdwell	29.5	33.4	20.1
31	Sheffield Road, Birdwell	29.7	29.7	19.1
32	Sheffield Road, Birdwell	32.8	35.5	23.0

4.3.2 As shown in Table 12, annual mean NO_2 concentrations were above the AQO at the 26 - A61 Sheffield Road monitor in 2019 and 2020. As this position is adjacent to a road with a high vehicle flow, elevated concentrations would be expected. Pollutant levels were below the AQO at all other monitoring positions in recent years. Reference should be made to Figure 2 for a map of the survey sites.

4.3.3 Pollutant concentrations during 2020 and 2021 were affected by changes to travel patterns and associated road vehicle exhaust emissions as a result of the COVID-19 pandemic. These results should therefore be viewed with caution.

4.3.4 BMBC do not undertake monitoring of PM_{10} or $PM_{2.5}$ concentrations within the vicinity of the site.

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:

439500, 401500. Data for this location was downloaded from the DEFRA website[15] for the purpose of the assessment and is summarised in Table 13.

Table 13 Background Pollutant Concentration Predictions

Pollutant	Predicted Background Pollutant Concentration (µg/m³)		
	2019	2024	2026
NO_2	10.99	9.02	8.50
PM_{10}	11.40	10.76	10.64
$PM_{2.5}$	7.16	6.66	6.57

4.4.2 As shown in Table 13, predicted background NO_2, PM_{10} and $PM_{2.5}$ concentrations are below the relevant AQOs and Interim Target 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 demolition, 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 14.

Table 14 Demolition, Earthworks and Construction Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Up to 20	10 - 100	0
Up to 50	10 - 100	0
Up to 100	More than 100	-

15 http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018.

Distance from Site Boundary (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
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 15.

Table 15 Trackout Dust Sensitive Receptors

Distance from Site Access Route (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Up to 20	More than 100	0
Up to 50	More than 100	0

4.5.4 There are no ecological receptors within 50m of the development boundary or the access route within 500m of the site entrance. As such, ecological impacts have not been assessed further within this report.

4.5.5 A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in Table 16.

Table 16 Additional Area Sensitivity Factors to Potential Dust Impacts

Guidance	Comment
Whether there is any history of dust generating activities in the area	The baseline review did not indicate any history of dust generation in the vicinity of the site.
The likelihood of concurrent dust generating activity on nearby sites	The baseline review did not indicate any concurrent dust generating activities in the vicinity of the site.
Pre-existing screening between the source and the receptors	Hedgerows are located along the site boundary, with a dense cover of trees on the northern boundary. These may act as barriers between emission sources and sensitive receptors.

Guidance	Comment
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 with notable frequencies from the north-west. As such, receptors to the north-east and south-east of the boundary are most likely to be affected by dust releases.
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 likely that it will extend beyond one year. The sensitivity of nearby receptors is unlikely to change during this time.
Any known specific receptor sensitivities which go beyond the classifications given in the document	No specific receptor sensitivities identified during the baseline assessment.

4.5.6 Based on the criteria shown in Table 4, the sensitivity of the receiving environment to potential dust impacts was determined as **high**. This was because the identified receptors included residential properties.

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 17.

Table 17 Sensitivity of the Surrounding Area to Potential Dust Impacts

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

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 18.

Table 18 Operational Phase Road Vehicle Exhaust Emission Sensitive Receptor Locations

Receptor		NGR (m)	
		X	Y
R1	Residential - A6195 Dearne Valley Parkway	435241.6	400831.6
R2	Residential - A6195 Dearne Valley Parkway	435123.7	400738.5
R3	Residential - A6195 Dearne Valley Parkway	435152.4	400699.6
R4	Residential - A6195 Dearne Valley Parkway	435197.8	400671.8
R5	Residential - Rockingham Row	434938.8	400718.0
R6	Residential - A61 Sheffield Road	434853.0	400389.9
R7	Residential - A61 Sheffield Road	434655.8	400695.4
R8	Residential - A61 Sheffield Road	434611.9	401013.5
R9	Residential - Cross Keys Lane	435221.4	400566.9
R10	Residential - Regent Court	435280.9	400430.9
R11	Residential - A6135 Sheffield Road	435397.5	400313.3
R12	Residential - Moor Lane	434708.1	400355.6
R13	Residential - M1	434492.3	400623.7
R14	Residential - Fenn Road	434669.8	400099.7
R15	Residential - Westwood New Road	434656.6	400182.8
R16	Residential - Hoyland Road	435555.1	400172.3
R17	Residential - Tankersley Lane	434893.9	399805.3
R18	Residential - Tankersley Lane	435379.7	399961.6
R19	Residential - A6195 Dearne Valley Parkway	436068.8	401433.5
R20	Residential - Grange View	436707.0	401753.6
R21	Residential - Barnsley Road	437011.2	401709.1
R22	Residential - Springfield Cottages	437693.2	401805.3
R23	Residential - Roebuck Ridge	438155.9	401554.1
R24	Residential - A6195 Dearne Valley Parkway	439076.6	401974.0
R25	Residential - Hemingfield Road	439022.8	402057.2

Receptor		NGR (m)	
		X	Y
R26	Residential - Hemingfield Road	439088.4	401759.8
R27	Residential - Hemingfield Road	439599.0	401561.0
R28	Residential - Lundhill Farm	439921.3	401566.8
R29	Residential - Lundhill Drive	440533.3	401811.8
R30	Residential - Smithy Bridge Lane	440735.5	400689.0
R31	Residential - Brampton Road	441142.8	402042.5
R32	Residential - Wath Road	441368.6	402205.1
R33	Residential - Wath Road	441313.5	402188.7
R34	Residential - Junction Close	441038.3	402361.5

4.5.9 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 The proposal has 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 demolition, excavation, ground works, cutting, construction and storage of materials has the potential to result in fugitive dust emissions throughout the construction phase. Vehicle movements on the local road network also have the potential to result in the re-suspension of dust from 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

Demolition

5.2.4 Demolition will involve clearance of the existing buildings on site. It is estimated that the total building volume to be demolished is less than 20,000m^3. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from demolition is therefore **small**.

5.2.5 Table 17 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. 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 demolition activities.

5.2.6 Table 17 indicates the sensitivity of the area to human health impacts is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **negligible** risk site for human health impacts as a result of demolition activities.

Earthworks

5.2.7 Earthworks may involve excavating material, haulage, tipping and stockpiling. The area of the proposed development site is greater than 10,000m^2. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from earthworks is therefore **large**.

5.2.8 Table 17 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 9, the development is considered to be a **high** risk site for dust soiling as a result of earthworks.

5.2.9 Table 17 indicates the sensitivity of the area to human health impacts is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **low** risk site for human health impacts as a result of earthworks.

Construction

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

5.2.11 Table 17 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 9, the development is considered to be a **medium** risk site for dust soiling as a result of construction activities.

5.2.12 Table 17 indicates the sensitivity of the area to human health impacts is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **low** risk site for human health impacts as a result of construction activities.

Trackout

5.2.13 Based on the site area, it is anticipated that the unpaved road length may be greater than 100m during certain stages of construction. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from trackout is therefore **large**.

5.2.14 Table 17 indicates the sensitivity of the area to dust soiling effects to people and property is **high**. In accordance with the criteria outlined in Table 10, the development is considered to be a **high** risk site for dust soiling as a result of trackout activities.

5.2.15 Table 17 indicates the sensitivity of the area to human health impacts is **medium**. In accordance with the criteria outlined in Table 10, the development is considered to be a **medium** risk site for human health impacts as a result of trackout activities.

Summary of the Risk of Dust Effects

5.2.16 A summary of the risk from each dust generating activity is provided in Table 19.

Table 19 Summary of Potential Unmitigated Dust Risks

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

5.2.17 As indicated in Table 19, the potential risk of dust soiling is **high** from earthworks and trackout and **medium** from demolition and construction. The potential risk of human health effects is **medium** from trackout, **low** from earthworks and construction and **negligible** from demolition.

5.2.18 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

5.2.19 The IAQM guidance[16] 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 20 and should be incorporated into a Construction Environmental Management Plan or similar.

Table 20 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 • Develop and implement a Dust Management Plan (DMP) or similar, which may include measures to control other emissions
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 off- site, and the action taken to resolve the situation in the log book
Monitoring	• Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority, if requested • Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection 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

16 Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

Issue	Control Measure
Site preparation	• Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible • Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site • 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
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 • Produce a Construction Logistics Travel Plan to manage sustainable delivery of good and materials
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	• No bonfires and burning of waste materials
Demolition	• Soft strip inside buildings before demolition • Ensure effective water suppression is used during demolition operations • Avoid explosive blasting, using appropriate manual or mechanical alternatives • Bag and remove any biological debris or damp down such material before demolition
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

Issue	Control Measure
Trackout	• Use water-assisted dust sweeper on access and local roads, if required • Avoid dry sweeping of large areas • Ensure vehicles entering and leaving site are covered to prevent escape of materials • Implement a wheel washing system, if required • Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits

Step 4

5.2.20 Assuming the relevant mitigation measures outlined in Table 20 are implemented, the residual impact from all dust generating activities is predicted to be **not significant**, in accordance with the IAQM guidance[17].

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 included the following scenarios:

- 2019 - Verification;
- 2026 - DM; and,
- 2026 - DS.

5.3.3 The DM scenario (i.e. without development) included baseline traffic data, inclusive of anticipated growth for the relevant assessment year and committed developments in the vicinity of the site. The DS scenario (i.e. with development) included baseline traffic data, inclusive of anticipated growth for the relevant assessment year and committed developments in the vicinity of the site, in addition to predicted vehicle trips associated with the proposals.

[17] Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

5.3.4 For the purpose of the assessment traffic data for 2026 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 for 2019 were utilised within the dispersion model. The use of 2026 traffic data and 2019 emission factors is considered to provide a worst-case scenario and therefore a sufficient level of confidence can be placed within the predicted pollution concentrations.

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

Predicted Concentrations

5.3.6 Annual mean NO_2 concentrations were predicted at the sensitive receptor locations for the DM and DS scenarios. These are summarised in Table 21. Exceedences of the AQO are shown in **bold**.

Table 21 Predicted Annual Mean NO_2 Concentrations

Receptor		Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)		
		DM	DS	Change
R1	Residential - A6195 Dearne Valley Parkway	26.44	26.52	0.08
R2	Residential - A6195 Dearne Valley Parkway	31.13	31.21	0.08
R3	Residential - A6195 Dearne Valley Parkway	25.78	25.81	0.03
R4	Residential - A6195 Dearne Valley Parkway	23.22	23.24	0.02
R5	Residential - Rockingham Row	22.93	22.95	0.02
R6	Residential - A61 Sheffield Road	**40.83**	**40.85**	0.02
R7	Residential - A61 Sheffield Road	34.23	34.24	0.01
R8	Residential - A61 Sheffield Road	32.83	32.83	0.00
R9	Residential - Cross Keys Lane	22.36	22.38	0.02
R10	Residential - Regent Court	23.69	23.71	0.02
R11	Residential - A6135 Sheffield Road	28.52	28.55	0.03
R12	Residential - Moor Lane	**47.62**	**47.65**	0.03
R13	Residential - M1	**41.77**	**41.79**	0.02

Receptor		Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)		
		DM	DS	Change
R14	Residential - Fenn Road	24.88	24.89	0.01
R15	Residential - Westwood New Road	28.10	28.12	0.02
R16	Residential - Hoyland Road	31.19	31.23	0.04
R17	Residential - Tankersley Lane	22.70	22.70	0.00
R18	Residential - Tankersley Lane	22.99	22.99	0.00
R19	Residential - A6195 Dearne Valley Parkway	21.71	21.75	0.04
R20	Residential - Grange View	19.57	19.60	0.03
R21	Residential - Barnsley Road	20.63	20.67	0.04
R22	Residential - Springfield Cottages	21.95	22.01	0.06
R23	Residential - Roebuck Ridge	19.14	19.16	0.02
R24	Residential - A6195 Dearne Valley Parkway	24.25	24.39	0.14
R25	Residential - Hemingfield Road	21.13	21.22	0.09
R26	Residential - Hemingfield Road	20.29	20.38	0.09
R27	Residential - Hemingfield Road	20.03	20.10	0.07
R28	Residential - Lundhill Farm	18.72	18.74	0.02
R29	Residential - Lundhill Drive	19.44	19.45	0.01
R30	Residential - Smithy Bridge Lane	19.40	19.47	0.07
R31	Residential - Brampton Road	20.17	20.19	0.02
R32	Residential - Wath Road	21.83	21.85	0.02
R33	Residential - Wath Road	22.80	22.83	0.03
R34	Residential - Junction Close	19.34	19.35	0.01

5.3.7 As indicated in Table 21, predicted annual mean NO_2 concentrations were above the AQO at three receptors in the DM and DS scenarios. Pollutant levels were below the AQO at all remaining locations. It should be noted that there were no new exceedences of the AQO in the DS scenario when compared with the DM.

5.3.8 Annual mean PM_{10} 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 PM_{10} Concentrations

Receptor		Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
		DM	DS	Change
R1	Residential - A6195 Dearne Valley Parkway	14.48	14.50	0.01
R2	Residential - A6195 Dearne Valley Parkway	15.44	15.45	0.02
R3	Residential - A6195 Dearne Valley Parkway	14.49	14.50	0.01
R4	Residential - A6195 Dearne Valley Parkway	14.02	14.02	0.00
R5	Residential - Rockingham Row	13.90	13.90	0.00
R6	Residential - A61 Sheffield Road	17.12	17.13	0.00
R7	Residential - A61 Sheffield Road	16.06	16.06	0.00
R8	Residential - A61 Sheffield Road	16.03	16.03	0.00
R9	Residential - Cross Keys Lane	13.85	13.86	0.00
R10	Residential - Regent Court	14.13	14.13	0.00
R11	Residential - A6135 Sheffield Road	15.17	15.18	0.01
R12	Residential - Moor Lane	17.45	17.46	0.00
R13	Residential - M1	16.12	16.13	0.00
R14	Residential - Fenn Road	14.12	14.12	0.00
R15	Residential - Westwood New Road	14.52	14.53	0.00
R16	Residential - Hoyland Road	15.21	15.21	0.01
R17	Residential - Tankersley Lane	13.76	13.76	0.00
R18	Residential - Tankersley Lane	13.84	13.84	0.00
R19	Residential - A6195 Dearne Valley Parkway	13.74	13.75	0.01
R20	Residential - Grange View	13.37	13.37	0.00
R21	Residential - Barnsley Road	13.46	13.46	0.00
R22	Residential - Springfield Cottages	13.63	13.64	0.01

Receptor		Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
		DM	DS	Change
R23	Residential - Roebuck Ridge	13.29	13.29	0.00
R24	Residential - A6195 Dearne Valley Parkway	13.94	13.97	0.02
R25	Residential - Hemingfield Road	13.60	13.61	0.01
R26	Residential - Hemingfield Road	13.60	13.62	0.02
R27	Residential - Hemingfield Road	13.58	13.60	0.02
R28	Residential - Lundhill Farm	13.27	13.27	0.00
R29	Residential - Lundhill Drive	13.34	13.34	0.00
R30	Residential - Smithy Bridge Lane	13.50	13.51	0.01
R31	Residential - Brampton Road	13.42	13.42	0.00
R32	Residential - Wath Road	13.87	13.87	0.00
R33	Residential - Wath Road	14.01	14.02	0.00
R34	Residential - Junction Close	13.39	13.39	0.00

5.3.9 As indicated in Table 22, predicted annual mean PM_{10} concentrations were below the relevant AQO at all sensitive receptor location in both the DM and DS scenarios.

5.3.10 Annual mean $PM_{2.5}$ concentrations were predicted at the sensitive receptor locations for the DM and DS scenarios. These are summarised in Table 23.

Table 23 Predicted Annual Mean $PM_{2.5}$ Concentrations

Receptor		Predicted Annual Mean $PM_{2.5}$ Concentration ($\mu g/m^3$)		
		DM	DS	Change
R1	Residential - A6195 Dearne Valley Parkway	9.61	9.62	0.01
R2	Residential - A6195 Dearne Valley Parkway	9.06	9.07	0.00
R3	Residential - A6195 Dearne Valley Parkway	8.79	8.79	0.00
R4	Residential - A6195 Dearne Valley Parkway	8.73	8.73	0.00
R5	Residential - Rockingham Row	10.60	10.60	0.00

Receptor		Predicted Annual Mean $PM_{2.5}$ Concentration ($\mu g/m^3$)		
		DM	DS	Change
R6	Residential - A61 Sheffield Road	9.97	9.97	0.00
R7	Residential - A61 Sheffield Road	9.92	9.93	0.00
R8	Residential - A61 Sheffield Road	8.69	8.70	0.00
R9	Residential - Cross Keys Lane	8.85	8.85	0.00
R10	Residential - Regent Court	9.43	9.44	0.00
R11	Residential - A6135 Sheffield Road	10.95	10.95	0.00
R12	Residential - Moor Lane	10.25	10.26	0.00
R13	Residential - M1	8.87	8.87	0.00
R14	Residential - Fenn Road	9.13	9.13	0.00
R15	Residential - Westwood New Road	9.47	9.47	0.00
R16	Residential - Hoyland Road	8.66	8.66	0.00
R17	Residential - Tankersley Lane	8.71	8.71	0.00
R18	Residential - Tankersley Lane	8.64	8.65	0.00
R19	Residential - A6195 Dearne Valley Parkway	8.41	8.42	0.00
R20	Residential - Grange View	8.48	8.48	0.00
R21	Residential - Barnsley Road	8.59	8.60	0.00
R22	Residential - Springfield Cottages	8.37	8.37	0.00
R23	Residential - Roebuck Ridge	8.79	8.80	0.01
R24	Residential - A6195 Dearne Valley Parkway	8.55	8.56	0.01
R25	Residential - Hemingfield Road	8.53	8.54	0.01
R26	Residential - Hemingfield Road	8.52	8.53	0.01
R27	Residential - Hemingfield Road	8.35	8.35	0.00
R28	Residential - Lundhill Farm	8.40	8.40	0.00
R29	Residential - Lundhill Drive	8.47	8.47	0.01
R30	Residential - Smithy Bridge Lane	8.45	8.45	0.00
R31	Residential - Brampton Road	8.69	8.69	0.00

Receptor		Predicted Annual Mean $PM_{2.5}$ Concentration ($\mu g/m^3$)		
		DM	DS	Change
R32	Residential - Wath Road	8.77	8.77	0.00
R33	Residential - Wath Road	8.42	8.42	0.00
R34	Residential - Junction Close	9.61	9.62	0.01

5.3.11 As indicated in Table 23, predicted annual mean $PM_{2.5}$ concentrations were below the Interim Target at all sensitive receptors in both the DM and DS scenarios.

Predicted Impacts

5.3.12 Predicted impacts on annual mean NO_2 concentrations at the sensitive receptor locations are summarised in Table 24.

Table 24 Predicted Impacts - NO_2

Receptor		Predicted Annual Mean NO_2 Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R1	Residential - A6195 Dearne Valley Parkway	Below 75% of AQO	0	Negligible
R2	Residential - A6195 Dearne Valley Parkway	76 - 94% of AQO	0	Negligible
R3	Residential - A6195 Dearne Valley Parkway	Below 75% of AQO	0	Negligible
R4	Residential - A6195 Dearne Valley Parkway	Below 75% of AQO	0	Negligible
R5	Residential - Rockingham Row	Below 75% of AQO	0	Negligible
R6	Residential - A61 Sheffield Road	103 - 109% of AQO	0	Negligible
R7	Residential - A61 Sheffield Road	76 - 94% of AQO	0	Negligible
R8	Residential - A61 Sheffield Road	76 - 94% of AQO	0	Negligible
R9	Residential - Cross Keys Lane	Below 75% of AQO	0	Negligible
R10	Residential - Regent Court	Below 75% of AQO	0	Negligible

Receptor		Predicted Annual Mean NO_2 Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R11	Residential - A6135 Sheffield Road	Below 75% of AQO	0	Negligible
R12	Residential - Moor Lane	110% or more of AQO	0	Negligible
R13	Residential - M1	103 - 109% of AQO	0	Negligible
R14	Residential - Fenn Road	Below 75% of AQO	0	Negligible
R15	Residential - Westwood New Road	Below 75% of AQO	0	Negligible
R16	Residential - Hoyland Road	76 - 94% of AQO	0	Negligible
R17	Residential - Tankersley Lane	Below 75% of AQO	0	Negligible
R18	Residential - Tankersley Lane	Below 75% of AQO	0	Negligible
R19	Residential - A6195 Dearne Valley Parkway	Below 75% of AQO	0	Negligible
R20	Residential - Grange View	Below 75% of AQO	0	Negligible
R21	Residential - Barnsley Road	Below 75% of AQO	0	Negligible
R22	Residential - Springfield Cottages	Below 75% of AQO	0	Negligible
R23	Residential - Roebuck Ridge	Below 75% of AQO	0	Negligible
R24	Residential - A6195 Dearne Valley Parkway	Below 75% of AQO	0	Negligible
R25	Residential - Hemingfield Road	Below 75% of AQO	0	Negligible
R26	Residential - Hemingfield Road	Below 75% of AQO	0	Negligible
R27	Residential - Hemingfield Road	Below 75% of AQO	0	Negligible
R28	Residential - Lundhill Farm	Below 75% of AQO	0	Negligible
R29	Residential - Lundhill Drive	Below 75% of AQO	0	Negligible
R30	Residential - Smithy Bridge Lane	Below 75% of AQO	0	Negligible
R31	Residential - Brampton Road	Below 75% of AQO	0	Negligible
R32	Residential - Wath Road	Below 75% of AQO	0	Negligible
R33	Residential - Wath Road	Below 75% of AQO	0	Negligible
R34	Residential - Junction Close	Below 75% of AQO	0	Negligible

5.3.13 As indicated in Table 24, impacts on annual mean NO_2 concentrations as a result of the proposed development were predicted to be **negligible** at all receptor locations.

5.3.14 Predicted impacts on annual mean PM_{10} concentrations at the sensitive receptor locations are summarised in Table 25.

Table 25 Predicted Impacts - PM_{10}

Receptor		Predicted Annual Mean PM_{10} Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R1	Residential - A6195 Dearne Valley Parkway	Below 75% of AQO	0	Negligible
R2	Residential - A6195 Dearne Valley Parkway	Below 75% of AQO	0	Negligible
R3	Residential - A6195 Dearne Valley Parkway	Below 75% of AQO	0	Negligible
R4	Residential - A6195 Dearne Valley Parkway	Below 75% of AQO	0	Negligible
R5	Residential - Rockingham Row	Below 75% of AQO	0	Negligible
R6	Residential - A61 Sheffield Road	Below 75% of AQO	0	Negligible
R7	Residential - A61 Sheffield Road	Below 75% of AQO	0	Negligible
R8	Residential - A61 Sheffield Road	Below 75% of AQO	0	Negligible
R9	Residential - Cross Keys Lane	Below 75% of AQO	0	Negligible
R10	Residential - Regent Court	Below 75% of AQO	0	Negligible
R11	Residential - A6135 Sheffield Road	Below 75% of AQO	0	Negligible
R12	Residential - Moor Lane	Below 75% of AQO	0	Negligible
R13	Residential - M1	Below 75% of AQO	0	Negligible
R14	Residential - Fenn Road	Below 75% of AQO	0	Negligible
R15	Residential - Westwood New Road	Below 75% of AQO	0	Negligible
R16	Residential - Hoyland Road	Below 75% of AQO	0	Negligible
R17	Residential - Tankersley Lane	Below 75% of AQO	0	Negligible
R18	Residential - Tankersley Lane	Below 75% of AQO	0	Negligible

Receptor		Predicted Annual Mean PM_{10} Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R19	Residential - A6195 Dearne Valley Parkway	Below 75% of AQO	0	Negligible
R20	Residential - Grange View	Below 75% of AQO	0	Negligible
R21	Residential - Barnsley Road	Below 75% of AQO	0	Negligible
R22	Residential - Springfield Cottages	Below 75% of AQO	0	Negligible
R23	Residential - Roebuck Ridge	Below 75% of AQO	0	Negligible
R24	Residential - A6195 Dearne Valley Parkway	Below 75% of AQO	0	Negligible
R25	Residential - Hemingfield Road	Below 75% of AQO	0	Negligible
R26	Residential - Hemingfield Road	Below 75% of AQO	0	Negligible
R27	Residential - Hemingfield Road	Below 75% of AQO	0	Negligible
R28	Residential - Lundhill Farm	Below 75% of AQO	0	Negligible
R29	Residential - Lundhill Drive	Below 75% of AQO	0	Negligible
R30	Residential - Smithy Bridge Lane	Below 75% of AQO	0	Negligible
R31	Residential - Brampton Road	Below 75% of AQO	0	Negligible
R32	Residential - Wath Road	Below 75% of AQO	0	Negligible
R33	Residential - Wath Road	Below 75% of AQO	0	Negligible
R34	Residential - Junction Close	Below 75% of AQO	0	Negligible

5.3.15 As indicated in Table 25, impacts on annual mean PM_{10} concentrations as a result of the proposed development were predicted to be **negligible** at all receptor locations.

5.3.16 Predicted impacts on annual mean $PM_{2.5}$ concentrations at the sensitive receptor locations are summarised in Table 26.

Table 26 Predicted Impacts - $PM_{2.5}$

Receptor		Predicted Annual Mean $PM_{2.5}$ Concentration	Predicted Concentration Change as Proportion of the Interim Target (%)	Impact Significance
R1	Residential - A6195 Dearne Valley Parkway	76 - 94% of Interim Target	0	Negligible
R2	Residential - A6195 Dearne Valley Parkway	76 - 94% of Interim Target	0	Negligible
R3	Residential - A6195 Dearne Valley Parkway	76 - 94% of Interim Target	0	Negligible
R4	Residential - A6195 Dearne Valley Parkway	Below 75% of Interim Target	0	Negligible
R5	Residential - Rockingham Row	Below 75% of Interim Target	0	Negligible
R6	Residential - A61 Sheffield Road	76 - 94% of Interim Target	0	Negligible
R7	Residential - A61 Sheffield Road	76 - 94% of Interim Target	0	Negligible
R8	Residential - A61 Sheffield Road	76 - 94% of Interim Target	0	Negligible
R9	Residential - Cross Keys Lane	Below 75% of Interim Target	0	Negligible
R10	Residential - Regent Court	Below 75% of Interim Target	0	Negligible
R11	Residential - A6135 Sheffield Road	76 - 94% of Interim Target	0	Negligible
R12	Residential - Moor Lane	76 - 94% of Interim Target	0	Negligible
R13	Residential - M1	76 - 94% of Interim Target	0	Negligible
R14	Residential - Fenn Road	Below 75% of Interim Target	0	Negligible
R15	Residential - Westwood New Road	76 - 94% of Interim Target	0	Negligible
R16	Residential - Hoyland Road	76 - 94% of Interim Target	0	Negligible

Receptor		Predicted Annual Mean $PM_{2.5}$ Concentration	Predicted Concentration Change as Proportion of the Interim Target (%)	Impact Significance
R17	Residential - Tankersley Lane	Below 75% of Interim Target	0	Negligible
R18	Residential - Tankersley Lane	Below 75% of Interim Target	0	Negligible
R19	Residential - A6195 Dearne Valley Parkway	Below 75% of Interim Target	0	Negligible
R20	Residential - Grange View	Below 75% of Interim Target	0	Negligible
R21	Residential - Barnsley Road	Below 75% of Interim Target	0	Negligible
R22	Residential - Springfield Cottages	Below 75% of Interim Target	0	Negligible
R23	Residential - Roebuck Ridge	Below 75% of Interim Target	0	Negligible
R24	Residential - A6195 Dearne Valley Parkway	Below 75% of Interim Target	0	Negligible
R25	Residential - Hemingfield Road	Below 75% of Interim Target	0	Negligible
R26	Residential - Hemingfield Road	Below 75% of Interim Target	0	Negligible
R27	Residential - Hemingfield Road	Below 75% of Interim Target	0	Negligible
R28	Residential - Lundhill Farm	Below 75% of Interim Target	0	Negligible
R29	Residential - Lundhill Drive	Below 75% of Interim Target	0	Negligible
R30	Residential - Smithy Bridge Lane	Below 75% of Interim Target	0	Negligible
R31	Residential - Brampton Road	Below 75% of Interim Target	0	Negligible
R32	Residential - Wath Road	Below 75% of Interim Target	0	Negligible
R33	Residential - Wath Road	Below 75% of Interim Target	0	Negligible

Receptor		Predicted Annual Mean $PM_{2.5}$ Concentration	Predicted Concentration Change as Proportion of the Interim Target (%)	Impact Significance
R34	Residential - Junction Close	Below 75% of Interim Target	0	Negligible

5.3.17 As indicated in Table 26, impacts on annual mean $PM_{2.5}$ concentrations as a result of the proposed development were predicted to be **negligible** at all receptor locations.

Overall Impact Significance

5.3.18 The overall significance of operational phase road traffic emission impacts was determined as **negligible**. This was based on the overall predicted impacts at discrete receptor locations and the considerations outlined previously. Further justification is provided in Table 27.

Table 27 Overall Road Vehicle Exhaust Emissions 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 AQO at three receptors in the DM scenario. There were no new exceedences of the AQO in the DS scenario when compared with the DM. PM_{10} and $PM_{2.5}$ concentrations were below the AQO and Interim Target at all locations in the DM scenario. The predicted concentrations are considered unlikely to change significantly in the absence of the proposals given the established nature of the area.
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 or Interim Target.

Guidance	Comment
The influence and validity of any assumptions adopted when undertaking the prediction of impacts	It is assumed that vehicle exhaust emission rates and background pollution levels will not reduce in future years. This provides worst-case results when compared with the DEFRA and National Highways methodologies. Due to the adopted assumptions it is considered the presented results are sufficiently robust for an assessment of this nature.

5.3.19 The IAQM guidance[18] states that only if the impact is greater than **slight**, the effect is considered **significant**. As impacts were predicted to be **negligible**, overall effects are considered **not significant**, in accordance with the stated methodology.

5.4 Barnsley Air Quality and Emissions Good Practice Guidance

Development Classification

5.4.1 BMBC has produced Air Quality and Emissions Good Practice Planning Guidance[19] which includes direction on when an air quality assessment will be required and the associated scope of works. This also 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.

5.4.2 Review of the relevant criteria indicated the proposals were classified as **medium** due to the following criteria:

- Dwelling Houses (C3) over 50 units; and,
- Did not trigger the additional criteria for a major development.

[18] Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

[19] Barnsley Air Quality and Emissions Good Practice Guidance, BMBC, 2021.

Proposed Measures

5.4.3 The guidance[20] provides a number of mitigation options that should be considered for inclusion within developments. These were reviewed and those to be incorporated within the proposals include the following.

- Provision of one electric vehicle charging point per dwelling;
- Implementation of a Travel Plan to encourage sustainable modes of transport to and from the site;
- Pedestrian access to be provided from the site to existing public transport stops to encourage sustainable modes of transport to and from the site;
- Relocation of existing bus stop infrastructure to encourage use of public transport to and from the site; and,
- Site layout to be designed to encourage walking.

5.4.4 The above measures are anticipated to reduce road vehicle exhaust emissions on the local road network and are considered to meet the mitigation requirements for a scheme of this scale and nature, in accordance with the guidance[21].

[20] Barnsley Air Quality and Emissions Good Practice Guidance, BMBC, 2021.

[21] Barnsley Air Quality and Emissions Good Practice Guidance, BMBC, 2021.

6.0 CONCLUSION

6.1.1 Redmore Environmental Ltd was commissioned by Ptarmigan Land North Ltd to undertake an Air Quality Assessment in support of a planning application for a residential development on land off Hemingfield Road, Barnsley.

6.1.2 The proposals have the potential to cause air quality impacts as a result of fugitive dust emissions during construction and road traffic exhaust emissions during operation. As such, an Air Quality Assessment was undertaken to determine baseline conditions and assess potential effects as a result of the scheme.

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 demolition, earthworks, construction and trackout activities was predicted to be **not significant**.

6.1.4 The proposed development has the potential to impact existing air quality in the vicinity of the site during operation. Dispersion modelling was therefore undertaken using ADMS-Roads in order to predict pollutant concentrations as a result of emissions from the highway network. Results were subsequently verified using local monitoring data.

6.1.5 Review of the dispersion modelling results indicated that impacts on annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations as a result of traffic generated by the development were predicted to be **negligible** at all sensitive receptor locations. Air quality impacts as a result of the operation of the development were therefore considered to be **not significant**, in accordance with the IAQM guidance.

6.1.6 A number of mitigation measures were identified from the Barnsley Air Quality and Emissions Good Practice Guidance[22] in order to reduce vehicle exhaust emissions associated with the proposals. It is considered these are appropriate for a development of this scale and nature and will further control impacts during the operational phase.

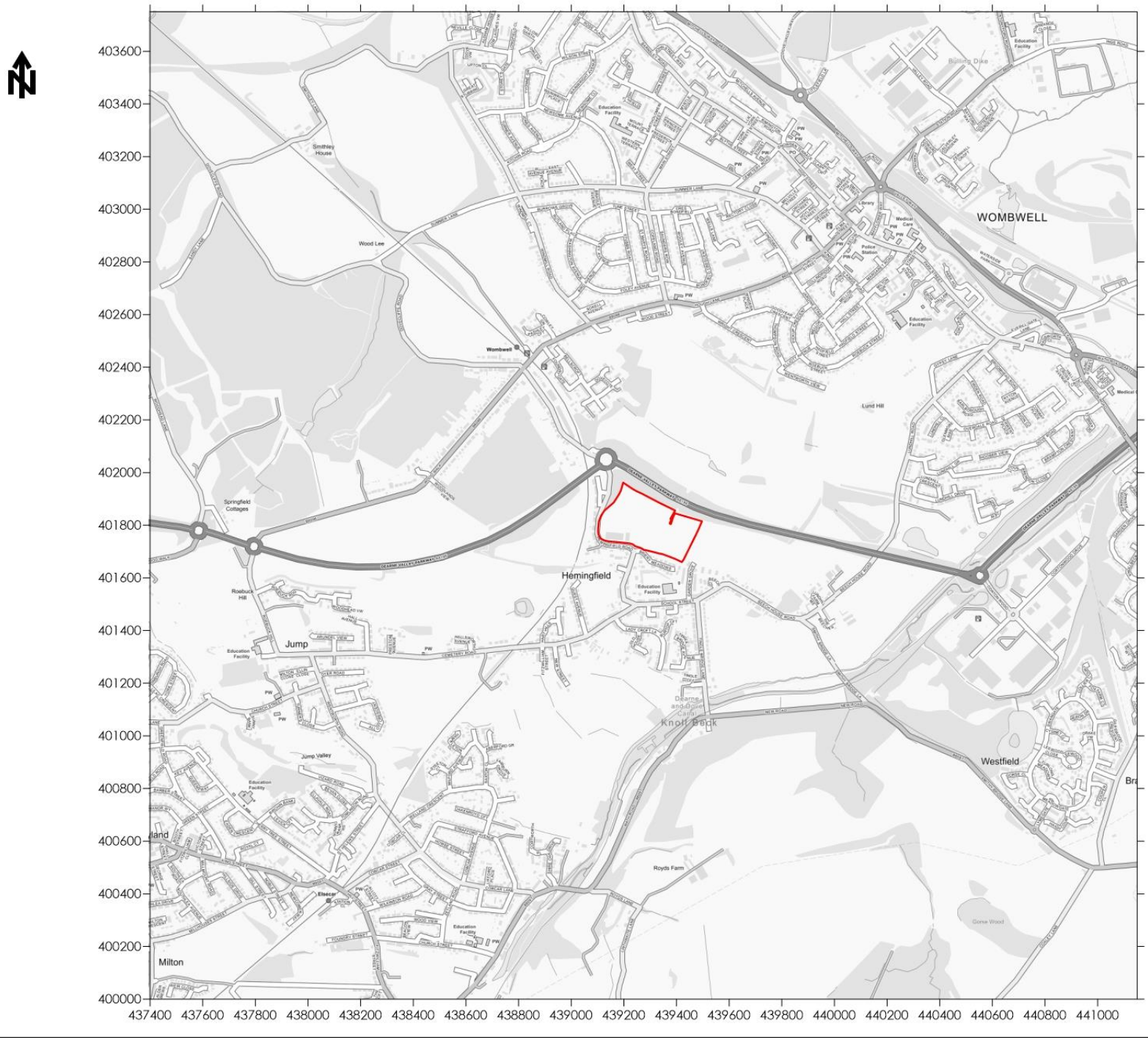
[22] Barnsley Air Quality and Emissions Good Practice Guidance, BMBC, 2021.

6.1.7 Based on the assessment results, air quality factors are not considered a constraint to planning consent for the development.

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
DMP	Dust Management Plan
DMRB	Design Manual for Roads and Bridges
DS	Do-Something
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
NGR	National Grid Reference
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NPPF	National Planning Policy Framework
NPPG	National Planning Policy Guidance
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10µm
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5µm
z_0	Roughness length

Figures



Legend

Site Boundary

Title
Figure 1 - Site Location Plan

Project
Air Quality Assessment
Hemingfield Road, Barnsley

Project Reference
7348

Client
Ptarmigan Land North Ltd

Redmore environmental
www.red-env.co.uk | 0161 7060075

Legend

Site Boundary

Monitor

Title
Figure 2 - Monitoring Locations

Project
Air Quality Assessment
Hemingfield Road, Barnsley

Project Reference
7348

Client
Ptarmigan Land North Ltd

Redmore environmental
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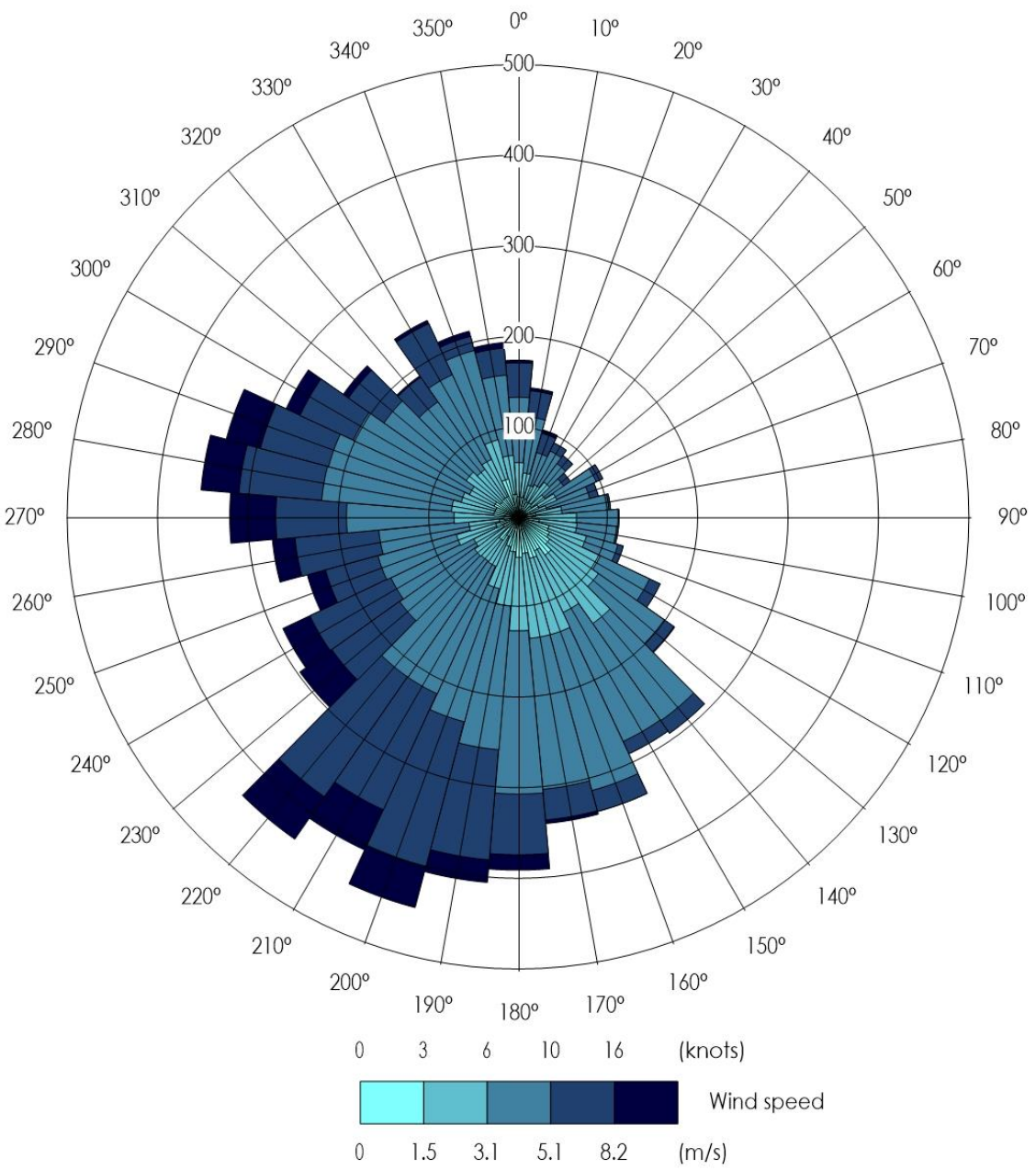

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Title
Figure 3 - Wind Rose of 2019 Doncaster Sheffield Meteorological Data

Project
Air Quality Assessment
Hemingfield Road, Barnsley

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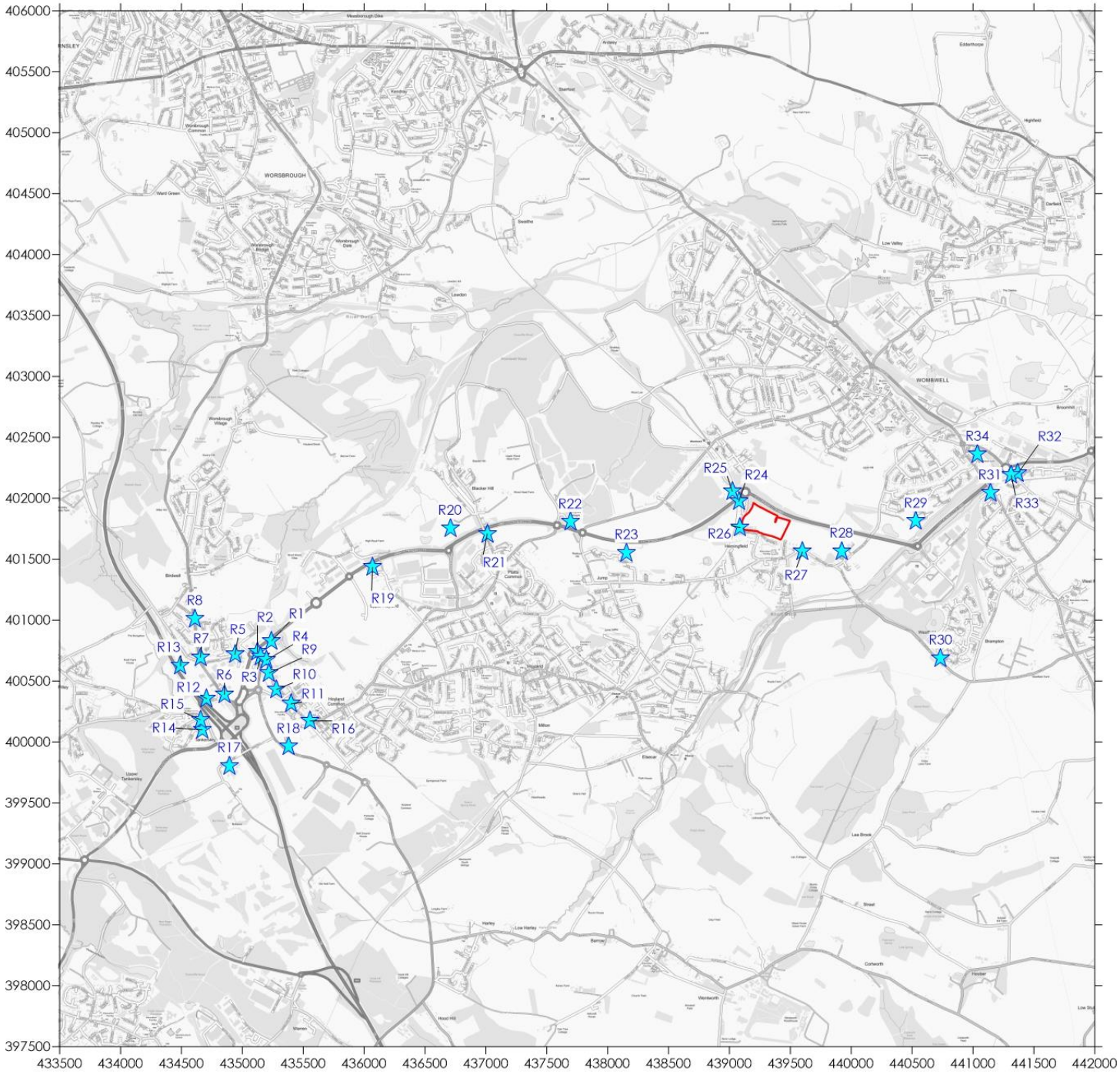

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Site Boundary

Sensitive Receptor

Title

Figure 4 - Road Vehicle Exhaust Emissions Sensitive Receptor Locations

Project

Air Quality Assessment
Hemingfield Road, Barnsley

Project Reference

7348

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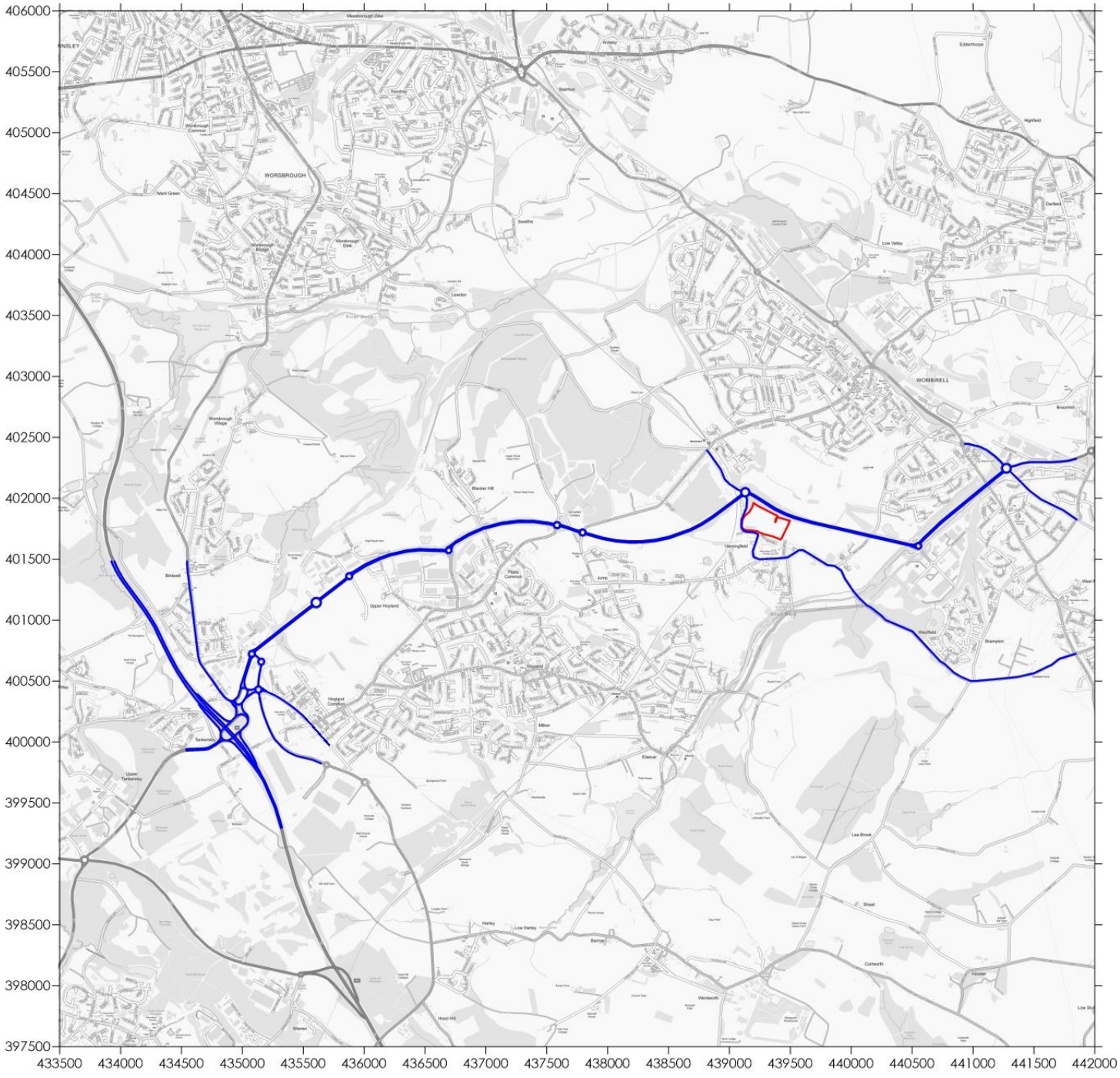

Legend

Site Boundary

Road Link

Title
Figure 5 - ADMS-Roads Inputs

Project
Air Quality Assessment
Hemingfield Road, Barnsley

Project Reference
7348

Client
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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 exhaust emissions associated with vehicles travelling to and from the site. In order to assess NO_2, PM_{10} and $PM_{2.5}$ 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 5.0.1.3). 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:

- Assessment area;
- Traffic flow data;
- Vehicle emission factors;
- Spatial co-ordinates of emissions;
- Street width;
- Meteorological data;
- Roughness length (z_0); and,
- Monin-Obukhov length.

The following Sections detail the relevant inputs utilised in the assessment.

Traffic Flow Data

Traffic data for use in the assessment, including 24-hour Annual Average Daily Traffic (AADT) flows and fleet composition as HDV proportion was provided by Bryan G Hall, the Transport Consultants for the project.

Baseline traffic data was not available for a number of roads included in the model. As such, flows for these links were obtained from the Department for Transport (DfT)[23]. The DfT web tool enables the user to view and download traffic flows on every link of the 'A' road and motorway network, as well as the selected minor roads, in Great Britain for the years 1999 to 2022. It should be noted that the DfT web tool is reference in DEFRA guidance[24] as being a suitable source of data for air quality assessment and it is therefore considered to provide a reasonable estimate of traffic flows in the vicinity of the site.

Baseline traffic data obtained from the DfT was converted to the site opening year utilising a factor obtained from Bryan G Hall.

Traffic flows associated with the former Wombwell School development (planning reference: 2019/0089) to the north-east of the proposals, as well as the Dearne Valley Parkway scheme (planning reference: 2021/0479) were included in the DM and DS scenarios in order to take account of cumulative air quality impacts at nearby sensitive locations.

A summary of the traffic data used in the assessment is provided in Table A1.1. Road widths and vehicle speeds were estimated from aerial photography and UK highway design standards.

Table A1.1 Traffic Data

Link		24-hour AADT Flow			HDV Prop. of Fleet (%)	Av. Vehicle Speed km/h	Road width (m)
		Verif.	2026 DM	2026 DS			
L1	Dearne Valley Parkway, east of Shortwood Way, eastbound	12,121	13,054	13,210	12.60	80	7.3
L2	Dearne Valley Parkway, east of Shortwood Way, westbound	12,121	13,054	13,210	12.60	80	7.3
L3	Dearne Valley Parkway, west of Shortwood Way, westbound	12,337	13,285	13,441	12.60	80	7.3
L4	Dearne Valley Parkway, east of Rockingham Roundabout, westbound	12,337	13,285	13,441	12.60	30	7.3
L5	Dearne Valley Parkway, east of Rockingham Roundabout, eastbound	12,337	13,285	13,441	12.60	30	7.3

[23] https://roadtraffic.dft.gov.uk/#14/53.3690/-2.7272/basemap-countpoints.

[24] Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

Link		24-hour AADT Flow			HDV Prop. of Fleet (%)	Av. Vehicle Speed km/h	Road width (m)
		Verif.	2026 DM	2026 DS			
L6	Dearne Valley Parkway, west of Shortwood Way, eastbound	12,337	13,285	13,441	12.60	80	7.3
L7	Dearne Valley Parkway, south of Rockingham Roundabout, southbound	11,627	12,589	12,745	13.00	80	7.3
L8	Dearne Valley Parkway, north of Rockingham Roundabout, northbound	11,627	12,589	12,745	13.00	80	7.3
L9	A61 Sheffield Road to Birdwell Roundabout	7,101	7,640	7,640	12.40	20	13.9
L10	Birdwell Roundabout to A61 Sheffield Road	7,101	7,640	7,640	12.40	20	4.5
L11	A61 to A61 Sheffield Road	7,101	7,640	7,640	12.40	20	4.5
L12	A61 Sheffield Road, south of The Walk	21,519	23,151	23,151	8.10	30	7.3
L13	A61 Sheffield Road, north of The Walk	21,519	23,151	23,151	8.10	40	7.3
L14	East of Rockingham Roundabout	2,523	3,110	3,110	8.50	30	8.5
L15	North of A6135	2,523	3,110	3,110	8.50	45	7.3
L16	A6135 Sheffield Road, eastbound	6,747	7,254	7,278	8.70	30	4.5
L17	A6135 Sheffield Road, westbound	6,747	7,254	7,278	8.70	30	4.5
L18	A6135 Sheffield Road	13,493	14,507	14,557	8.70	45	7.3
L19	A61 south of Birdwell Roundabout, southbound	19,158	20,729	20,860	12.40	30	7.3
L20	A61 south of Birdwell Roundabout, northbound	19,158	20,729	20,860	12.40	30	7.3
L21	A6135, east of Birdwell Roundabout, eastbound	6,747	7,254	7,278	8.70	40	7.3
L22	A6135, east of Birdwell Roundabout, westbound	6,747	7,254	7,278	8.70	40	7.3
L23	M1, northbound	54,272	51,626	51,626	10.80	100	11.3
L24	M1, southbound	48,224	51,626	51,664	10.10	100	11.3
L25	Shortwood Roundabout	12,229	13,169	13,169	12.60	40	7.3
L26	Rockingham Roundabout	10,090	10,971	10,971	12.60	40	7.3

Link		24-hour AADT Flow			HDV Prop. of Fleet (%)	Av. Vehicle Speed km/h	Road width (m)
		Verif.	2026 DM	2026 DS			
L27	Sheffield Road Roundabout	2,523	3,110	3,110	8.50	40	7.3
L28	Birdwell to Sheffield Road Roundabout	5,691	6,218	6,218	8.70	40	7.3
L29	Birdwell Roundabout	12,510	13,524	13,655	13.00	40	11.3
L30	M1 Roundabout	21,635	23,271	23,395	12.40	40	11.3
L31	M1 slip road, southbound	24,112	25,813	25,851	10.10	20	6.5
L32	M1 slip road, northbound	24,112	25,813	25,851	10.80	20	6.2
L33	A6135 Sheffield Road, Hoyland Road junction	13,493	14,507	14,557	8.70	20	7.3
L34	A6135 Sheffield Road	13,493	14,507	14,557	8.70	40	7.3
L35	M1 north of A61 Southbound	54,439	51,626	51,626	10.10	100	11.3
L36	M1 north of A61 Northbound	48,224	51,626	51,664	10.80	100	11.3
L37	A6195 Dearne Valley Parkway, adjacent to Barnsley Road, eastbound	12,907	13,617	13,787	4.85	100	7.1
L38	A6195 Dearne Valley Parkway, adjacent to Barnsley Road, westbound	12,907	13,617	13,787	4.85	100	7.1
L39	A6195 Dearne Valley Parkway, adjacent to Springfield Cottages, eastbound	12,907	13,617	13,787	4.85	100	7.5
L40	A6195 Dearne Valley Parkway, adjacent to Springfield Cottages, westbound	12,907	13,617	13,787	4.85	100	7.5
L41	A6195 Dearne Valley Parkway, south of Wood Walk, eastbound	12,907	13,617	13,787	4.85	100	7.3
L42	A6195 Dearne Valley Parkway, south of Wood Walk, eastbound, SP	12,907	13,617	13,787	4.85	20	7.8
L43	A6195 Dearne Valley Parkway, south of Wood Walk, westbound	12,907	13,617	13,787	4.85	100	7.3
L44	A6195 Dearne Valley Parkway, adjacent to Site, eastbound	14,461	15,091	15,195	4.73	100	7.5
L45	A6195 Dearne Valley Parkway, adjacent to Site, eastbound, SP	14,461	15,091	15,195	4.73	20	7.7

Link		24-hour AADT Flow			HDV Prop. of Fleet (%)	Av. Vehicle Speed km/h	Road width (m)
		Verif.	2026 DM	2026 DS			
L46	A6195 Dearne Valley Parkway, adjacent to Site, westbound, SP	14,461	15,091	15,195	4.73	20	7.5
L47	A6195 Dearne Valley Parkway, adjacent to Site, westbound	14,461	15,091	15,195	4.73	100	7.7
L48	A6195 Dearne Valley Parkway, north of Corton Wood, northbound	14,461	15,091	15,195	4.73	100	7.1
L49	A6195 Dearne Valley Parkway, north of Corton Wood, southbound, slow phase	14,461	15,091	15,195	4.73	20	8.2
L50	A6195 Dearne Valley Parkway, north of Corton Wood, northbound, slow phase	14,461	15,091	15,195	4.73	20	7.6
L51	A6195 Dearne Valley Parkway, north of Corton Wood, southbound	14,461	15,091	15,195	4.73	100	7.7
L52	A633	15,382	16,288	16,383	3.15	65	10.7
L53	A6195, slow phase	27,439	29,055	29,167	3.70	20	16.3
L54	A6195	27,439	29,055	29,167	3.70	65	7.6
L55	Wath Road, slow phase	9,068	9,602	9,602	2.55	20	11.6
L56	Wath Road	9,068	9,602	9,602	2.55	65	10.7
L57	Hemingfield Road, north of Dearne Valley Parkway, slow phase	4,896	5,168	5,412	2.61	20	7.3
L58	Hemingfield Road, north of Dearne Valley Parkway	4,896	5,168	5,412	2.61	45	9.0
L59	Hemingfield Road, north of Site Access	4,931	5,500	6,292	3.06	30	7.3
L60	Hemingfield Road, south of Site Access	4,931	5,500	5,701	3.06	45	7.3
L61	M1 southbound Slip Road, south of A61	12,181	12,898	12,956	9.75	80	6.1
L62	M1 northbound Slip Road, south of A61	12,069	12,780	12,837	9.72	80	6.4
L63	M1 southbound, south of A61	48,724	51,593	51,650	9.75	110	11.3
L64	M1 northbound, south of A62	48,277	51,119	51,177	9.72	110	11.3
L65	Westwood New Road, eastbound	12,123	12,837	12,837	4.20	65	6.9
L66	Westwood New Road, westbound	11,460	12,135	12,135	3.94	65	7.8

Link		24-hour AADT Flow			HDV Prop. of Fleet (%)	Av. Vehicle Speed km/h	Road width (m)
		Verif.	2026 DM	2026 DS			
L67	A6195 Dearne Valley Parkway, south of Shortwood Crescent, eastbound	12,337	13,187	13,344	12.60	80	7.5
L68	A6195 Dearne Valley Parkway, south of Shortwood Crescent, westbound	12,337	13,187	13,344	12.60	80	7.5
L69	Olympus Way, slow phase	9,092	9,627	9,627	2.50	20	12.2
L70	Olympus Way	9,092	9,627	9,627	2.50	80	10.5
R1	Ryecroft Bank Roundabout	6,257	6,668	6,824	8.73	40	10.2
R2	Wood Walk Roundabout	6,453	6,808	6,979	4.85	40	9.9
R3	Roebuck Hill Roundabout	6,453	6,808	6,979	4.85	40	8.6
R4	Hemingfield Road Roundabout	5,377	5,646	6,042	4.06	40	11.5
R5	Corton Wood Roundabout	7,231	7,546	7,649	4.73	40	10.2
R6	Wath Road Roundabout	8,081	8,513	8,616	3.77	40	9.9
R7	A6195 Dearne Valley Parkway Roundabout	6,169	6,618	6,774	12.60	40	10.5

Reference should be made to Figure 5 for a graphical representation of the road link locations.

Emission Factors

Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 12.0.1). This has been produced by DEFRA and incorporates COPERT 5.6 vehicle emission factors and fleet information.

There is current uncertainty over NO_2 concentrations within the UK, with the implementation of new vehicle emission standards not resulting in the previously expected reduction in roadside levels. Therefore, 2019 emission factors were utilised in preference to the scheme opening year in order to provide robust model outputs. As predictions for 2019 were verified, it is considered the results are a robust indication of worst case concentrations for the future year.

Meteorological Data

Meteorological data used in the assessment was taken from Doncaster Sheffield meteorological station over the period 1st January 2019 to 31st December 2019 (inclusive). Doncaster Sheffield is located at NGR: 465930, 398920, which is approximately 26.9km south-east of the development. It is anticipated that conditions would be reasonably similar over a distance of this magnitude. The data was therefore considered suitable for an assessment of this nature.

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 the utilised meteorological data.

Roughness Length

The z_0 is a modelling parameter applied to allow consideration of surface height roughness elements. A z_0 of 0.5m was used to describe the modelling extents. This is considered appropriate for the morphology of the area and is suggested within ADMS-Roads as being suitable for 'parkland, open suburbia'.

A z_0 of 0.2m was used to describe the meteorological site. This is considered appropriate for the morphology of the area and is suggested within ADMS-Roads as being suitable for 'agricultural areas (min)'.

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 development site and is suggested within ADMS-Roads as being suitable for 'cities and large towns.'

A minimum Monin-Obukhov length of 10m was used to describe the meteorological site. This value is considered appropriate for the nature of the meteorological site and is suggested within ADMS-Roads as being suitable for 'small towns < 50,000'.

Background Concentrations

Background annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations for use in the assessment were obtained from the DEFRA mapping study for the grid square containing the B2 monitor. These are shown in Table A1.2.

Table A1.2 Background Pollutant Concentrations - Modelling Extents

Pollutant	Predicted Background Pollutant Concentration (µg/m³)
NO_2	17.36
PM_{10}	13.08
$PM_{2.5}$	8.23

The annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations were chosen to represent concentrations throughout the dispersion modelling extents without the contribution from road vehicles as they were higher than the DEFRA backgrounds for the grid square containing the site, as shown in Table 13.

Similarly to emission factors, background concentrations from 2019 were utilised throughout the assessment in preference to the development opening year. This provided a robust assessment and is likely to overestimate pollutant concentrations during the operation of the proposal.

NO_x to NO_2 Conversion

Predicted annual mean NO_x concentrations were converted to NO_2 concentrations using the spreadsheet (version 8.1) provided by DEFRA, which is the method detailed within DEFRA guidance[25].

Verification

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

- Estimates of background concentrations;

[25] Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

- 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 2019 using traffic data, meteorological data and monitoring results from this year. The choice of 2019 as the verification year aligns with the IAQM position statement 'Use of 2020 and 2021 Monitoring Datasets'[26], which states:

> "If you are carrying out an air quality study that includes validation against monitoring data, use 2019 monitoring data as the last typical year"

Monitoring of NO_2 concentrations was undertaken at six locations within the vicinity of roads included within the model during 2019. The results were obtained and the road contribution to total NO_x concentrations calculated following the methodology contained within DEFRA guidance[27]. The monitored annual mean NO_2 concentrations and calculated road NO_x concentrations are summarised in Table A1.3.

Table A1.3 NO_x Verification - Monitoring Results

Monitoring Location		Monitored NO_2 Concentration ($\mu g/m^3$)	Calculated Road NO_x Concentration ($\mu g/m^3$)
24	A6135 Hoyland	30.3	25.21
25	A61 Sheffield Road, Birdwell	38.6	42.96
26	A61 Sheffield Road, Birdwell	40.3	46.76
27	A61 Sheffield Road, Birdwell	39.8	45.64
31	Sheffield Road Birdwell	29.7	23.98

[26] Use of 2020 and 2021 Monitoring Datasets, IAQM, 2021.

[27] Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

Monitoring Location		Monitored NO_2 Concentration ($\mu g/m^3$)	Calculated Road NO_x Concentration ($\mu g/m^3$)
32	Sheffield Road, Birdwell	35.5	36.17

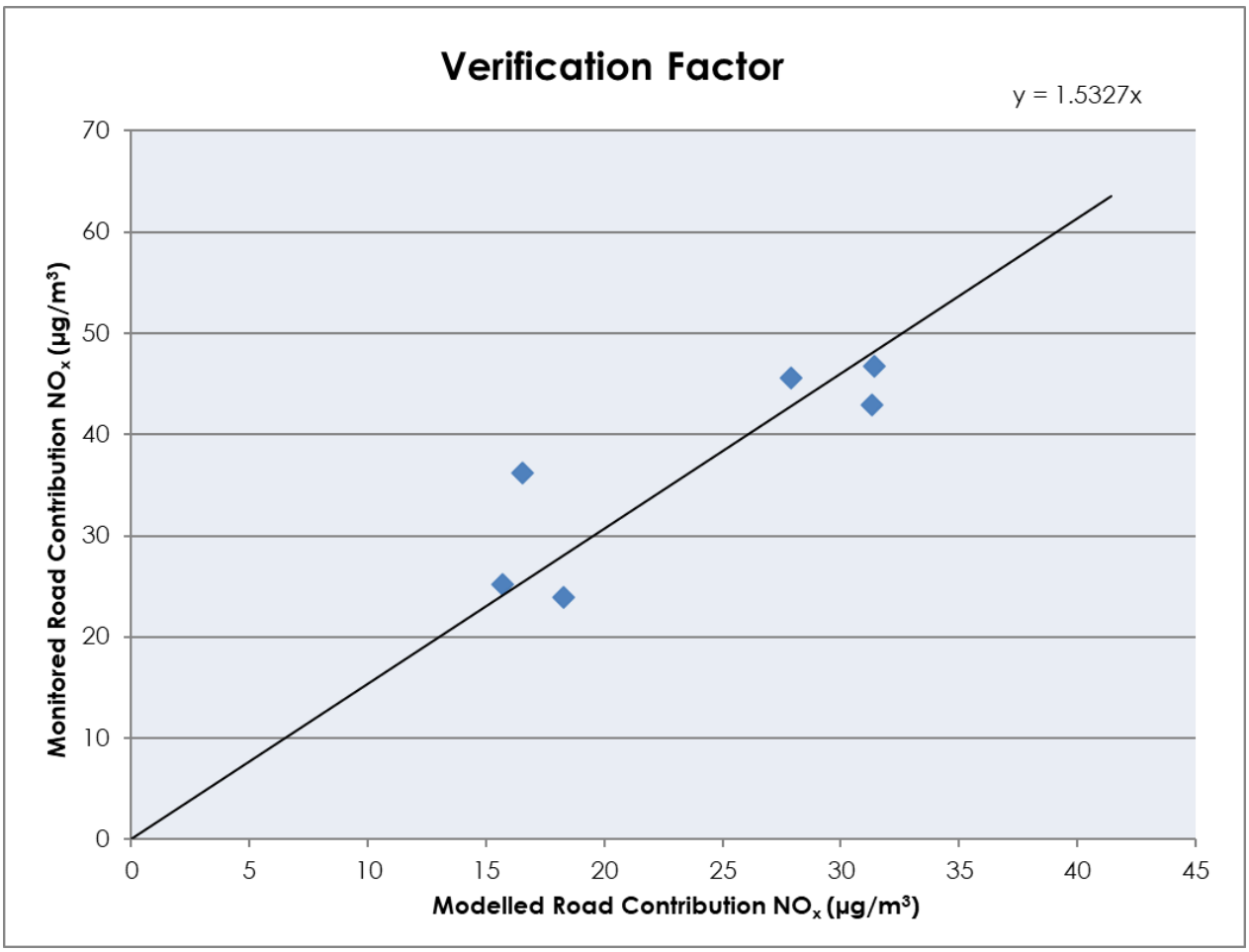
The annual mean road NO_x concentrations predicted from the dispersion model and the 2019 road NO_x concentrations calculated from the monitoring results are summarised in Table A1.5.

Table A1. 4 NO_x Verification - Modelling Results

Monitoring Location		Calculated Road NO_x Concentration ($\mu g/m^3$)	Modelled Road NO_x Concentration ($\mu g/m^3$)
24	A6135 Hoyland	25.21	15.71
25	A61 Sheffield Road, Birdwell	42.96	31.33
26	A61 Sheffield Road, Birdwell	46.76	31.44
27	A61 Sheffield Road, Birdwell	45.64	27.89
31	Sheffield Road Birdwell	23.98	18.30
32	Sheffield Road, Birdwell	36.17	16.52

The monitored and modelled road NO_x concentrations were graphed and the equation of the trendline based on linear progression through zero calculated. This indicated that a verification factor of 1.5327 was required to be applied to all NO_x modelling results, as shown in Graph 1.

Graph 1 NO_x verification Factor



Monitoring of PM_{10} or $PM_{2.5}$ concentrations was not undertaken within the assessment extents during 2019. The NO_x verification factor was therefore used to adjust model predictions of these species in lieu of more accurate data in accordance with DEFRA guidance[28].

28 Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

Appendix 2 - Curricula Vitae

JETHRO REDMORE

Director

BEng (Hons), MSc, MIAQM, MIEnvSc, PIEMA, CEnv

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.

OLLY HANLON

Senior Air Quality Consultant

BSc (Hons), AMIEnvSc

Tel: 0161 706 0075 | Email: oliver.hanlon@red-env.co.uk

KEY EXPERIENCE:

Olly is a Senior Environmental Consultant with specialist experience in the air quality sector. His 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.
- Detailed dispersion modelling of industrial emission sources using ADMS-5. Studies have included assessment of pollutant concentrations and consideration of associated impacts.
- 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.
- Air quality monitoring at industrial sites to quantify pollutant concentrations.

SELECT PROJECTS SUMMARY:

Millharbour, Isle of Dogs

Air Quality Assessment for the development of residential units within an Air Quality Management Area (AQMA). Concerns were raised regarding the exposure of future occupants to poor air quality due to road traffic emissions. Detailed dispersion modelling was undertaken using ADMS-roads to assess PM_{10} and NO_2 concentrations across the site. Results identified that pollution levels were below the air quality standards across the development.

Station Road, Howden

Air Quality Assessment in support of a residential development. Using sensitive receptors located in areas where increased road traffic may affect NO_2 concentrations, a comparison was made between overall concentrations with and without the development in place. Results indicated pollutant concentrations were below the relevant standards across the site and impacts associated with the development were not significant.

Honeycombe Beach, Bournemouth

Air Quality Assessment to determine air quality conditions within a covered car park serving a residential complex and evaluate the effectiveness of the existing ventilation system. Monitoring of pollutant concentrations over a three-month period at four locations at the site was undertaken. Internal concentrations of pollutants were below the relevant Work Exposure Limits (WELs) at all locations. As such, natural ventilation was considered to provide adequate control of internal air quality.

Matching Airport, Abbess Roding

Air Quality Assessment in support of a flexible generation facility. Dispersion modelling was undertaken to determine potential changes in pollution levels as a result of emissions from the installation and consider the potential impact at nearby sensitive receptor locations. Predicted concentrations of NO_2 were below the relevant air quality criteria at all locations of relevant exposure across all meteorological data sets modelled. The overall effects of the development were predicted to be not significant in accordance with the stated guidance.

High Road, Wood Green, London

Air Quality Assessment for a residential scheme located in an AQMA. Detailed dispersion modelling was undertaken at several heights reflective of residential units within the development. Results indicated that NO_2 and PM_{10} concentrations were below air quality criteria across the development.

Anlaby Road, Hull

Air Quality Assessment for the development of a six storey hotel and associated infrastructure within an AQMA. Concerns were raised about the exposure of future occupants to elevated pollution concentrations during operation due to road traffic exhaust emissions. Detailed dispersion modelling was undertaken using ADMS-roads to assess PM_{10} and NO_2 concentrations across the site. Results indicated that pollution levels were below the air quality standards across the development.