

ENVIRONMENT

Taylor Wimpey UK Limited
Markfield
Leicestershire
Air Quality Assessment

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Leicestershire
Air Quality Assessment

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EXECUTIVE SUMMARY

BWB Consulting Limited was appointed by Taylor Wimpey UK Limited to undertake an Air Quality Assessment for a proposed residential development at Ratby Lane in Markfield, Leicestershire.

The Site is located within the administrative area of Hickley and Bosworth Borough Council. The Site is not located within or in close proximity to an existing Air Quality Management Area. The closest Air Quality Management Area to the Site is the Leicester Air Quality Management Area which is located 6.5km south east and was declared by the neighbouring Leicester City Council for the potential exceedances of the annual mean nitrogen dioxide air quality objective.

A qualitative construction phase dust assessment was undertaken in accordance with Institute of Air Quality Management guidance and measures were recommended to minimise emissions during construction activities. With the implementation of these mitigation measures the impact of construction phase dust emissions was considered to be 'not significant' in accordance with Institute of Air Quality Management guidance.

A detailed operational phase road traffic emissions assessment was undertaken to consider the impact of development-generated road traffic on local air quality at identified existing receptor locations. Road traffic emissions were modelled using the dispersion model ADMS-Roads and concentrations of nitrogen dioxide and particulate matter (PM₁₀ and PM_{2.5}) were predicted at identified sensitive receptor locations. The modelling assessment was undertaken in accordance with Defra Local Air Quality Management Technical Guidance, Institute of Air Quality Management & Environmental Policy Implementation Community (previously Environmental Protection UK) guidance. The development was not predicted to result in any exceedances of the current relevant air quality objectives and the impact of the development with regard to these objectives was predicted to be 'negligible' in accordance with guidance.

Pollutant concentrations were also predicted across the Site and the suitability of the Site for the proposed residential use was considered with regard to the current relevant air quality objectives. Pollutant concentrations were predicted to be below the current relevant air quality objectives and the Site was therefore considered suitable for the proposed residential use with regard to these objectives.

Based on the assessment results, the impact of the proposed development with regards to the current relevant air quality objectives was considered to be not significant. No mitigation is required but measures included in the development that can be considered beneficial to air quality include the provision of photovoltaic panels, electric vehicle charging points, cycle storage facilities and provision of a Travel Plan.

CONTENTS

EXECUTIVE SUMMARY	iii
1. INTRODUCTION.....	1-6
Site Setting	1-6
Proposed Development	1-6
2. LEGISLATION, PLANNING POLICY & GUIDANCE.....	2-8
Legislation and Planning Policy	2-8
Defra PM _{2.5} targets: Interim Planning Guidance	2-9
Air Quality Assessment Guidance	2-10
3. METHODOLOGY	3-11
Consultation with Hickley and Bosworth Borough Council	3-11
Construction Phase Dust Assessment	3-11
Operational Phase Road Traffic Emissions – Detailed Assessment	3-11
4. BASELINE CONDITIONS	4-18
Local Air Quality Management	4-18
Local Air Quality Monitoring	4-18
Background Pollutant Concentrations	4-21
5. CONSTRUCTION PHASE DUST ASSESSMENT.....	5-23
Step 1: Screen the Need for a Detailed Assessment.....	5-23
Step 2: Assess the Risk of Dust Impacts.....	5-23
6. OPERATIONAL PHASE ROAD TRAFFIC EMISSIONS ASSESSMENT.....	6-26
Baseline Assessment	6-26
Impact Assessment.....	6-27
Site Suitability Assessment	6-31
Operational Phase Mitigation	6-35
Defra PM _{2.5} Targets: Interim Planning Guidance	6-35
7. CONCLUSION	7-36

FIGURES

Figure 1.1: Site Location

Figure 3.1: Existing Receptor Locations

Figure 4.1: HBBC Monitoring Locations in the Vicinity of the Site

Figure 6.1: Predicted Annual Mean NO₂ Concentrations Across the Site

Figure 6.2: Predicted Annual Mean PM₁₀ Concentrations Across the Site

Figure 6.3: Predicted Annual Mean PM_{2.5} Concentrations Across the Site

TABLES

Table 2.1: Air Quality Standards and Objectives (England)
Table 2.2: Examples of Where the Air Quality Objectives Apply
Table 3.1: Model Inputs Used in the Assessment
Table 3.2: Existing Sensitive Receptor Locations
Table 3.3: Impact Descriptors for Individual Receptors
Table 4.1: HBBC NO ₂ Monitoring Data in 2017 – 2023
Table 4.2: Background Pollutant Concentrations used in the Assessment
Table 5.1: Dust Emission Magnitude
Table 5.2: Determination of the Sensitivity of the Area
Table 5.3: Summary Dust Risk Table to Define Site Specific Risk
Table 6.1: Predicted Annual Mean Pollutant Concentrations for Scenario 2 and Scenario 3 at Existing Receptor Locations
Table 6.2: Predicted Annual Mean NO ₂ Concentrations and Development Impact at Existing Receptor Locations
Table 6.3: Predicted Annual Mean PM ₁₀ Concentrations and Development Impact at Existing Receptor Locations
Table 6.4: Predicted Annual Mean PM _{2.5} Concentrations and Development Impact at Existing Receptor Locations

APPENDICES

APPENDIX A: GLOSSARY OF TERMS
APPENDIX B: PROPOSED DEVELOPMENT MASTERPLAN
APPENDIX C: PLANNING POLICY AND LEGISLATION
APPENDIX D: CONSULTATION WITH HBBC
APPENDIX E: CONSTRUCTION DUST ASSESSMENT METHODOLOGY
APPENDIX F: MODEL INPUTS AND VERIFICATION

1. INTRODUCTION

- 1.1 BWB Consulting Limited (BWB) was instructed by Taylor Wimpey UK Limited (the Client) to undertake an air quality assessment for a proposed residential development at Ratby Lane in Markfield, Leicestershire ('the Site').
- 1.2 The assessment considers construction phase dust impacts and operational phase road traffic emissions. A qualitative construction phase dust assessment was undertaken in accordance with relevant guidance. A detailed road traffic emissions assessment was undertaken to consider the impact of development-generated road traffic on local air quality at identified receptor locations. In addition, pollutant concentrations were predicted across the proposed development Site to determine the suitability of the Site for the proposed end use with regard to the current relevant air quality objectives.
- 1.3 This report is necessarily technical in nature so to assist the reader a glossary of air quality terminology can be found in **Appendix A**.

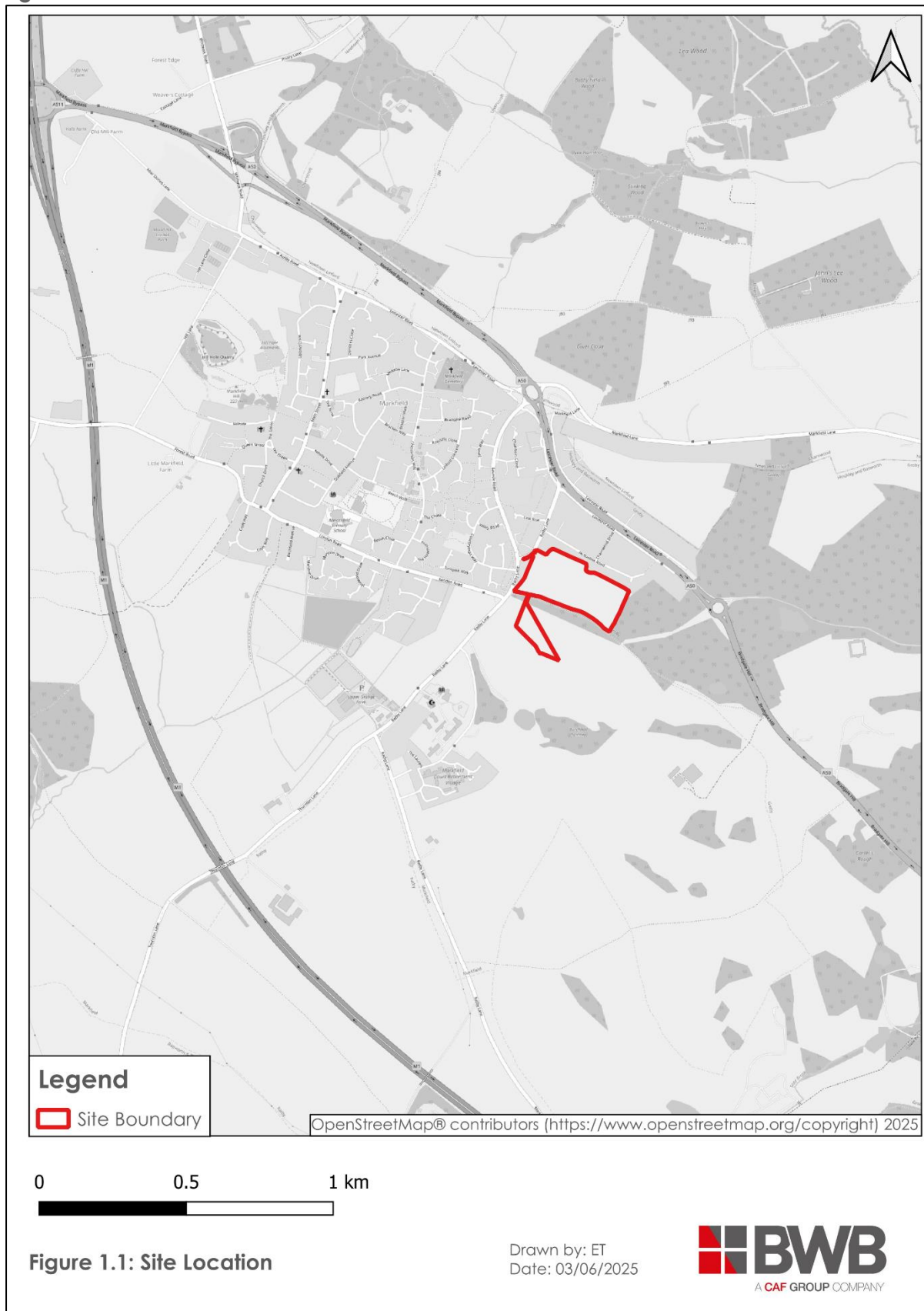
Site Setting

- 1.4 The Site is located to the south and east of Ratby Lane and is set back from the A50 Leicester Road, within the village of Markfield and within the administrative area of Hickey and Bosworth Borough Council (HBBC). The Site is not located within or in close proximity to an existing Air Quality Management Area (AQMA). The closest AQMA to the Site is the Leicester AQMA which is located 6.5km south east and was declared by the neighbouring Leicester City Council (LCC) for the potential exceedances of the annual mean nitrogen dioxide (NO₂) air quality objective.
- 1.5 The Site currently comprises agricultural land. To the north, the Site is bound by residential dwellings located off Jacqueline Road, with the A50 Leicester Road located beyond. Woodland is located to the east of the Site, with further woodland and agricultural parcels of land located to the south. Ratby Lane is located to the west with existing residential dwellings located beyond. The M1 motorway is located 1.3km to the south west. **Figure 1.1** details the location of the proposed development.
- 1.6 Principal air pollution sources in the vicinity of the Site are likely to comprise road traffic emissions from the A50 Leicester Road and the M1 motorway.

Proposed Development

- 1.7 The proposed development comprises an outline planning application with all matters except access reserved, for the erection of up to 135 dwellings, amenity space, areas for outdoor play, landscaping and all associated infrastructure. The proposed development masterplan is detailed in **Appendix B**.

Figure 1.1: Site Location



2. LEGISLATION, PLANNING POLICY & GUIDANCE

Legislation and Planning Policy

National Legislation and Planning Policy

- 2.1 European Union (EU) legislation forms the basis of air quality policy and legislation in the UK. The EU 2008 ambient Air Quality Directive¹ sets limits for ambient concentrations of air pollutants including nitrogen dioxide (NO₂) and particulate matter (PM₁₀ and PM_{2.5}). The air quality standards and objectives are prescribed through the Air Quality (England) Regulations 2000², as amended, for the purpose of the Local Air Quality Management Framework. The Air Quality (England) Regulations were amended in 2002³ and again in 2010⁴, with miscellaneous amendments added in 2020⁵ following the UK exit from the EU. Additionally, an updated PM_{2.5} objective was published in 2023⁶ with an interim target to be achieved by 2028⁷.
- 2.2 **Table 2.1** presents the air quality objectives for pollutants considered within this assessment.

Table 2.1: Air Quality Standards and Objectives (England)

Pollutant	Averaging Period	Air Quality Objective (µg.m ⁻³)	Date to Achieve by
NO ₂	Annual Mean	40	31 December 2005
	1-hour mean not to be exceeded more than 18 times per year	200	31 December 2005
PM ₁₀	Annual Mean	40	31 December 2004
	24-hour mean not to be exceeded more than 35 times per year	50	31 December 2004
PM _{2.5}	Annual Mean	20	1 January 2020
	<i>Annual mean interim target as detailed within the Environmental Improvement Plan⁷</i>	12	31 January 2028
	Annual mean	10	31 December 2040

Italics notes future objective

¹ European Parliament (2008) Council Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe

² HMSO (2000) Statutory Instrument 2000 No. 928, The Air Quality (England) Regulations 2000 (as amended), London: HMSO

³ HMSO (2002) Statutory Instruments 2002 No. 3043, The Air Quality (England) (Amendment) Regulations 2002, London: HMSO

⁴ HMSO (2010) Statutory Instruments 2010 No. 1001 Air Quality Standards Regulations 2010, London: HMSO

⁵ Department of the Environment, Food and Rural Affairs (Defra) (2020) The Environment (Miscellaneous Amendments) (EU Exit) Regulations, London: HMSO

⁶ Department for the Environment, Food and Rural Affairs (Defra) (2023) Air Quality Strategy: Framework for Local Authority

⁷ Defra (2023) Environmental Improvement Plan 2023, First revision of the 25 Year Environment Plan

- 2.3 **Table 2.2** summarises on where the air quality objectives for pollutants considered within this report apply.

Table 2.2: 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 (including all of playgrounds), hospitals (and their grounds), care homes (and their grounds) 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
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

Local Planning Policy

- 2.4 The following local planning policy was considered in the undertaking of the assessment and a summary is provided in **Appendix C**:

- Hinckley & Bosworth Borough Council, Local Development Framework Core Strategy (2009)⁸; and
- Hinckley & Bosworth Borough Council, Hinckley and Bosworth Local Plan 2020-2039 (Pre-Submission Local Plan Regulation 19) (2022)⁹.

- 2.5 A summary of the relevant national legislation and planning policy is provided in **Appendix C**.

Defra PM_{2.5} targets: Interim Planning Guidance

- 2.6 Defra is developing guidance in relation to the new targets for PM_{2.5} to be considered in planning. The new guidance will require planning applications to consider how the

⁸ Hinckley & Bosworth Borough Council (2009) Local Development Framework Core Strategy

⁹ Hinckley & Bosworth Borough Council (2022) Hinckley and Bosworth Local Plan 2020-2039 (Pre-Submission Local Plan Regulation 19)

development will reduce population exposure to PM_{2.5} from design stage. At the time of writing, the planning guidance has not been published (expected to be published in 2025). An interim guidance¹⁰ has been published by Defra, which advises planning applications to consider the following:

- *How has exposure to PM_{2.5} been considered when selecting the development site?*
- *What actions and/or mitigations have been considered to reduce PM_{2.5} exposure for development users and nearby receptors (houses, hospitals, schools etc.) and to reduce emissions of PM_{2.5} and its precursors?*

2.7 Consideration to the interim guidance¹⁰ has therefore been included within the assessment.

Air Quality Assessment Guidance

2.8 The following guidance was utilised in the air quality assessment:

- Defra, Local Air Quality Management Technical Guidance (LAQM.TG(22)) (2022)¹¹;
- Institute of Air Quality Management, Guidance on the Assessment of Dust from Demolition and Construction (2024)¹²; and
- Institute of Air Quality Management and Environmental Policy Implementation Community (previously Environmental Protection UK), Land-Use Planning and Development Control: Planning for Air Quality (2017)¹³.

¹⁰ Defra (2024) PM_{2.5} Targets: Interim Planning Guidance

¹¹ Defra (2022) Local Air Quality Management Technical Guidance LAQM.TG(22)

¹² Institute of Air Quality Management (2024) Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management, London

¹³ Institute of Air Quality Management and Environmental Policy Implementation Community (previously Environmental Protection UK) (2017) Land-Use Planning and Development Control: Planning for Air Quality

3. METHODOLOGY

Consultation with Hickley and Bosworth Borough Council

- 3.1 Full details of the methodology used in the assessment, as agreed with HBBC, are detailed in **Appendix D**.

Construction Phase Dust Assessment

- 3.2 An assessment of the potential impacts arising from the construction of the proposed development was undertaken in accordance with IAQM guidance¹². The full assessment methodology is not reproduced within this report, but a summary of the assessment steps as detailed within the IAQM guidance¹² are provided below:

- Step 1 – screen the requirement for a more detailed assessment. No assessment is required if there are no receptors within a certain distance of the works.
- Step 2 – assess the risk of dust impacts separately for each of the four activities considered (demolition, earthworks, construction and trackout).
 - Step 2A – determine the potential dust emission magnitude for each of the four activities;
 - Step 2B – determine the sensitivity of the area;
 - Step 2C – determine the risk of dust impacts by combining the findings of steps 2A and 2B.
- Step 3 – determine the site-specific mitigation for each of the four activities; and
- Step 4 – examine the residual effects and determine significance.

Operational Phase Road Traffic Emissions – Detailed Assessment

Air Dispersion Modelling

- 3.3 The air dispersion model ADMS-Roads, version 5.0.1.3 was utilised in the assessment to predict concentrations of NO_x, PM₁₀ and PM_{2.5} at existing receptors and across the Site.
- 3.4 The assessment was undertaken in accordance with Defra LAQM.TG(22)¹¹ and IAQM and EPIC (previously EPUK) guidance¹³.

Assessment Scenarios and Traffic Data

- 3.5 The following scenarios were considered in the air dispersion modelling:
- Scenario 1: 2023 Verification Year;
 - Scenario 2: 2025 Base Year;
 - Scenario 3: 2028 Opening Year without development; and
 - Scenario 4: 2028 Opening Year with development.

- 3.6 The operational phase road traffic emissions study area is defined by the road network modelled as part of the assessment. Traffic data were obtained from DTA Transport Planning Consultants, the Transport Consultants for the project. 24-hour Annual Average Daily Traffic Data (AADT) and Heavy Duty Vehicle (HDV) proportions and speeds were provided for use in the assessment. Further details on the traffic data used in the assessment are detailed in **Appendix F**.

ADMS-Roads Model Inputs

- 3.7 The model inputs were utilised in the assessment are shown in **Table 3.1**.

Table 3.1: Model Inputs Used in the Assessment

Parameter	Input
Emission factors	Emission factors were utilised from the Defra Emission Factor Toolkit ¹⁴ (EFT), version 13.0, for the years of assessment (2023, 2025 and 2028).
Conversion of oxides of nitrogen	Concentrations of NO _x were predicted using the ADMS-Roads dispersion model. These concentrations were converted to nitrogen dioxide (NO ₂) using the Defra NO _x to NO ₂ calculator ¹⁵ , version 9.1.
Meteorological data	Hourly sequential meteorological data for the verification year of assessment (2023) were obtained for the East Midlands recording station. This was considered the most representative meteorological station due to its proximity and similar topography to the Site. The wind rose for 2023 is provided in Appendix F .
Surface roughness and Monin-Obukhov length (MO) – Site	A surface roughness of 0.5m and a MO length of 10m were utilised in the air dispersion model to represent the suburban conditions at the Site and within the Study area in the village of Markfield.
Surface roughness and Monin-Obukhov length (MO) – Meteorological Station	A surface roughness of 0.5m and a MO length of 30m were utilised in the air dispersion model to represent the industrial conditions of the area in the vicinity of the meteorological station.
Background pollutant concentrations	Background concentrations of NO ₂ , PM ₁₀ and PM _{2.5} for the study area were obtained from the pollutant concentration maps ¹⁶ provided by Defra as a 1km x 1km grid of the UK, for the years of assessment (2023, 2025 and 2028).
Model verification	Model verification was undertaken using HBBC monitoring data available for the study area. Full details of the verification procedure are provided in Appendix F .
Calculation of short term PM ₁₀ concentrations	The following calculation, as detailed in Defra guidance ¹¹ , was utilised to calculate the number of exceedances of the 24-hour mean PM ₁₀ air quality objective:

¹⁴ Defra (2025) Emission Factor Toolkit [<https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>]

¹⁵ Defra (2024) NO_x to NO₂ Calculator [<https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc>]

¹⁶ Defra (2024) background pollutant concentration maps [<https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2021>]

Parameter	Input
	$\text{Number of 24-Hour Mean Exceedance} = -18.5 + 0.00145 * \text{Annual Mean}^3 + (206 / \text{Annual Mean})$

Receptor Locations

Existing Sensitive Receptors

3.8 Existing receptor locations were identified within close proximity of the road links detailed in **Appendix F** and considered in the operational phase road traffic emissions assessment. Concentrations of NO₂, PM₁₀ and PM_{2.5} were predicted at the identified existing receptor locations for the assessment scenarios detailed in paragraph 3.5. Where possible the closest receptors to those road links were considered, as these receptors are likely to experience the greatest change in pollutant concentrations as a result of the proposed development. Receptor heights were modelled at 1.5m to represent average ground floor breathing height, and 0.8m for nurseries to represent average ground floor breathing height for children.

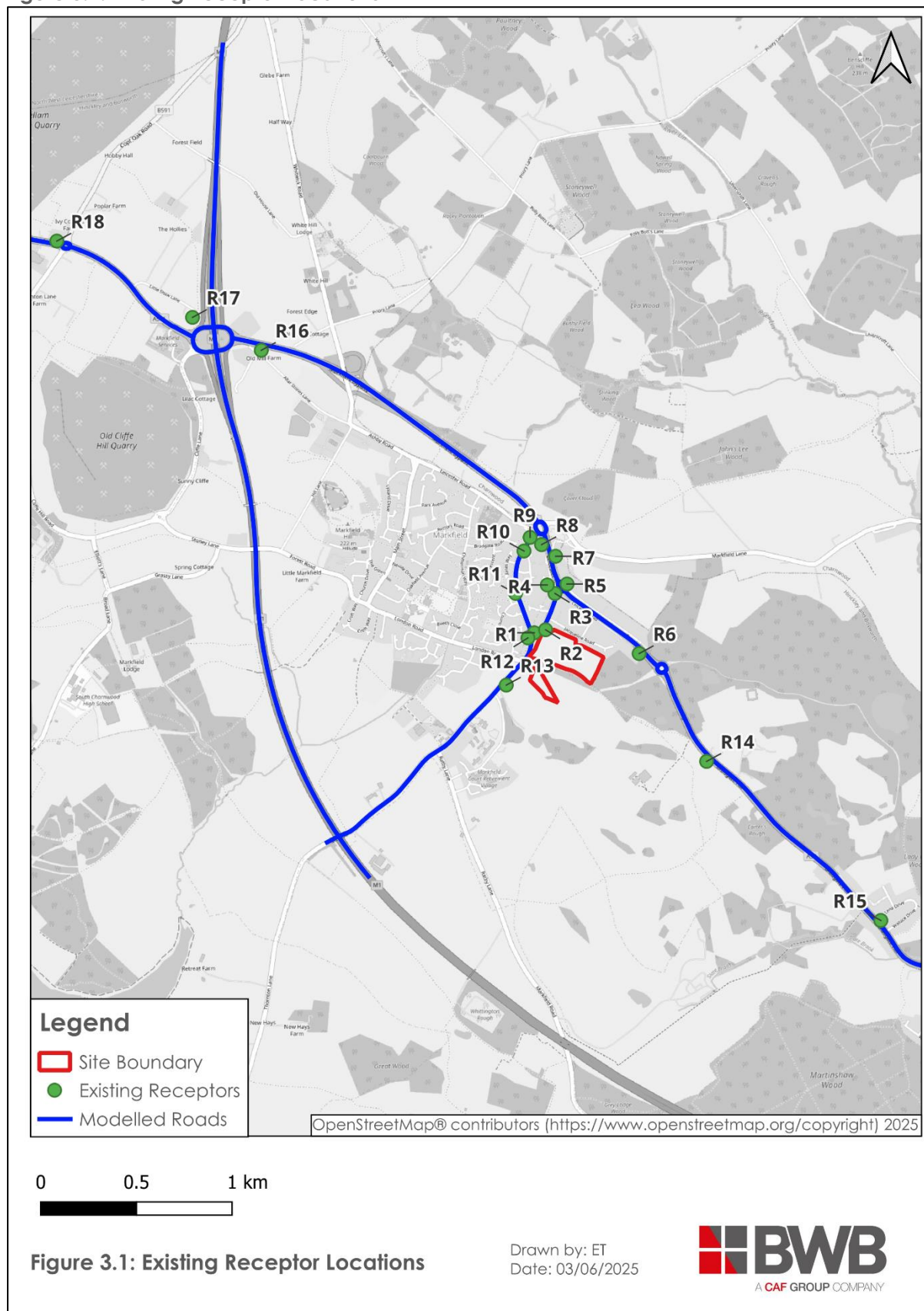
3.9 The existing receptor locations are detailed in **Table 3.2** and **Figure 3.1**.

Table 3.2: Existing Sensitive Receptor Locations

Receptor	Grid Reference		Details	Height Modelled
	X	Y		(m)
R1	449592	309616	Residential dwelling along Ratby Lane	1.5
R2	449651	309632	Residential dwelling along Ratby Lane	1.5
R3	449700	309822	Residential dwelling along Ratby Lane	1.5
R4	449660	309866	Markfield Day Nursery	0.8
R5	449763	309871	Residential dwelling off the A50 Leicester Road	1.5
R6	450140	309508	Residential dwelling off A50 Leicester Road	1.5
R7	449703	310016	Residential dwelling off A50 Leicester Road	1.5
R8	449630	310076	Residential dwelling off A50 Leicester Road	1.5
R9	449570	310114	Residential dwelling at Launde Road	1.5
R10	449538	310043	Residential dwelling along Launde Road	1.5

Receptor	Grid Reference		Details	Height Modelled
	X	Y		(m)
R11	449494	309822	Residential dwelling along Launde Road	1.5
R12	449559	309589	Residential dwelling off Ratby Lane and Launde Road Junction	1.5
R13	449446	309343	Residential dwelling along Ratby Lane	1.5
R14	450492	308945	Residential dwelling along A50 Bradgate Hill	1.5
R15	451402	308115	Residential dwelling along A50 Markfield Road	1.5
R16	448166	311091	Residential dwelling off A50 Markfield Bypass	1.5
R17	447807	311263	Residential dwelling off A511 Little Shaw Lane and M1 Motorway	1.5
R18	447098	311661	Residential dwelling along A511 Shaw Lane	1.5

Figure 3.1: Existing Receptor Locations



Site Suitability

- 3.10 Pollutant concentrations were predicted across the Site to consider exposure of future residents of the proposed development to air quality. A Cartesian grid from minimum X 449400, Y 309100 to maximum X 450100, Y 310000, modelled at a height of 1.5m to represent average ground floor breathing level conditions, was included to predict pollutant concentrations across the Site to consider its suitability for the proposed sensitive end use.

Limitations and Assumptions

- 3.11 There are uncertainties associated with both measured and predicted pollutant concentrations. The model (ADMS-Roads) used in this assessment relies on input data, which are also subject to uncertainty. The model itself simplifies complex physical systems into a range of algorithms. In addition, local micro-climatic conditions may affect the concentrations of pollutants that the ADMS-Roads model will not take into account.
- 3.12 The assessment is based on traffic data provided by DTA Transport Planning Consultants, the Transport Consultants for the project. As such any assumptions made by the Transport Consultants will also influence the air quality assessment.
- 3.13 In future year scenarios, uncertainty relates to the projection of vehicle emissions and, in particular the rate at which emissions per vehicle will improve over time. This assessment utilised the most recent version of the Defra EFT¹⁴ to provide the most up to date estimate of current and future emission projections.
- 3.14 The opening year with development assessment scenario assumes that all operational phase traffic associated with the development will be present in the opening year. This provides a conservative assessment to align with the assessment year likely to experience the highest background pollutant emissions.
- 3.15 To reduce the uncertainty associated with predicted concentrations, model verification was carried out following guidance set out in Defra guidance¹¹. As the models were verified using local monitoring data and adjusted accordingly, there can be reasonable confidence in the predicted concentrations.
- 3.16 Consideration of committed local developments that may represent sensitive receptors to dust during the construction phase was undertaken through a review of the HBBC planning portal. Any applications submitted following the review, or not present on the portal at the time of review, were not considered.

Assessment Criteria

- 3.17 Predicted pollutant concentrations were compared to the current relevant air quality objectives for England. The current relevant air quality standards and objectives are detailed in **Table 2.1**.
- 3.18 Guidance is provided by the IAQM and EPIC (previously EPUK)¹³ to determine the significance of the impact of development-generated road traffic emissions on local air

quality. The impact descriptors at receptor locations are detailed in **Table 3.3**. These impact descriptors consider the predicted magnitude of change in pollutant concentrations and the concentration in relation to the current relevant air quality objectives.

Table 3.3: Impact Descriptors for Individual Receptors

Long Term Average Concentration at Receptor in Assessment Year	% Change in Concentration Relative to Air Quality Assessment Level (AQAL)			
	1%	2 – 5%	6 – 10%	>10%
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76 – 94% of AQAL	Negligible	Slight	Moderate	Moderate
95 – 102% of AQAL	Slight	Moderate	Moderate	Substantial
103 – 109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Note: Figures rounded up to the nearest whole number, therefore any value less than 1% after rounding (effectively less than 0.5%) will be described as negligible.

- 3.19 In accordance with IAQM and EPIC (previously EPUK) guidance¹³, negligible and slight impacts at are considered to be 'not significant' at individual receptor locations and moderate and substantial impacts are considered to be 'significant' at individual receptor locations. Overall significance is determined by professional judgment.

4. BASELINE CONDITIONS

Local Air Quality Management

- 4.1 The Site is not located within or in close proximity to an existing AQMA. The closest AQMA to the Site is the Leicester AQMA which is located 6.5km south east and was declared by the neighbouring LCC for the potential exceedances of the annual mean NO₂ air quality objective.

Local Air Quality Monitoring

Nitrogen Dioxide

- 4.2 HBBC undertake monitoring of NO₂ across its administrative area using a network of diffusion tubes. The closest monitoring location to the Site is urban background diffusion tube site '11' which is located 1.9km south east along the A50 Markfield Road.
- 4.3 Bias adjusted NO₂ monitoring results, for the locations in the vicinity of the Site, are detailed in **Table 4.1** and **Figure 4.1**. Exceedances are shown in **Bold**.

Table 4.1: HBBC NO₂ Monitoring Data in 2017 – 2023¹⁷

ID	Grid Reference (X,Y)	Site Type	Monitored Annual Average Concentration (µg.m ⁻³)						
			2017	2018	2019	2020	2021	2022	2023
11	451376, 308147	Suburban	28.1	24.3	23.7	19.0	18.8	18.1	17.1
10,12,14	447113, 311660	Rural	40.9	36.7	35.1	26.8	28.8	27.1	26.1

Data presented to the available precision

- 4.4 Monitored annual mean NO₂ concentrations were below the current annual mean objective for England at both diffusion tubes presented between 2017 and 2023 with the exception of triplicate monitoring location '10,12,14' in 2017. There is a general trend of decreasing NO₂ concentrations noticeable between 2017 and 2023 with some year on year fluctuations.
- 4.5 The study area for the purposes of this assessment is defined by roads that development generated traffic is anticipated to utilise, such as the A50 and the A511 which are arterial roads leading to Leicester and the wider Leicestershire area. Both locations presented in **Table 4.1** are located along these roads and are therefore considered representative of conditions within the study area and were utilised in the model verification process.

¹⁷ The IAQM released a position statement (Institute of Air Quality Management (2021) Position Statement: Use of 2020 and 2021 Monitoring Datasets) in August 2021 with regard to 2020 and 2021 monitoring datasets. Due to the influence of the COVID-19 pandemic lockdown restrictions, 2020 and 2021 monitoring data are not considered representative of normal conditions. Data is reported for completeness.

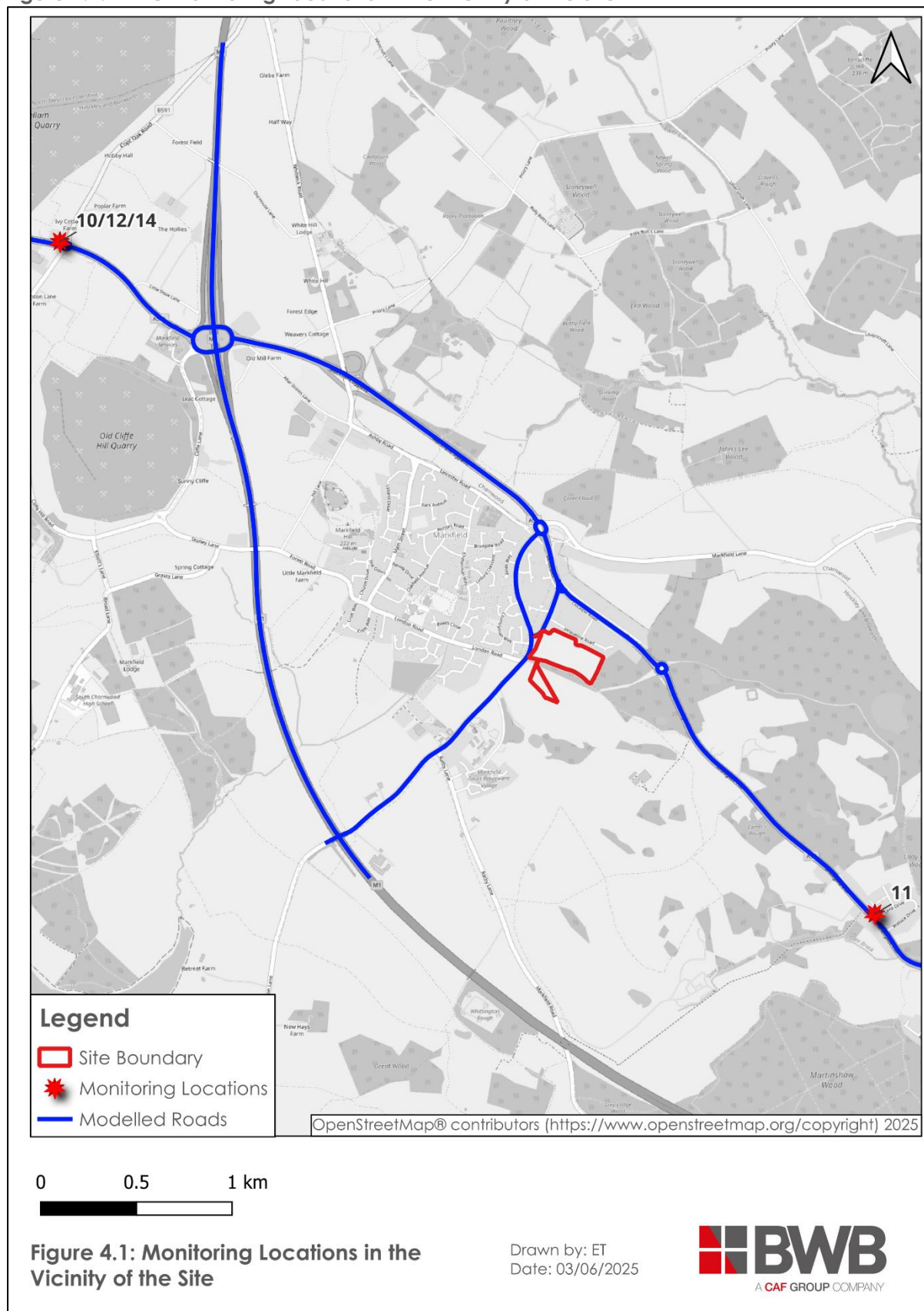
- 4.6 It is acknowledged that diffusion tube '11' is classified as a suburban site while triplicate site '10,12,14' is classified as rural site within the latest HBBC Annual Status Report¹⁸, however a review of conditions at these locations through Google Street View indicated that both locations are located within 15m of the kerb of the A50 and the A511 respectively. They were therefore considered representative of roadside conditions in accordance with the Defra guidance¹¹ and were utilised in the model verification process.

Particulate Matter (PM₁₀ and PM_{2.5})

- 4.7 HBBC does not undertake monitoring of PM₁₀ or PM_{2.5} across its administrative area.

¹⁸ Hinckley and Bosworth Borough Council (2024) 2024 Air Quality Annual Status Report (ASR)

Figure 4.1: HBBC Monitoring Locations in the Vicinity of the Site



Background Pollutant Concentrations

- 4.8 No background air quality monitoring is undertaken by HBBC within the study area. Background pollutant concentrations were therefore obtained from the latest Defra background concentration maps¹⁶, which are provided for the UK as a 1km x 1km grid network. The latest maps are based on 2021 monitoring and meteorological data. Background concentrations of NO₂, PM₁₀ and PM_{2.5} were obtained for the grid squares covering the study area for the years of assessment (2023, 2025 and 2028). The background concentrations used in the assessment are detailed in **Table 4.2**.

Table 4.2: Background Pollutant Concentrations used in the Assessment

Receptor	2023			2025			2028		
	NO ₂	PM ₁₀	PM _{2.5}	NO ₂	PM ₁₀	PM _{2.5}	NO ₂	PM ₁₀	PM _{2.5}
Site	8.4	13.7	7.5	7.8	13.5	7.3	7.0	13.3	7.1
Verification Locations									
10,12,14	11.3	14.4	7.5	10.3	14.2	7.3	9.0	14.0	7.1
11	9.9	12.3	7.0	9.4	12.1	6.8	8.7	12.0	6.7
Receptors									
R1	8.4	13.7	7.5	7.8	13.5	7.3	7.0	13.3	7.1
R2	8.4	13.7	7.5	7.8	13.5	7.3	7.0	13.3	7.1
R3	8.4	13.7	7.5	7.8	13.5	7.3	7.0	13.3	7.1
R4	8.4	13.7	7.5	7.8	13.5	7.3	7.0	13.3	7.1
R5	8.4	13.7	7.5	7.8	13.5	7.3	7.0	13.3	7.1
R6	8.4	12.4	7.0	7.8	12.2	6.8	7.0	12.0	6.6
R7	8.4	13.2	7.3	7.8	13.0	7.1	7.0	12.8	6.9
R8	8.4	13.2	7.3	7.8	13.0	7.1	7.0	12.8	6.9
R9	8.4	13.2	7.3	7.8	13.0	7.1	7.0	12.8	6.9
R10	8.4	13.2	7.3	7.8	13.0	7.1	7.0	12.8	6.9
R11	8.4	13.7	7.5	7.8	13.5	7.3	7.0	13.3	7.1

Receptor	2023			2025			2028		
	NO ₂	PM ₁₀	PM _{2.5}	NO ₂	PM ₁₀	PM _{2.5}	NO ₂	PM ₁₀	PM _{2.5}
R12	8.4	13.7	7.5	7.8	13.5	7.3	7.0	13.3	7.1
R13	8.4	13.7	7.5	7.8	13.5	7.3	7.0	13.3	7.1
R14	8.6	12.7	7.0	8.0	12.5	6.8	7.2	12.3	6.6
R15	9.9	12.3	7.0	9.4	12.1	6.8	8.7	12.0	6.7
R16	8.7	12.8	7.0	8.1	12.6	6.9	7.3	12.4	6.7
R17	11.3	14.4	7.5	10.3	14.2	7.3	9.0	14.0	7.1
R18	11.3	14.4	7.5	10.3	14.2	7.3	9.0	14.0	7.1

- 4.9 2023, 2025 and 2028 background concentrations are below the current relevant annual mean air quality objectives for England for NO₂, PM₁₀ and PM_{2.5}. Background PM_{2.5} concentrations are also below the 2028 interim target of 12µg.m⁻³ and the 2040 future annual mean air quality objective of 10µg.m⁻³. A review of Defra background concentration maps¹⁶ highlighted a significant contribution of residual and secondary particulate matter towards the total background PM₁₀ concentration. It is likely that this contributes towards background PM₁₀ concentrations being higher than background NO₂ concentrations in all grid squares considered in the assessment.

5. CONSTRUCTION PHASE DUST ASSESSMENT

- 5.1 The construction phase of the proposed development will involve a number of activities which have the potential to impact on local air quality.
- 5.2 The location of sensitive receptors in relation to construction activities will affect the potential for such construction activities to cause dust soiling, nuisance and local air quality impacts. Meteorological conditions and the use of control measures will also contribute to the effects experienced.

Step 1: Screen the Need for a Detailed Assessment

- 5.3 Step 1 of the IAQM guidance¹² involves a screening assessment to consider whether a more detailed construction phase dust assessment is required.
- 5.4 In accordance with the guidance, a detailed assessment is required if:
- Human receptors are located within 250m of the boundary of the site or 50m of routes used by construction vehicles on the public highways, up to 250m from the Site entrances; or
 - Ecological receptors are located within 50m of the boundary of the site or 50m of routes used by construction vehicles on the public highways, up to 250m from the Site entrances.
- 5.5 From a review of the Multi Agency Geographic Information for the Countryside (MAGIC) website¹⁹, no ecological designations were identified within the above screening distance and therefore the impact on ecological designations was not considered further. However human receptors are located within the above screening distances, with the closest of these receptors located off Ratby Lane. A construction phase assessment was therefore undertaken.

Step 2: Assess the Risk of Dust Impacts

Step 2A: Define the Potential Dust Emission Magnitude

- 5.6 The dust emission magnitudes for the construction activities were defined using the criteria detailed in the IAQM guidance¹² as detailed in **Appendix E**. Demolition is not proposed as part of the development and therefore was not considered further in the assessment.

Table 5.1: Dust Emission Magnitude

Activity	Dust Emission Magnitude	Justification
Earthworks	Medium	The total Site area is between 18,000 and 110,000m ² .

¹⁹ Defra, Multi Agency Geographic Information for the Countryside (MAGIC) [<http://magic.defra.gov.uk/>]

Activity	Dust Emission Magnitude	Justification
Construction	Large	The proposed development will require the construction of approximately 135no. residential dwellings with a total building volume anticipated to be over 75,000m ³ .
Trackout	Medium	There is potential for between 20 and 50 outward HDV movements in any one day.

Step 2B: Define the Sensitivity of the Area

- 5.7 The assessment requires the determination of the sensitivity of the area for the purposes of dust soiling and human health. **Figure E.1 in Appendix E** was utilised to determine the number of receptors located within the distance bands provided in the IAQM guidance¹² for determining receptor sensitivity.
- 5.8 The sensitivity of the area is defined below, in accordance with IAQM criteria¹² as detailed in **Appendix E** and summarised in **Table 5.2**.

Table 5.2: Determination of the Sensitivity of the Area

Table 6.2: Determination of the Sensitivity of the Area		
Activity	Sensitivity of the Area	Justification
<u>Dust Soiling</u>		
Earthworks	High	There are between 10 and 100 highly sensitive residential dwellings located within 20m of the proposed Site boundary and of the roads to be used by construction vehicles.
Construction		
Trackout		
<u>Human Health</u>		
Earthworks	Low	There are between 10 and 100 highly sensitive residential dwellings located within 20m of the proposed Site boundary and of the roads to be used by construction vehicles. Furthermore, background PM ₁₀ concentrations in the area surrounding the Site are below 24µg.m ³ , as indicated by a review of Defra background pollutant concentration mapping ²⁰ .
Construction		
Trackout		

Step 2C: Define the Risk of Impacts

- 5.9 The dust emission magnitude determined in Step 2A is then combined with the sensitivity of the area determined in Step 2B in accordance with IAQM guidance¹² as detailed in

²⁰ Defra (2024) Background Pollutant Concentration Maps [<https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2021>]

Appendix E to define the risk of dust impacts with no mitigation applied. The results of this assessment are detailed in **Table 5.3**.

Table 5.3: Summary Dust Risk Table to Define Site Specific Risk

Activity	Step 2A: Dust Emission Magnitude	Step 2B: Sensitivity of the Area	Step 2C: Risk of Dust Impacts
Dust Soiling Effects on People and Property			
Earthworks	Medium	High	Medium Risk
Construction	Large	High	High Risk
Trackout	Medium	High	Medium Risk
Human Health Impacts			
Earthworks	Medium	Low	Low Risk
Construction	Large	Low	Low Risk
Trackout	Medium	Low	Low Risk

Step 3: Site-Specific Mitigation

- 5.10 The risk of dust impacts, defined in Step 2C of the assessment, is used to determine the mitigation measures required to minimise the emission of dust during construction phase activities. The IAQM guidance¹² provides details of highly recommended and desirable mitigation measures which are commensurate with the risk of dust impacts defined in Step 2C for construction, earthworks and trackout activities. Where the mitigation measures are general in nature, the highest risk category was applied in accordance with the guidance¹². The highest risk category identified was '**High Risk**' and the recommended mitigation taken from the IAQM guidance¹² is detailed in **Appendix E**.

Step 4: Determine Significant Effects

- 5.11 In accordance with IAQM guidance¹², with the implementation of the mitigation measures detailed in Step 3, the residual impacts from the construction phase are considered to be 'not significant'.

6. OPERATIONAL PHASE ROAD TRAFFIC EMISSIONS ASSESSMENT

Baseline Assessment

- 6.1 Pollutant concentrations were predicted at the identified existing sensitive receptor locations using the dispersion model ADMS-Roads. Predicted pollutant concentrations for Scenario 2: 2025 Base Year and Scenario 3: 2028 Opening Year without development are detailed in **Table 6.1**.

Table 6.1: Predicted Annual Mean Pollutant Concentrations for Scenario 2 and Scenario 3 at Existing Receptor Locations

Receptor	Scenario 2: 2025 Base Year ($\mu\text{g.m}^{-3}$)			Scenario 3: 2028 Opening Year Without Development ($\mu\text{g.m}^{-3}$)		
	NO ₂	PM ₁₀	PM _{2.5}	NO ₂	PM ₁₀	PM _{2.5}
R1	9.3	14.0	7.6	8.2	13.9	7.4
R2	8.8	13.9	7.5	7.8	13.7	7.3
R3	9.9	14.2	7.7	8.6	14.0	7.5
R4	9.6	14.1	7.6	8.3	13.9	7.4
R5	11.9	14.9	8.1	10.1	14.7	7.9
R6	11.3	13.4	7.5	9.6	13.2	7.3
R7	13.2	14.8	8.1	11.0	14.5	7.9
R8	11.9	14.3	7.8	10.0	14.1	7.6
R9	10.9	14.0	7.7	9.4	13.8	7.5
R10	10.6	13.9	7.6	9.2	13.7	7.4
R11	9.3	14.0	7.6	8.2	13.9	7.4
R12	9.0	13.9	7.5	7.9	13.7	7.3
R13	9.0	13.9	7.5	7.9	13.7	7.3
R14	10.7	13.4	7.3	9.2	13.2	7.1
R15	19.0	14.4	8.1	15.7	14.2	8.0
R16	12.6	14.0	7.7	10.7	13.8	7.5

Receptor	Scenario 2: 2025 Base Year ($\mu\text{g.m}^{-3}$)			Scenario 3: 2028 Opening Year Without Development ($\mu\text{g.m}^{-3}$)		
	NO ₂	PM ₁₀	PM _{2.5}	NO ₂	PM ₁₀	PM _{2.5}
R17	15.4	15.8	8.3	12.9	15.6	8.1
R18	17.8	16.1	8.4	14.4	15.8	8.1

6.2 The predicted annual mean NO₂, PM₁₀ and PM_{2.5} concentrations are below the current annual mean objectives for England at all modelled receptor locations for both Scenario 2: 2025 Base Year and Scenario 3: 2028 Opening Year without development. Furthermore, the annual mean PM_{2.5} concentrations are predicted to be below the 2028 interim target of 12 $\mu\text{g.m}^{-3}$ and the 2040 future objective of 10 $\mu\text{g.m}^{-3}$ at all receptor locations.

6.3 With regard to short term air quality objectives for NO₂ and PM₁₀, the predicted annual mean NO₂ concentrations are less than 60 $\mu\text{g.m}^{-3}$ and therefore in accordance with Defra guidance¹¹ it may be assumed that exceedance of the 1-hour mean objective is unlikely. The calculation detailed in **Table 3.1** was used to determine potential exceedance of the 24-hour PM₁₀ short term objective; no exceedances were predicted.

Impact Assessment

Detailed Operational Phase Road Traffic Emissions Assessment

6.4 Concentrations of NO₂, PM₁₀ and PM_{2.5} were predicted at identified existing receptor locations for Scenario 4: 2028 Opening Year with development, to consider the impact of development-generated vehicles on with regard to the current relevant air quality objectives.

6.5 Predicted pollutant concentrations are detailed in **Table 6.2**, **Table 6.3** and **Table 6.4** for NO₂, PM₁₀ and PM_{2.5} respectively together with Scenario 3: 2028 without development concentrations for comparison purposes. The predicted change in pollutant concentrations resulting from development-generated traffic, and the associated impact are also provided.

Table 6.2: Predicted Annual Mean NO₂ Concentrations and Development Impact at Existing Receptor Locations

Receptor	Predicted NO ₂ Concentration ($\mu\text{g.m}^{-3}$)					
	Scenario 3: 2028 Opening Year Without Development † ($\mu\text{g.m}^{-3}$)	Scenario 4: 2028 Opening Year With Development † ($\mu\text{g.m}^{-3}$)	Concentrati on Change* ($\mu\text{g.m}^{-3}$)	Change in Concentrati on Relative to Air Quality Assessment Level (%)	Long Term Average Concentrati on as % of Air Quality Assessment Level	Impact
R1	8.2	8.3	<0.1	0	21	Negligible

Receptor	Predicted NO ₂ Concentration (µg.m ⁻³)					
	Scenario 3: 2028 Opening Year Without Developmen † (µg.m ⁻³)	Scenario 4: 2028 Opening Year With Developmen † (µg.m ⁻³)	Concentrati on Change* (µg.m ⁻³)	Change in Concentrati on Relative to Air Quality Assessment Level (%)	Long Term Average Concentrati on as % of Air Quality Assessment Level	Impact
R2	7.8	7.8	<0.1	0	20	Negligible
R3	8.6	8.6	<0.1	0	22	Negligible
R4	8.3	8.4	<0.1	0	21	Negligible
R5	10.1	10.1	<0.1	0	25	Negligible
R6	9.6	9.7	<0.1	0	24	Negligible
R7	11.0	11.0	<0.1	0	28	Negligible
R8	10.0	10.1	<0.1	0	25	Negligible
R9	9.4	9.4	<0.1	0	24	Negligible
R10	9.2	9.2	<0.1	0	23	Negligible
R11	8.2	8.3	<0.1	0	21	Negligible
R12	7.9	8.0	<0.1	0	20	Negligible
R13	7.9	7.9	<0.1	0	20	Negligible
R14	9.2	9.3	<0.1	0	23	Negligible
R15	15.7	15.7	<0.1	0	39	Negligible
R16	10.7	10.7	<0.1	0	27	Negligible
R17	12.9	12.9	<0.1	0	32	Negligible
R18	14.4	14.4	<0.1	0	36	Negligible

* Discrepancies in changes due to rounding effects

Table 6.3: Predicted Annual Mean PM₁₀ Concentrations and Development Impact at Existing Receptor Locations

Receptor	Predicted PM ₁₀ Concentration (µg.m ⁻³)					
	Scenario 3: 2028 Opening Year Without Developmen † (µg.m ⁻³)	Scenario 4: 2028 Opening Year With Developmen † (µg.m ⁻³)	Concentrati on Change* (µg.m ⁻³)	Change in Concentrati on Relative to Air Quality Assessment Level (%)	Long Term Average Concentrati on as % of Air Quality Assessment Level	Impact
R1	13.9	13.9	<0.1	0	35	Negligible
R2	13.7	13.7	<0.1	0	34	Negligible
R3	14.0	14.0	<0.1	0	35	Negligible
R4	13.9	13.9	<0.1	0	35	Negligible
R5	14.7	14.7	<0.1	0	37	Negligible
R6	13.2	13.2	<0.1	0	33	Negligible
R7	14.5	14.6	<0.1	0	36	Negligible
R8	14.1	14.1	<0.1	0	35	Negligible
R9	13.8	13.8	<0.1	0	35	Negligible
R10	13.7	13.7	<0.1	0	34	Negligible
R11	13.9	13.9	<0.1	0	35	Negligible
R12	13.7	13.7	<0.1	0	34	Negligible
R13	13.7	13.7	<0.1	0	34	Negligible
R14	13.2	13.2	<0.1	0	33	Negligible
R15	14.2	14.3	<0.1	0	36	Negligible
R16	13.8	13.8	<0.1	0	34	Negligible
R17	15.6	15.6	<0.1	0	39	Negligible
R18	15.8	15.8	<0.1	0	40	Negligible

* Discrepancies in changes due to rounding effects

Table 6.4: Predicted Annual Mean PM_{2.5} Concentrations and Development Impact at Existing Receptor Locations

Receptor	Predicted PM _{2.5} Concentration (µg.m ⁻³)					
	Scenario 3: 2028 Opening Year Without Developmen † (µg.m ⁻³)	Scenario 4: 2028 Opening Year With Developmen † (µg.m ⁻³)	Concentrati on Change* (µg.m ⁻³)	Change in Concentrati on Relative to Air Quality Assessment Level (%)	Long Term Average Concentrati on as % of Air Quality Assessment Level	Impact
R1	7.4	7.4	<0.1	0	30	Negligible
R2	7.3	7.3	<0.1	0	29	Negligible
R3	7.5	7.5	<0.1	0	30	Negligible
R4	7.4	7.4	<0.1	0	30	Negligible
R5	7.9	7.9	<0.1	0	31	Negligible
R6	7.3	7.3	<0.1	0	29	Negligible
R7	7.9	7.9	<0.1	0	32	Negligible
R8	7.6	7.6	<0.1	0	31	Negligible
R9	7.5	7.5	<0.1	0	30	Negligible
R10	7.4	7.5	<0.1	0	30	Negligible
R11	7.4	7.4	<0.1	0	30	Negligible
R12	7.3	7.3	<0.1	0	29	Negligible
R13	7.3	7.3	<0.1	0	29	Negligible
R14	7.1	7.1	<0.1	0	28	Negligible
R15	8.0	8.0	<0.1	0	32	Negligible
R16	7.5	7.5	<0.1	0	30	Negligible
R17	8.1	8.1	<0.1	0	32	Negligible
R18	8.1	8.1	<0.1	0	33	Negligible

* Discrepancies in changes due to rounding effects

- 6.6 The predicted annual mean NO₂, PM₁₀ and PM_{2.5} concentrations are below the current annual mean objectives for England at all modelled receptor locations for both Scenario 3: 2028 Opening Year without development and Scenario 4: 2028 Opening Year with development. Furthermore, the annual mean PM_{2.5} concentrations are predicted to be below the 2028 interim target of 12µg.m⁻³ and the 2040 future objective of 10µg.m⁻³ at all receptor locations.
- 6.7 In accordance with IAQM and EPIC (former EPUK) guidance¹³, the impacts are considered to be 'negligible' at all modelled receptor locations.
- 6.8 With regard to short term air quality objectives for NO₂ and PM₁₀, the predicted annual mean NO₂ concentrations are less than 60µg.m⁻³ and therefore in accordance with Defra guidance¹¹ it may be assumed that exceedance of the 1-hour mean objective is unlikely. The calculation detailed in **Table 3.1** was used to determine potential exceedance of the 24-hour PM₁₀ short term objective; no exceedances were predicted.

Site Suitability Assessment

- 6.9 Concentrations of NO₂, PM₁₀ and PM_{2.5} were predicted at the proposed residential dwellings within the Site for Scenario 4: 2028 Opening Year with development. Predicted pollutant concentrations are detailed in **Figure 6.1** to **Figure 6.3**.
- 6.10 The predicted NO₂, PM₁₀ and PM_{2.5} concentrations for Scenario 4, indicate that pollutant concentrations across the Site will be below the respective current air quality objectives for England in 2028 with the proposed development in place. Predicted PM_{2.5} concentrations are also below the 2028 annual mean interim target of 12µg.m⁻³ as well as the 2040 future annual mean air quality objective of 10µg.m⁻³ across the Site including all proposed residential areas.
- 6.11 With regard to short term air quality objectives for NO₂ and PM₁₀ at the residential development, the predicted annual mean NO₂ concentrations are less than 60µg.m⁻³ and therefore in accordance with Defra guidance¹¹ it may be assumed that exceedance of the 1-hour mean NO₂ objective are unlikely. The calculation detailed in **Table 3.1** was used to determine potential exceedance of the 24-hour PM₁₀ short term objective; no exceedances were predicted.

Figure 6.1: Predicted Annual Mean NO₂ Concentrations Across the Site

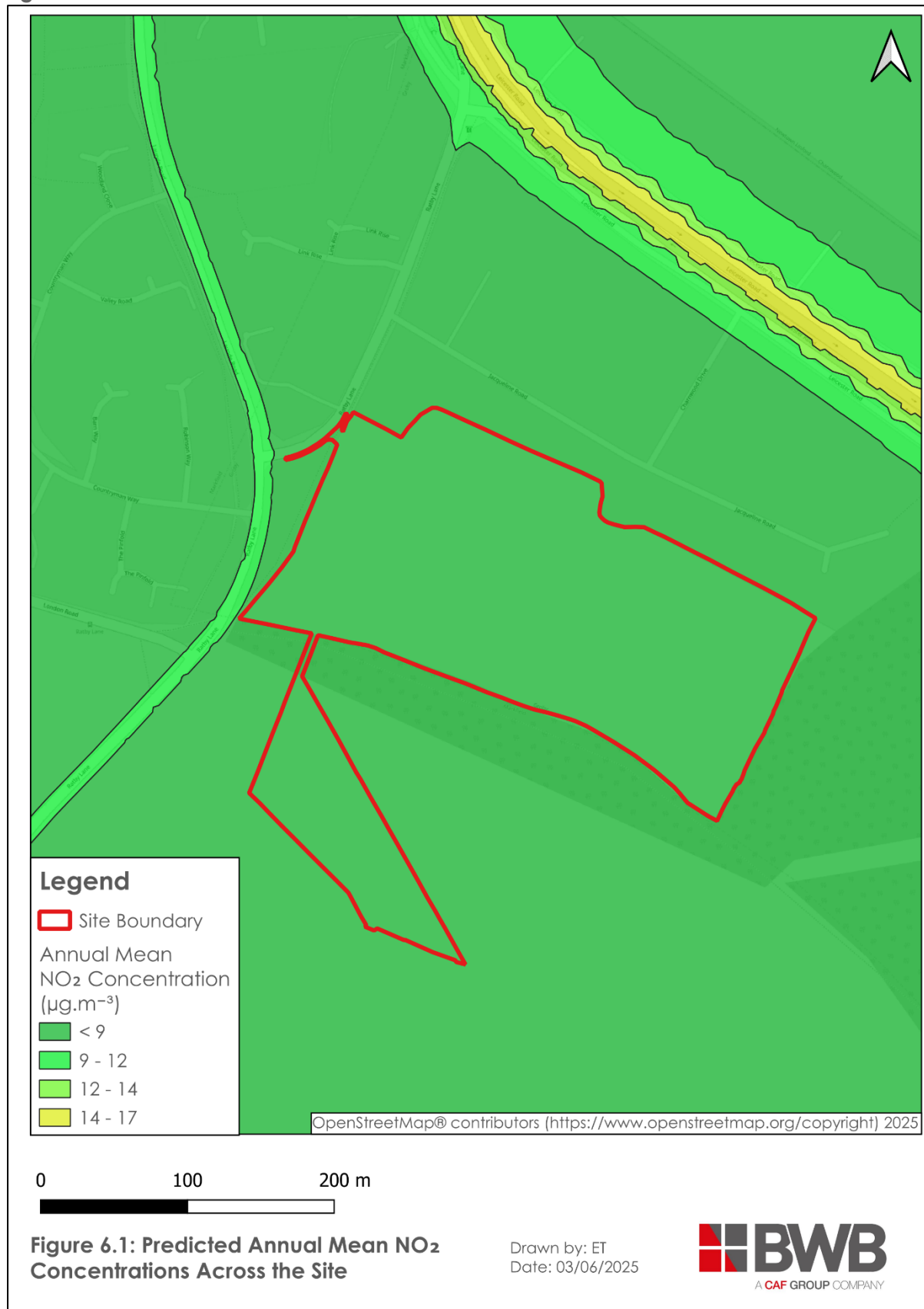


Figure 6.2: Predicted Annual Mean PM₁₀ Concentrations Across the Site

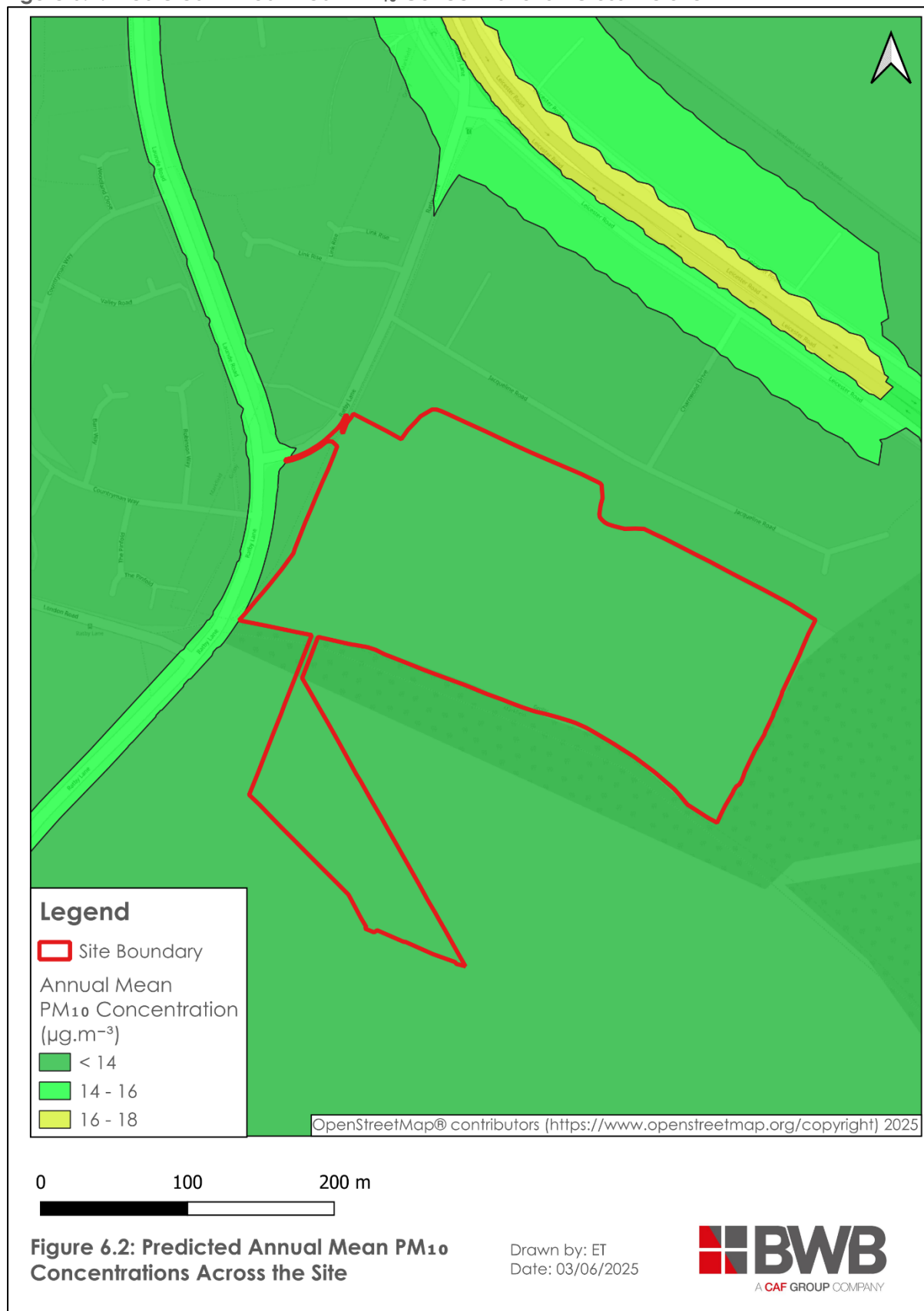


Figure 6.3: Predicted Annual Mean PM_{2.5} Concentrations Across the Site



Operational Phase Mitigation

- 6.12 Based on the assessment results, the impact of the proposed development with regards to the current relevant air quality objectives was considered to be 'not significant'. Therefore no mitigation measures were required to minimise development-generated road traffic emissions. However, the development will incorporate measures such as provision of photovoltaic (PV) panels, electric vehicle (EV) charging points, cycle storage facilities and provision of a Travel Plan which may be beneficial to air quality.

Defra PM_{2.5} Targets: Interim Planning Guidance

- 6.13 Defra is developing new guidance which will require planning applications to reduce population exposure to PM_{2.5} from design stage. Consideration to the interim planning guidance¹⁰, as considered in the development design, is summarised below:
- A review of nearby pollution sources identified road emissions as the main pollutant source in the vicinity of the Site. Upon review of publicly available data, annual mean PM_{2.5} concentrations across and in the vicinity of the Site suggest no exceedances to the 2040 future objective of 10µg.m⁻³. Furthermore, the suitability of the Site was considered through the dispersion modelling assessment, with no exceedances of the future PM_{2.5} objective predicted across the Site. Based on the above, the Site was considered suitable for the proposed residential use, when considering the 2040 future objective of 10µg.m⁻³.
 - As part of the operational phase road emissions assessment, existing sensitive receptors were identified and pollutant concentrations at these receptors were predicted. These included nearby nurseries which are classified as vulnerable groups. The assessment considered the annual mean PM_{2.5} concentrations against the 2040 future objective of 10µg.m⁻³.
 - A construction phase dust assessment was conducted to consider the impact of dust. On review of background mapping, annual mean PM_{2.5} concentrations across and in the vicinity of the Site are below 10µg.m⁻³. Therefore, it is considered that with the implementation of the mitigation measures detailed in Section 5, the residual impacts from the construction phase are considered to be 'not significant'.
- 6.14 Based on the above, the Site was considered suitable for the proposed end use, when considering the 2040 future objective of 10µg.m⁻³. Based on the above and as summarised in Section 6, no new exceedances of the 2040 future objective were predicted at any existing receptors, including identified vulnerable groups. Therefore, no further mitigation is required.

7. CONCLUSION

- 7.1 An air quality impact assessment was undertaken for the proposed residential development at Ratby Lane in Markfield, Leicestershire.
- 7.2 A qualitative construction phase assessment was undertaken and measures were recommended to minimise emissions during construction activities. With the implementation of these mitigation measures the impact of construction phase dust emissions is considered to be 'not significant' in accordance with IAQM guidance¹².
- 7.3 A detailed road traffic emissions assessment was undertaken to consider the impact of development-generated road traffic on with regard to the current relevant air quality objectives at identified existing receptor locations. Road traffic emissions were modelled using the dispersion model ADMS-Roads and concentrations of NO₂, PM₁₀ and PM_{2.5} were predicted at identified sensitive receptor locations. The modelling assessment was undertaken in accordance with Defra Local Air Quality Management Technical Guidance¹¹. The development was not predicted to result in any new exceedances of the relevant air quality objectives and the impact of the development with regard to the current relevant air quality objectives was predicted to be 'negligible' in accordance with IAQM and EPIC (previously EPUK) guidance¹³.
- 7.4 Pollutant concentrations were also predicted across the Site. Concentrations of NO₂, PM₁₀ and PM_{2.5} were all predicted to be below the relevant air quality objectives and therefore the Site was considered to be suitable for the proposed residential use with regard to the current relevant air quality objectives.
- 7.5 Based on the assessment results, the impact of the proposed development on local air quality with regards to the current relevant air quality objectives was considered to be not significant. No mitigation is required but measures included in the development that can be considered beneficial to air quality include PV panels, EV charging points, cycle storage facilities and provision of a Travel Plan.

APPENDICES

APPENDIX A: GLOSSARY OF TERMS

	Definition
AADT	Annual Average Daily Traffic flow.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. This period avoids splitting winter season between two years, which is useful for pollutants that have higher concentrations during the winter months.
AQAP	Air Quality Action Plan.
AQMA	Air Quality Management Area.
AQS	Air Quality Strategy.
Defra	Department for Environment, Food and Rural Affairs.
EPIC	Environmental Policy Implementation Community (formerly EPUK)
EPUK	Environmental Protection UK.
Exceedance	A period of time where the concentrations of a pollutant is greater than, or equal to, the appropriate air quality standard.
HDV	Heavy Duty Vehicles (HGVs + buses and coaches)
HGV	Heavy Goods Vehicles.
IAQM	Institute of Air Quality Management.
LAQM	Local Air Quality Management.
LDV	Light Duty Vehicles (motorbikes, cars, vans and small trucks)
NO	Nitrogen monoxide, a.k.a. nitric oxide.
NO ₂	Nitrogen dioxide.
NO _x	Nitrogen oxides.
Percentile	The percentage of results below a given value.
PM ₁₀	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
PM _{2.5}	Particulate matter with an aerodynamic diameter of less than 2.5 micrometres.
micrograms per cubic metre (µg.m ⁻³)	A measure of concentration in terms of mass per unit volume. A concentration of 1µg.m ⁻³ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.

APPENDIX B: PROPOSED DEVELOPMENT MASTERPLAN



0 10 20 30 40 50 metres

Site Boundary: Aprx. 6.39ha

Residential developable area: 3.63ha (Up to 135 dwellings @ 37dph)

Proposed location for foul pump station and substation

Access & Movement

- Proposed vehicular access point
- Proposed spine road through the development
- Proposed secondary streets leading off the spine road
- Proposed private drives and lanes
- Proposed shared spaces
- Existing public footpath
- Proposed recreational routes

Green Infrastructure

- Existing vegetation
- Proposed amenity and informal open space (to include new landscaping, tree planting and SuDS features)
- Proposed new woodland planting
- Proposed location for children's play area
LEAP - Local Equipped Area for Play
- Proposed locations for sustainable drainage features (attenuation basins)

Surrounding Context

- Existing bus routes

Rev	Date	By	Description

CSA
environmental

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Project Land at Ratby Lane, Markfield, Leicestershire

Title Illustrative Masterplan

Client Taylor Wimpey UK Ltd

Scale 1:1250 @ A2	Drawn SM
Date May 2025	Checked RR
Drawing No. CSA/2550/118	Rev 0

APPENDIX C: PLANNING POLICY AND LEGISLATION

National Legislation and Planning Policy

The UK Air Quality Strategy

- C.1 European Union (EU) legislation forms the basis of air quality policy and legislation in the UK. The EU 2008 ambient Air Quality Directive¹ sets limits for ambient concentrations of air pollutants including nitrogen dioxide (NO₂) and particulate matter (PM₁₀ and PM_{2.5}). The air quality standards and objectives are prescribed through the Air Quality (England) Regulations 2000², as amended, for the purpose of the Local Air Quality Management Framework. The Air Quality (England) Regulations were amended in 2002³ and again in 2010⁴, with miscellaneous amendments added in 2020⁵ following the UK exit from the EU. Additionally, an updated PM_{2.5} objective was published in 2023⁶ with an interim target to be achieved by 2028⁷.
- C.2 The UK Government are required under the Environment Act 1995²¹ to produce a national Air Quality Strategy (AQS). The AQS was first published in 1997²², updated in 2007²³ and most recently reviewed and updated in 2023⁶. The AQS provides an overview of the Government's ambient air quality policy and sets out the air quality standards and objectives to be achieved and measures to improve air quality.
- C.3 The Environment Act 2021²⁴ was granted Royal Assent in November 2021 and contains amendments to Part IV of the Environment Act 1995²¹ with regard to the Local Air Quality Management regime. Under the Environment Act 2021²⁴, the Secretary of State must lay a statement before Parliament setting out progress made in meeting air quality objectives and standard in England and steps taken towards achieving the standards. The Environment Act 2021²⁴ also places responsibility on local authorities to co-operate with air quality partners in the preparation of Air Quality Action Plans and identification of measures which should be monitored within the Plan and dates by which they should be implemented.
- C.4 Part IV of the Environment Act²⁴ requires local authorities in the UK to review local air quality within their administrative area and, if relevant air quality standards and objectives are likely to be exceeded, designate Air Quality Management Areas (AQMA). Following the designation of an AQMA, local authorities are required to publish an Air Quality Action Plan (AQAP) detailing measures to be taken to improve local air quality and work towards meeting the relevant air quality standards and objectives.

National Planning Policy Framework

- C.5 The National Planning Policy Framework (NPPF)²⁵ was amended in December 2024 and sets out the Government's planning policies for England and how these are expected to be applied.

²¹ HMSO (1995) The Environment Act 1995, London: TSO

²² Department of the Environment (DoE) (1997) The UK National Air Quality Strategy, London: HMSO

²³ Department of the Environment, Food and Rural Affairs (Defra) (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, London: HMSO

²⁴ HMSO (2021) The Environment Act 2021, London: TSO

²⁵ Ministry of Housing, Communities & Local Government (2024) National Planning Policy Framework, HMSO London

C.6 The NPPF²⁵ recognises air quality within Section 15: Conserving and enhancing the natural environment, and 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, taking into account relevant information such as river basin management plans;

[...]

Ground conditions and pollution

[...]

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.

[...]

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.”

C.7 With regard to assessing cumulative effects the NPPF²⁵ states:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.

[...]”

Planning Practice Guidance

- C.8 The Planning Practice Guidance (PPG) for air quality²⁶ was updated in November 2019 and provides guiding principles on how the planning process can take account of the impacts of new development on air quality.
- C.9 The PPG²⁶ sets out the following with regard to air quality and planning:
- *"What air quality considerations does planning need to address;*
 - *What is the role of plan-making with regard to air quality;*
 - *Air quality concerns relevant to neighbourhood planning;*
 - *What information is available about air quality;*
 - *When could air quality considerations be relevant to the development management process;*
 - *What specific issues may need to be considered when assessing air quality impacts;*
 - *How detailed does an air quality assessment need to be; and*
 - *How can an impact on air quality be mitigated".*
- C.10 The PPG²⁶ sets out the pollutants for which there are legally binding limits for concentrations and those which the UK also has national emissions reduction commitments.
- C.11 The PPG²⁶ states that development plans may need to consider:
- *"what are the observed trends shown by recent air quality monitoring data and what would happen to these trends in light of proposed development and / or allocations;*
 - *the impact of point sources of air pollution (pollution that originates from one place);*
 - *the potential cumulative impact of a number of smaller developments on air quality as well as the effect of more substantial developments, including their implications for vehicle emissions;*
 - *ways in which new development could be made appropriate in locations where air quality is or is likely to be a concern, and not give rise to unacceptable risks from pollution. This could, for example, entail identifying measures for offsetting the impact on air quality arising from new development including supporting measures in an air quality action plan or low emissions strategy where applicable; and*
 - *opportunities to improve air quality or mitigate impacts, such as through traffic and travel management and green infrastructure provision and enhancement".*

²⁶ Ministry for Housing, Communities and Local Government (2019) Planning Practice Guidance Air Quality

C.12 The PPG²⁶ also states what may be considered relevant to determining a planning application and these include whether a development would:

- *“Lead to changes (including any potential reductions) in vehicle-related emissions in the immediate vicinity of the proposed development or further afield. This could be through the provision of electric vehicle charging infrastructure; altering the level of traffic congestion; significantly changing traffic volumes, vehicle speeds or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; could add to turnover in a large car park; or involve construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more;*
- *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; biomass boilers or biomass-fuelled Combined Heat and Power plant; centralised boilers or plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area; or extraction systems (including chimneys) which require approval or permits under pollution control legislation;*
- *Expose people to harmful concentrations of air pollutants, including dust. This could be by building new homes, schools, workplaces or other development in places with poor air quality;*
- *Give rise to potentially unacceptable impacts (such as dust) during construction for nearby sensitive locations;*
- *Have a potential adverse effect on biodiversity, especially where it would affect sites designated for their biodiversity value”.*

C.13 The PPG²⁶ provides guidance regarding what should be included within an air quality assessment. Examples of potential air quality mitigation measures are also provided.

Local Planning Policy

Hinckley & Bosworth Borough Council, Local Development Framework Core Strategy⁸

C.14 The Local Development Framework Core Strategy⁸ was adopted by HBBC in December 2009 and sets out the strategies and policies to be used to guide development in the borough until 2026. This document was reviewed; however, there were no policies related to air quality.

Hinckley & Bosworth Borough Council, Hinckley and Bosworth Draft Local Plan 2020-2039, Regulation 19⁹

C.15 HBBC is currently preparing a new Local Plan⁹ for 2020 – 2039, which was open to public consultation in 2022. The following draft policies relate to air quality:

“PMD01 High Quality Design

The Borough Council will require the highest standards of design, architecture, inclusivity and place-making.

[...]

Development will be supported where the following requirements are met:

[...]

b) The amenity and privacy of nearby residents are not adversely affected, including by matters of lighting, air quality, odour, noise, vibration and visual intrusion;

[...]."

"PMD03 Preventing Pollution

Adverse impacts from pollution will be prevented by ensuring that development proposals demonstrate that:

[...]

f) It will not and significantly impact air quality in terms of additional nitrogen and emissions and ammonia levels which can be damaging to the natural environment;

[...]."

C.16 The above policies were taken into consideration throughout the undertaking of the assessment.

APPENDIX D: CONSULTATION WITH HBBC

- D.1 Consultation was undertaken with the Environmental Protection department at HBBC via email in May 2021. Details of the consultation process are shown below.

Eirini Tsermentseli

From: Simon Smith <Simon.Smith@hinckley-bosworth.gov.uk>
Sent: 21 May 2025 08:06
To: Eirini Tsermentseli
Subject: RE: Air Quality Assessment Scope and Methodology for Development in Markfield

This email originated from outside of our organisation. Please exercise caution with content, links and attachments.

Morning

Yes, your proposal is satisfactory.

Regards

Simon Smith

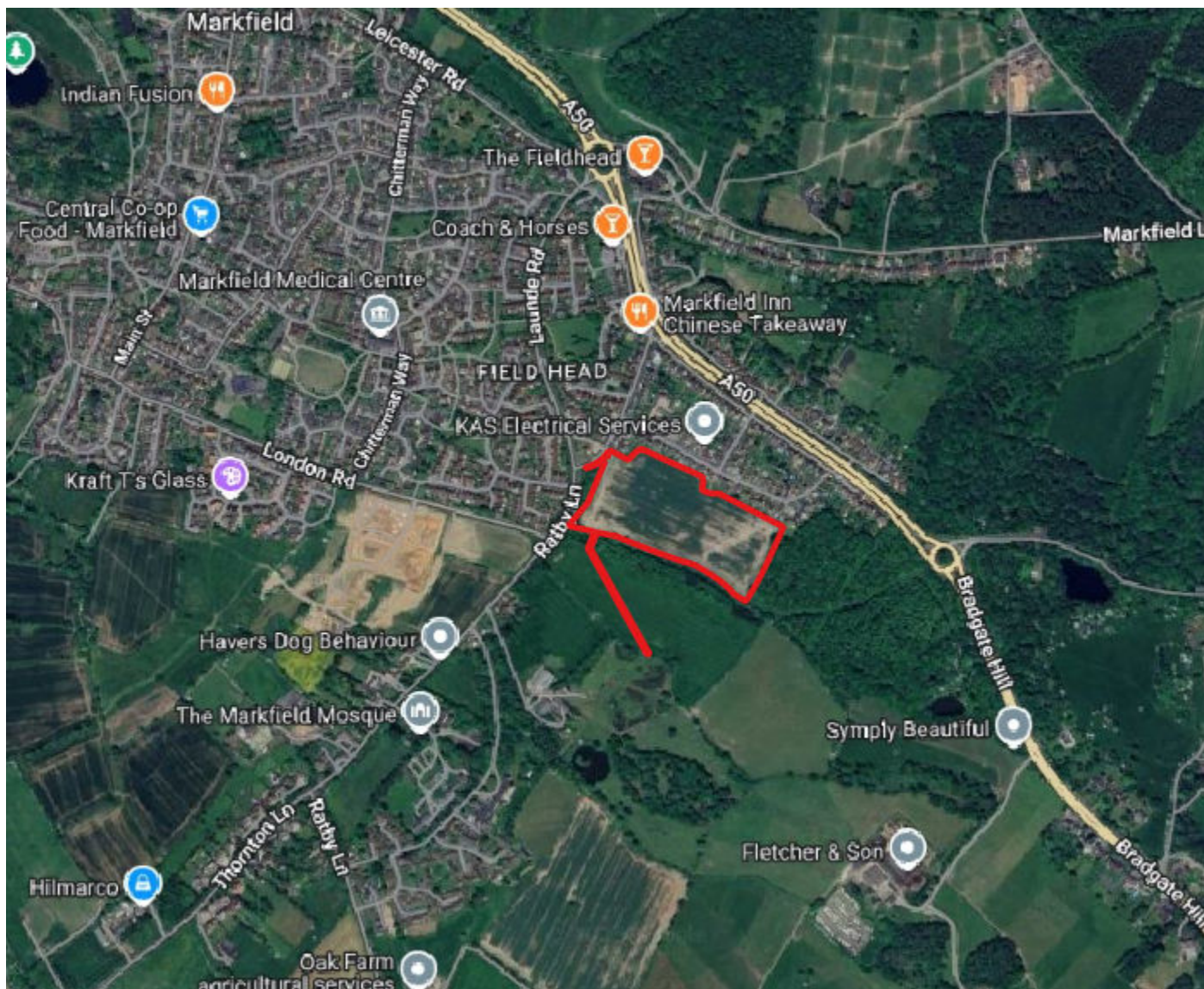
Team Leader – Environmental Protection
Hinckley and Bosworth Borough Council

From: Eirini Tsermentseli <Eirini.Tsermentseli@bwiconsulting.com>
Sent: 20 May 2025 15:23
To: Giles Rawdon <Giles.Rawdon@hinckley-bosworth.gov.uk>
Subject: Air Quality Assessment Scope and Methodology for Development in Markfield

Good afternoon Giles,

I hope you are well.

BWB have been appointed to undertake an air quality assessment for a proposed residential development of up to 135 dwellings at Ratby Lane in Markfield. The location of the Site is shown below.



I was hoping to kindly check with you that our proposed scope and methodology are acceptable to Hinckley and Bosworth Borough Council.

Construction Phase Dust Assessment

We propose to undertake a construction dust assessment in accordance with the Institute of Air Quality Management (IAQM) guidance. The assessment will utilise the 2024 version of the guidance. Mitigation measures will be specified to mitigate dust and particulate matter emissions during the construction phase.

Operational Phase

Road Traffic Emissions Assessment

The proposed development is not located within or in close proximity to an existing Air Quality Management Area (AQMA). The proposed development trip generation is expected to exceed the Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK) criteria of 500 Light Duty Vehicle (LDV) flows outside of an AQMA for when a detailed road traffic emissions impact assessment may be required. We therefore propose to undertake a detailed assessment of air quality impacts associated with the additional trips generated by the development proposals on existing sensitive receptor locations in the vicinity of the Site.

The detailed assessment will be undertaken using the dispersion model ADMS-Roads (v [5.0.1.3](#)) to predict concentrations of nitrogen dioxide (NO₂) and particulate matter (PM₁₀ and PM_{2.5}) at identified existing sensitive receptor locations within the vicinity of the Site. The assessment will be undertaken in accordance with Defra Technical Guidance (LAQM.TG22) and the IAQM and EPUK guidance will be used to determine

the significance of the any impacts on local air quality with regards to the current relevant air quality objectives.

We will utilise the latest tools available from Defra within the assessment including the latest version of the Emission Factor Toolkit, version 13. The following model inputs will be utilised within the assessment:

- Meteorological data – 2023 data will be utilised from the East Midlands meteorological recording station. This is considered the most representative of the Site given the similar topography and proximity of the site and recording station.
- A surface roughness of 0.5m and a Monin-Obhukov (MO) length of 10m will be used for the Site, representative of its predominantly suburban surroundings in the village of Markfield.
- A surface roughness of 0.5m and a Monin-Obhukov (MO) length of 30m will be used for the meteorological station, representative of its predominantly industrial surroundings.
- Backgrounds – No representative background monitoring is undertaken in close proximity to the Site, therefore background pollutant concentrations will be taken from Defra background mapping.
- Verification – On review of 2023 monitoring data in the area, it is considered that Hinckley and Bosworth diffusion tube site '11' and the triplicate '10,12,14' are the most representative of conditions at the Site and the study area. We therefore propose to utilise these sites in the model verification process.

The following scenarios will be modelled:

- 2023 Verification;
- 2025 Base Year;
- 2028 Opening Year without Development; and
- 2028 Opening Year with Development.

In addition, a Site suitability assessment will be undertaken to predict pollutant concentrations across the site to determine the suitability of the Site for its proposed residential use, specifically in relation to emissions associated with the A50 Leicester Road and the M1 motorway.

The Defra PM_{2.5} Interim Planning Guidance will also be considered throughout the assessment.

If you could please confirm your acceptance of the air quality assessment, that would be most appreciated. However, if you have any queries or would like to discuss in more detail, please do not hesitate to get in touch.

Kind regards,

Eirini Tsermentseli MSc BEng AMIAQM AMIEnvSc
Senior Air Quality Consultant

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Company No. 5265863
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APPENDIX E: CONSTRUCTION DUST ASSESSMENT METHODOLOGY

- E.1 The construction phase of the proposed development will involve a number of activities which have the potential to impact on local air quality. These include emissions of dust generated through construction, earthworks and trackout activities, exhaust pollutant emissions from construction traffic on the local highways network, and exhaust emissions from non-road mobile machinery (NRMM) within the construction site itself.
- E.2 The location of sensitive receptors in relation to construction activities will affect the potential for such construction activities to cause dust soiling, nuisance and local air quality impacts. Meteorological conditions and the use of control measures will also contribute to the effects experienced.

Step 1: Screen the Need for a Detailed Assessment

- E.3 Step 1 of the IAQM guidance¹² involves a screening assessment to consider whether a more detailed construction phase dust assessment is required.
- E.4 In accordance with the guidance¹², a detailed assessment is required if:
- Human receptors are located within 250m of the boundary of the site or 50m of routes used by construction vehicles on the public highways, up to 250m from the site entrances; or
 - Ecological receptors are located within 50m of the boundary of the site or 50m of routes used by construction vehicles on the public highways, up to 250m from the site entrances.
- E.5 From a review of the Multi Agency Geographic Information for the Countryside (MAGIC) website²⁷, no ecological designations were identified within the above screening distance and therefore the impact on ecological designations was not considered further. However human receptors are located within the above screening distances, with the closest of these receptors located off Ratby Lane. A construction phase assessment was therefore undertaken.

Step 2: Assess the Risk of the Dust Impacts

Step 2A: Define the Potential Dust Emission Magnitude

- E.6 The dust emission magnitudes for the construction activities were defined using the criteria detailed in the IAQM guidance¹² as detailed in **Table E.1**. Demolition is not proposed as part of the development and therefore was not considered further in the assessment.

Table E.1: Dust Emission Magnitude

Activity	IAQM Dust Emission Magnitude	Dust Emission Magnitude
Earthworks	Large	Total site area >110,000m ² , potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >6 m in height.

²⁷ <https://magic.defra.gov.uk/>

	Medium	Total site area 18,000m ² – 110,000m ² , moderately dusty soil type (e.g. silt), 5 - 10 heavy earth moving vehicles active at any one time, formation of bunds 3m - 6m in height.
	Small	Total site area <18,000m ² , soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <3m in height.
Construction	Large	Total building volume >75,000m ³ , on site concrete batching, sandblasting.
	Medium	Total building volume 12,000m ³ – 75,000m ³ , potentially dusty construction material (e.g. concrete), on site concrete batching.
	Small	Total building volume <12,000m ³ , construction material with low potential for dust release (e.g. metal cladding or timber).
Trackout	Large	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m.
	Medium	20 - 50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100m.
	Small	<20 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50m.

E.7 The following dust emissions magnitudes were defined for the Proposed Development.

- Earthworks – The total Site area is between 18,000 and 110,000m². The dust emissions magnitude for earthworks was therefore defined as **Medium**.
- Construction – The proposed development will require the construction of circa 135no. residential dwellings with a total building volume anticipated to be over 75,000m³. Therefore, the dust emissions magnitude for construction was defined as **Large**.
- Trackout – There is an unpaved road within the Site with a length of over 100m. However, due to the size of the Site, it is likely that there will be between 20 and 50 outward HDV movements in any one day. Therefore, the dust emissions magnitude for trackout was defined as **Medium**. In accordance with IAQM guidance¹², a trackout distance of 250m was therefore used.

E.8 A summary of the defined dust emissions magnitude for the development are provided in **Table E.2**.

Table E.2: Summary of Dust Emission Magnitudes

Activity	Dust Emission Magnitude
Earthworks	Medium
Construction	Large
Trackout	Medium

Step 2B: Define the Sensitivity of the Area

- E.9 The assessment requires the determination of the sensitivity of the area for the purposes of dust soiling and human health. The sensitivity of the study area takes into account the specific receptors in the vicinity of the site, the proximity and number of those receptors, the local background concentration of PM₁₀ and site-specific factors. **Figure E.1** was utilised to determine the number of receptors located within the distance bands provided in the IAQM guidance¹² for determining receptor sensitivity.
- E.10 The sensitivity of the area is defined below, in accordance with the IAQM criteria¹² and summarised in **Table E.3**.
- Dust Soiling – Residential dwellings are considered to be highly sensitive to dust soiling. There are between 10 and 100 highly sensitive residential dwellings located within 20m of the proposed Site boundary and of the roads to be used by construction vehicles. Therefore, the sensitivity of the area to dust soiling impacts was defined as **High**.
 - Human Health – Residential receptors are also considered to be highly sensitive to health effects of PM₁₀. There are between 10 and 100 highly sensitive residential dwellings located within 20m of the proposed Site boundary and of the roads to be used by construction vehicles. Background PM₁₀ concentrations in the area surrounding the Site are below 24µg.m³, as indicated by a review of Defra background pollutant concentration mapping²⁰. Therefore, the sensitivity of the area to human health impacts was defined as **Low**.

Table E.3: Summary of the Area to Dust Soiling and Human Health Impacts

Activity	Sensitivity		
	Earthworks	Construction	Trackout
Dust Soiling	High	High	High
Human Health	Low	Low	Low

Step 2C: Define the Risk of Impacts

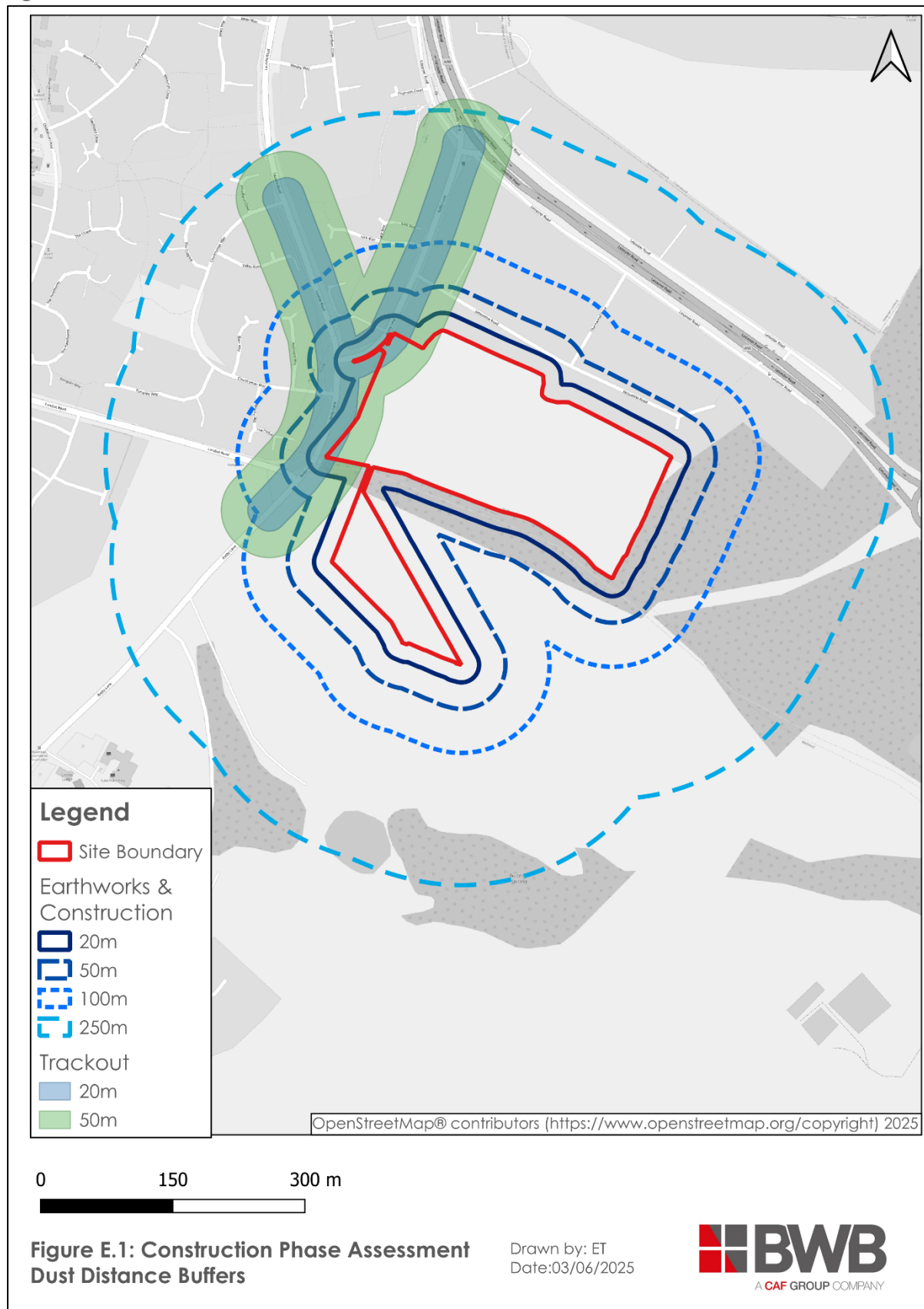
- E.11 The dust emission magnitude determined in Step 2A is then combined with the sensitivity of the area determined in Step 2B to define the risk of dust impacts with no mitigation applied. The results of this assessment are detailed in **Table E.4**.

Table E.4 – Risk of Dust Impacts

Activity	Step 2A: Dust Emission Magnitude	Step 2B: Sensitivity of the Area	Step 2C: Risk of Dust Impacts
Dust Soiling Effects on People and Property			
Earthworks	Medium	High	Medium Risk
Construction	Large	High	High Risk
Trackout	Medium	High	Medium Risk
Human Health Effects			

Activity	Step 2A: Dust Emission Magnitude	Step 2B: Sensitivity of the Area	Step 2C: Risk of Dust Impacts
Earthworks	Medium	Low	Low Risk
Construction	Large	Low	Low Risk
Trackout	Medium	Low	Low Risk

Figure E.1: Construction Phase Assessment Dust Distance Buffers



Step 3: Site-Specific Mitigation

- E.12 The risk of dust impacts, defined in Step 2C of the assessment, is used to determine the mitigation measures required to minimise the emission of dust during construction phase activities. The IAQM guidance¹² provides details of highly recommended and desirable mitigation measures which are commensurate with the risk of dust impacts defined in Step 2C for construction, earthworks and trackout activities. Where the mitigation measures are general in nature, the highest risk category was applied in accordance with the guidance¹². The highest risk category identified was '**High Risk**' and the recommended mitigation taken from the IAQM guidance¹² is detailed in **Table E.5** and **Table E.6**.

Table E.5: Mitigation Measures for a High Risk Site

Category	Mitigation Measures for a High Risk Site	
	Highly Recommended	Desirable
Communication	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	None
	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environmental manager/engineer or the site manager.	
	Display the head or regional office contact information.	
	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.	
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.	None
	Make the complaints log available to the local authority when asked.	
	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.	
	Hold regular liaison meetings with other high risk construction sites within 250m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which	

Category	Mitigation Measures for a High Risk Site	
	Highly Recommended	Desirable
	might be using the same strategic road network routes.	
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 when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of the site boundary, with cleaning to be provided as necessary.	None
	Carry out regular site inspections to monitor compliance with the DMP, record inspections results, and make an inspection log available to the local authority when asked.	
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	
Preparing and maintaining the site	Plan the site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	None
	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 site or specific operations where there is a high potential for dust production and the site is active for an extended 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 on site. If they are being re-used on-site cover as described below.	
	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.	None
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.	

Category	Mitigation Measures for a High Risk Site	
	Highly Recommended	Desirable
	Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable control measures provided, subject to the approval of the nominated undertaker with the agreement of the local authority, where appropriate).	
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	
	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).	
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.	None
	Ensure an adequate water supply on site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	
	Used enclose chutes and conveyors and covered skips.	
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	
	Ensure equipment is readily available on site to clean and dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	
Waste Management	Avoid bonfires and burning of waste materials.	None

Table E.6: Mitigation Measures Specific to Demolition Earthworks, Construction and Trackout

Category	Mitigation Measures	
	Highly Recommended	Desirable
Earthworks (Medium Risk Site)	None	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
		Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
		Only remove the cover in small areas during work and not all at once.

Category	Mitigation Measures	
	Highly Recommended	Desirable
Construction (High Risk Site)	Avoid scabbling (roughening of concrete surfaces) if possible.	For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.	
	Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.	
Trackout (Medium Risk Site)	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any materials tracked out of the site. This may require the sweeper being continuously in use.	None
	Avoid dry sweeping of large areas.	
	Ensure vehicles entering and leaving the sites are covered to prevent escape of materials during transport.	
	Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	
	Record all inspections of haul routes and any subsequent action in a site log book.	
	Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	
	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.	
	Access gates to be located at least 10m from receptors where possible.	

Step 4: Determine Significant Effects

- E.13 In accordance with the IAQM guidance¹², with the implementation of the mitigation measures detailed in Step 3, the residual impacts from the construction phase are considered to be 'Not Significant'.

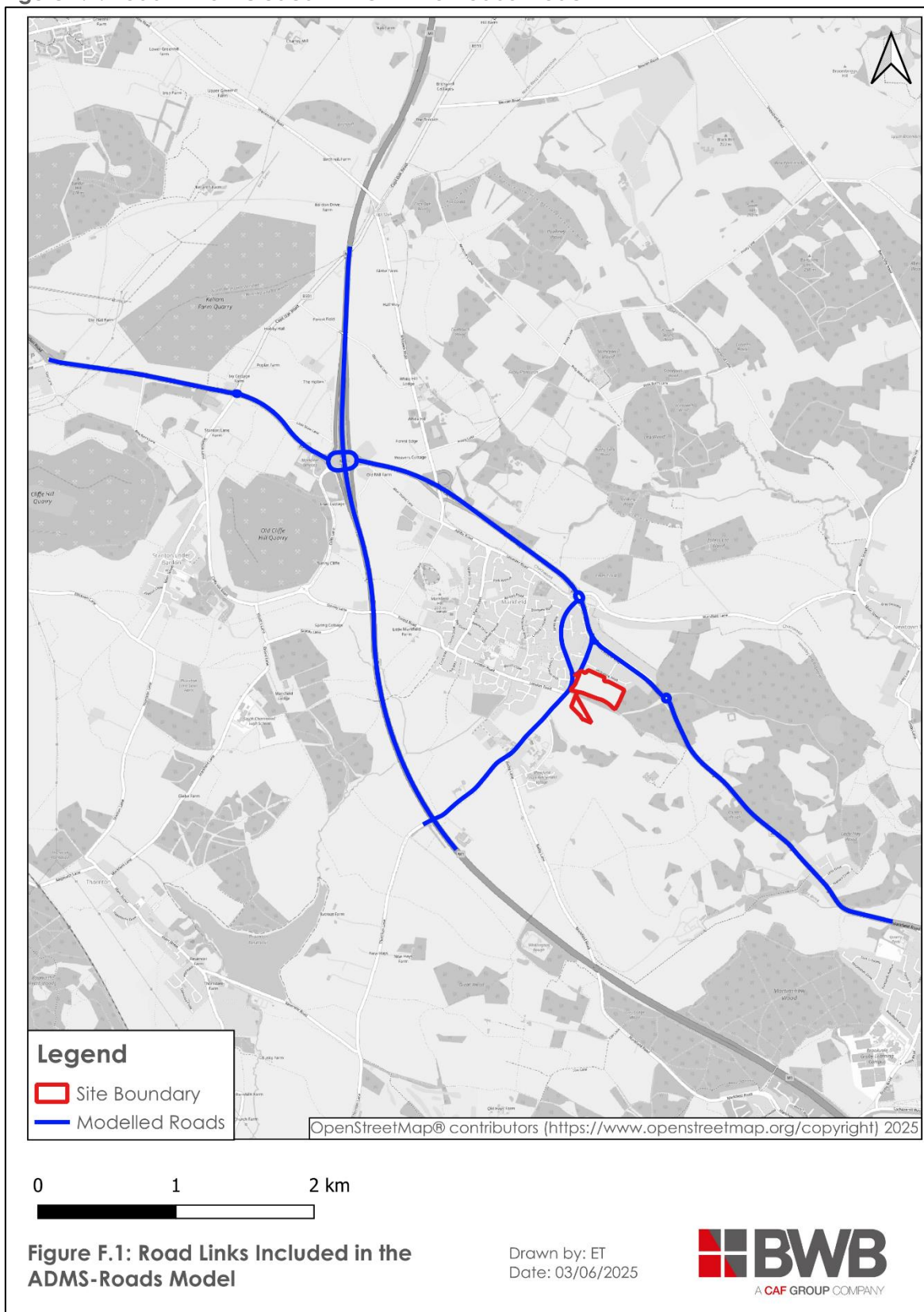
APPENDIX F: MODEL INPUTS AND VERIFICATION

Table F.1: Traffic Data used in the Assessment

Road Link	Speed	Scenario 1: 2023 Verification Year		Scenario 2: 2025 Base Year		Scenario 3: 2028 Opening Year Without Development		Scenario 4: 2028 Opening Year With Development	
	Km.hr ⁻¹	24 hour AADT Total Flow	HDV Flow	24 hour AADT Total Flow	HDV Flow	24 hour AADT Total Flow	HDV Flow	24 hour AADT Total Flow	HDV Flow
Ratby Lane, north of Site access	42	1,102	93	1,110	94	1,388	96	1,776	96
Ratby Lane, south of Site access	48	1,102	93	1,110	94	1,388	96	1,812	96
Ratby Lane, south of Launde Road	55	6,867	662	6,916	666	7,979	679	8,043	679
Launde Lane, north of Ratby Lane	60	6,170	718	6,214	723	7,892	737	8,200	737
A50 Leicester Road, East of Ratby Lane	64	35,110	8,188	35,609	8,304	38,431	8,533	38,775	8,533
A50 Bradgate Hill, South of A50 Leicester Road	64	35,110	8,188	35,609	8,304	38,431	8,533	38,775	8,533
A50 Leicester Road, South of A50 Markfield Bypass	64	35,110	8,188	35,609	8,304	38,401	8,533	38,537	8,533
A50 Markfield Bypass, north of A50 Leicester Road	112	33,783	8,008	34,263	8,122	36,291	8,345	36,611	8,345
A50 Markfield Bypass, east of M1	80/112	33,783	8,008	34,263	8,122	36,712	8,345	36,988	8,345
A511 Little Shaw Lane, west of M1	80	31,854	10,146	32,083	10,219	33,118	10,424	33,238	10,424
A511 Shaw Lane, west of A511 Little Shaw Lane	112	19,885	5,767	20,028	5,809	20,821	5,925	20,941	5,925
M1 motorway	112	97,504	33,599	99,123	34,157	103,400	35,407	103,480	35,407

F.1 An illustration of the road links included in the ADMS-Roads model is provided in **Figure F.1**.

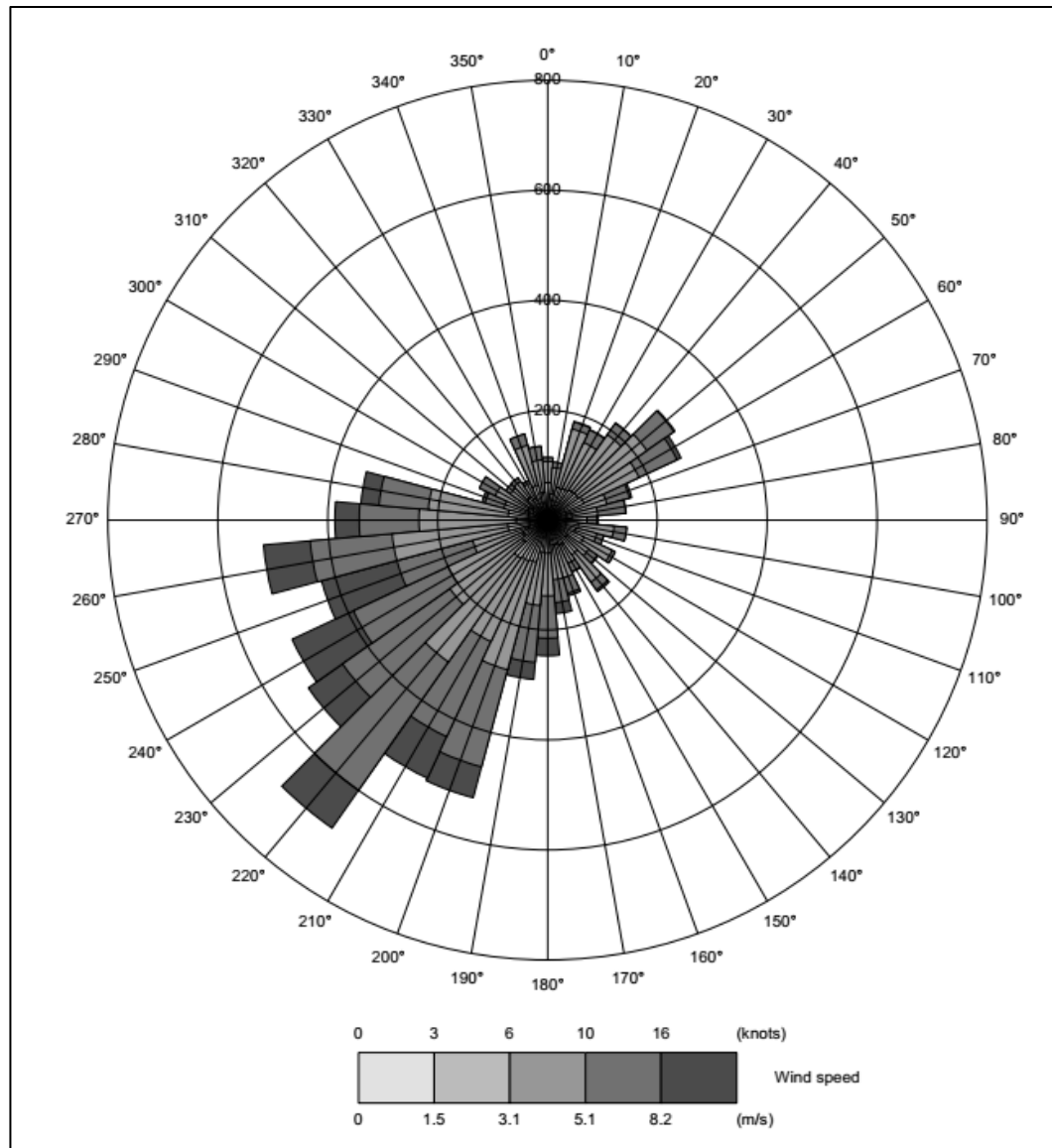
Figure F.1: Road Links Included in the ADMS-Roads Model



Meteorological Data

- F.2 Meteorological data for 2023 Verification Year scenario for the East Midlands recording station was obtained for use in the air dispersion modelling assessment. The wind rose for 2023 is detailed below in **Figure F.2** and illustrates a predominant wind direction from the south west.

Figure F.2: Wind Rose for 2023



Model Verification

- F.3 Whilst ADMS-Roads is widely validated for use in this type of assessment, model verification for the area around the Site will not have been included. To determine model performance at a local level, a comparison of modelled results with monitored results in the study area was done in accordance with the methodology provided by Defra¹¹. This process of verification aims to minimise modelling

uncertainty by correcting modelled results by an adjustment factor to give greater confidence to the results.

- F.4 The model was run for Scenario 1: 2023 Verification Year to predict the 2023 annual mean road contributions of NO_x at the monitoring locations in the study area. The model NO_x outputs at these locations were compared to the 2023 monitored concentrations to provide adjustment factors. **Table F.2** presents the verification process for NO_x.
- F.5 The study area for the purposes of this assessment is defined by roads that development generated traffic is anticipated to utilise such as the A50 and the A511 which are arterial roads leading to Leicester and the wider Leicestershire area. Monitoring locations '11' and '10,12,14' as presented in **Table 4.1** are located along these roads and were therefore considered representative of conditions within the study area and were utilised in the model verification process.
- F.6 The locations of the verification locations used in the assessment are shown in **Figure 4.1**.
- F.7 No monitoring of PM₁₀ or PM_{2.5} is undertaken within the study area. Therefore the adjustment factor calculated during the NO_x verification process was utilised to adjust predicted concentrations of PM₁₀ and PM_{2.5}.

Table F.2: NO_x Verification Process

Model Verification Steps	10,12,14	11
2023 monitored total NO ₂ (µg.m ⁻³)	26.1	17.1
2023 background NO ₂ concentration (µg.m ⁻³)	11.3	9.9
Monitored road contribution NO _x (µg.m ⁻³)	34.4	15.6
Modelled road contribution NO _x (µg.m ⁻³)	19.6	19.5
Ratio of monitored road NO _x to modelled road NO _x	1.8	0.8
Adjustment factor for modelled road contribution NO _x	1.2796	
Adjusted modelled road contribution NO _x (µg.m ⁻³)	25.1	25.0
Modelled total NO ₂ concentration (µg.m ⁻³)	22.5	21.1
Monitored total NO ₂ concentration (µg.m ⁻³)	26.1	17.1
% difference between modelled and monitored total NO ₂ concentration	-14.0	23.2
RMSE % (should be less than 25% and ideally less than 10%)	9.5	

Road-NO_x component, determined from NO_x to NO₂ calculator

- F.8 A road-NO_x factor of **1.2796** was determined as the slope of the best fit line between the 'measured' road contribution and the model derived road contribution, forced through zero. This factor was then applied to the modelled road-NO_x concentration

at each receptor, before conversion to NO₂ concentrations using the NO_x to NO₂ calculator provided by Defra¹¹.

- F.9 The RMSE was calculated a 9.5% which is within the ideal guideline variance as suggested by the Defra guidance¹¹. Model performance is therefore considered to be good and acceptable.

