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ENVIRONMENT

Richborough
Land North of Little Green Lane
Croxley Green
Air Quality Assessment

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Croxley Green
Air Quality Assessment

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Notice

EXECUTIVE SUMMARY

BWB Consulting Limited was appointed by Richborough to undertake an air quality assessment for proposed residential-led, mixed-use development on land north of Little Green Lane, Croxley Green.

The Site is located within the administrative area of Three Rivers District Council. The Site is located in the vicinity of an existing Air Quality Management Area. Three Rivers District Council declared the Chorleywood nitrogen dioxide Air Quality Management Area and the Chorleywood particulate matter (PM_{10}) Air Quality Management Area for the potential exceedance of the annual mean nitrogen dioxide and the 24-hour mean particulate matter (PM_{10}) air quality objectives.

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 (PM_{10} 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 new 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 mixed 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 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 further mitigation is required but measures included in the development that may be considered beneficial to air quality include provision for pedestrians and cyclists and Electric Vehicle charging points.

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1. INTRODUCTION

1.1 BWB Consulting Limited (BWB) was instructed by Richborough (the Client) to undertake an air quality assessment for a proposed mixed-use development comprising 600 residential dwellings, 1 form-entry primary school and a mixed-use local centre, on land north of Little Green Lane, Croxley Green ('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 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 on land north of Little Green Lane, Croxley Green within the administrative area of Three Rivers District Council (TRDC). The eastern boundary runs along the neighbouring administrative area of Watford Borough Council (WBC). The Site is not within an existing Air Quality Management Area (AQMA), however there are existing AQMAs, designated by TDRC; the Chorleywood nitrogen dioxide (NO_2) AQMA and the Chorleywood particulate matter (PM_{10}) AQMA are located approximately 3.2km west.

1.5 The Site currently comprises agricultural fields and existing woodland. The north and east of the Site are bound by Rousebarn Lane and Whippendell Woods beyond. To the south is Little Green Lane, whereby the Site will be accessed, and residential dwellings and the A412 Rickmansworth Road thereafter. To the west of the Site are agricultural fields with the M25 motorway beyond. Located to the southwest is a residential development, currently under construction (TRDC Reference: 20/1881/FUL). **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 M25 motorway and A412 Rickmansworth Road.

Proposed Development

1.7 The proposed development comprises up to 600 residential dwellings (Use Class C3(a)), a 5-bedroom property for children's social care and supported living (Use Class C3(b)). Two vehicular access points from Little Green Lane and further pedestrian / cycleway accesses. A one form entry primary school (Use Class F1(a)) (plus expansion land for a two form entry primary school). A mixed use local centre including provision for NHS health and social care services (Use Class E(e)), community building (Use Class F2), retail and café provision (Use Class E(a-c)), car parking and associated infrastructure. A country park, areas for play and recreation, allotments, community orchard and landscaping with associated infrastructure including sustainable urban drainage

systems. (All matters are reserved except for vehicular access). The illustrative masterplan is detailed in **Appendix B**.

Figure 1.1: Site Location

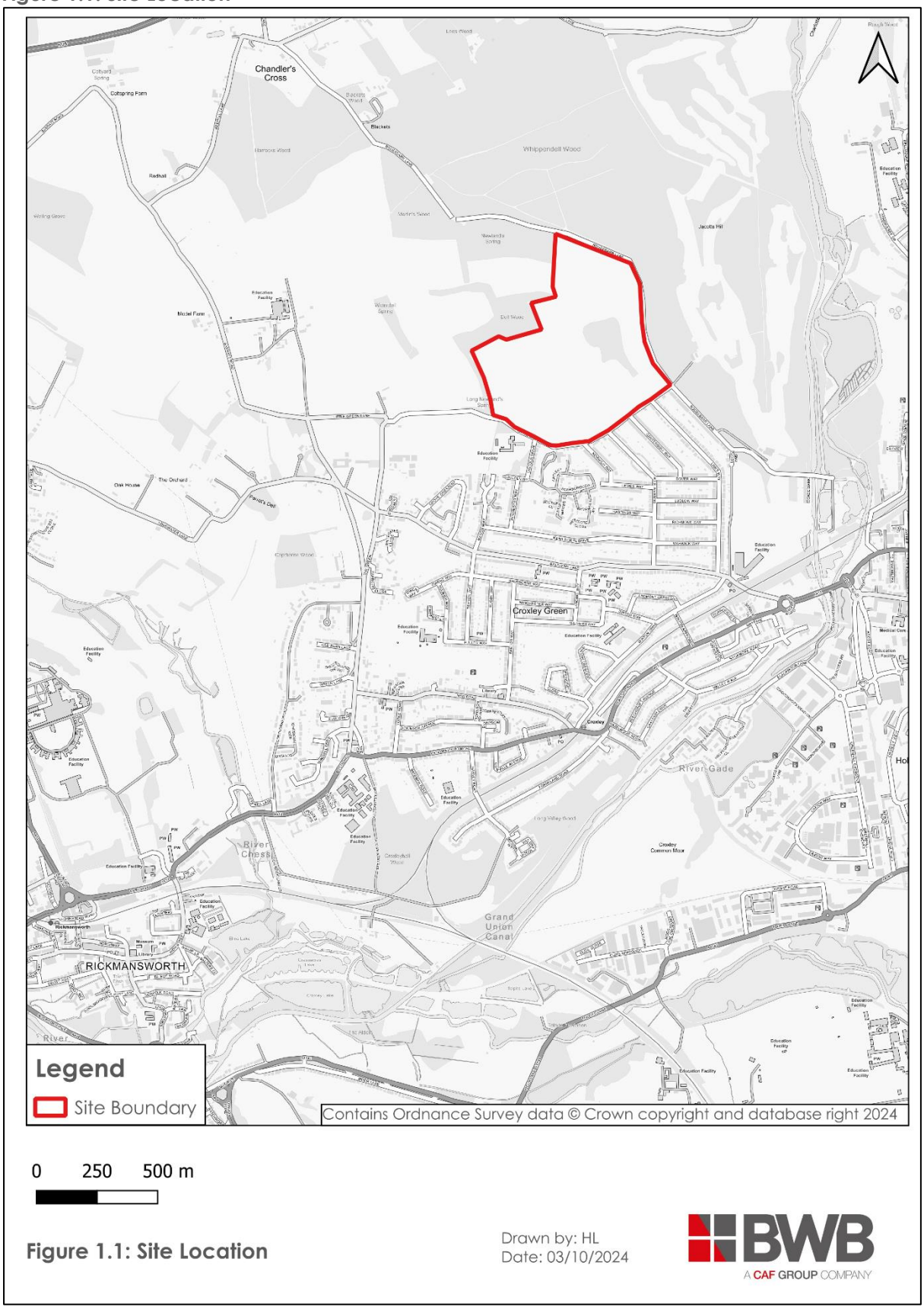

Figure 1.1: Site Location

Drawn by: HL
Date: 03/10/2024

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2. LEGISLATION, PLANNING POLICY & GUIDANCE

National Legislation and Planning Policy

2.1 The following national legislation and planning policy is relevant to air quality and was considered in the undertaking of the assessment. A summary of the relevant national legislation and planning policy is provided in **Appendix C**:

- European Parliament, EU 2008 ambient Air Quality Directive (2008)[1];
- HMSO, Air Quality (England) Regulations (2000)[2];
- HMSO, Environment Act (1995)[3];
- HMSO, Environment Act (2021)[4];
- HMSO, Air Quality (England) Regulations (2002)[5];
- HMSO, Air Quality Standards Regulations (2010)[6];
- Department for Environment, Air Quality Strategy (1997)[7];
- Department for the Environment, Food and Rural Affairs, Air Quality Strategy (2007)[8];
- Department for the Environment, Food and Rural Affairs, Air Quality Strategy (2023)[9];
- Department for the Environment, Food and Rural Affairs, The Environment (Miscellaneous Amendments) (EU Exit) Regulations (2020)[10];
- HMSO, The Environmental Targets (Fine Particulate Matter) (England) Regulations (2023)[11];
- Ministry of Housing, Communities and Local Government, National Planning Policy Framework (NPPF) (2024)[12]; and
- Ministry for Housing, Communities and Local Government, Planning Practice Guidance (PPG) for air quality (2019)[13].

Local Planning Policy

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

- Three Rivers District Council, Core Strategy (2011)[14].

[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 (1995) The Environment Act 1995, London: TSO
[4] HMSO (2021) The Environment Act 2021, London: TSO
[5] HMSO (2002) Statutory Instruments 2002 No. 3043, The Air Quality (England) (Amendment) Regulations 2002, London: HMSO
[6] HMSO (2010) Statutory Instruments 2010 No. 1001 Air Quality Standards Regulations 2010. London: HMSO
[7] Department of the Environment (DoE) (1997) The UK National Air Quality Strategy, London: HMSO
[8] Department of the Environment, Food and Rural Affairs (Defra) (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, London: HMSO
[9] Department for the Environment, Food and Rural Affairs (Defra) (2023) Air Quality Strategy: Framework for Local Authority
[10] Department of the Environment, Food and Rural Affairs (Defra) (2020) The Environment (Miscellaneous Amendments) (EU Exit) Regulations, London: HMSO
[11] HMSO (2023) Statutory Instruments 2023 No. 96 The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023
[12] Ministry of Housing, Communities & Local Government (2024) National Planning Policy Framework, HMSO London
[13] Ministry for Housing, Communities and Local Government (2019) Planning Practice Guidance Air Quality
[14] Three Rivers District Council (2011) Core Strategy

Air Quality Assessment Guidance

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

- Defra, Local Air Quality Management Technical Guidance (LAQM.TG(22)) (2022)[15];
- Defra, $PM_{2.5}$ Targets: Interim Planning Guidance (2024)[16];
- Institute of Air Quality Management, Guidance on the Assessment of Dust from Demolition and Construction (2024)[17]; 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)[18].

[15] Defra (2022) Local Air Quality Management Technical Guidance LAQM.TG(22)
[16] Defra (2024) $PM_{2.5}$ Targets: Interim Planning Guidance
[17] Institute of Air Quality Management (2024) Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management,
[18] 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 Watford Borough Council

3.1 WBC are responsible for air quality monitoring and management for TRDC. Consultation was therefore undertaken with WBC, as outlined below:

- First consultation was undertaken via email on 10th July 2024, which outlined the proposed methodology for the assessment. The Environmental Health team at WBC responded via email on 11th July 2024, agreeing to the proposed methodology.
- Further consultation with WBC was undertaken via email on 7th November 2024 to confirm the use of additional verification locations within the ADMS-Roads modelling assessment. WBC responded via email on 7th November agreeing to the proposed updates.

3.2 The scope of works, as agreed with WBC are detailed below:

- Construction Phase - A construction phase dust assessment was undertaken and relevant measures to mitigate construction phase dust emissions were recommended. The assessment was undertaken in accordance with guidance provided by the Institute of Air Quality Management (IAQM)[17].
- Operational Phase – A detailed operational phase road traffic emissions assessment was undertaken to consider the impact of development-generated traffic on local air quality and predict pollutant concentrations at the Site. The dispersion model ADMS-Roads was used to model concentrations of oxides of nitrogen (NOx) and particulate matter (PM_{10} and $PM_{2.5}$) at identified existing receptor locations for both without and with development scenarios. The change in pollutant concentrations as a result of development-generated traffic was then calculated. The assessment was undertaken in accordance with Defra Local Air Quality Management Technical Guidance (LAQM.TG22)[15] and IAQM and Environmental Policy Implementation Community (previously Environmental Protection UK) (EPIC)[18] guidance. Pollutant concentrations were predicted across the Site to consider the suitability of the Site for residential use.

3.3 Full details of the methodology used in the assessment, as agreed with WBC are provided below.

Construction Phase Dust Assessment

3.4 An assessment of the potential impacts arising from the construction of the proposed development was undertaken in accordance with IAQM guidance[17]. The full assessment methodology is not reproduced within this report but a summary of the assessment steps 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

3.5 The air dispersion model ADMS-Roads, version 5.0.1.3 was utilised in the assessment to predict concentrations of NOx, PM_{10} and $PM_{2.5}$ at existing receptors and across the Site.

3.6 The assessment was undertaken in accordance with Defra LAQM.TG(22)[15] and IAQM and EPIC (previously EPUK) guidance[18].

Assessment Scenarios and Traffic Data

3.7 The following scenarios were considered in the air dispersion modelling:

- Scenario 1: 2022 Verification Year;
- Scenario 2: 2024 Base Year;
- Scenario 3: 2026 Opening Year without development; and
- Scenario 4: 2026 Opening Year with development.

3.8 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 Hub Transport Planning Ltd, the Transport Consultants for the project. Traffic data for Little Green Lane, Canterbury Way and Durrants Drive were sourced from Automatic Traffic Count surveys. The remaining data were sourced from publicly available data from the Department for Transport website[19]. 24-hour Annual Average Daily Traffic Data (AADT) and Heavy Duty Vehicle (HDV) proportions were provided for the following roads for use in the assessment:

- M25 Motorway;
- A404 Chorleywood Road;
- A412 Park Road;
- A412 Rickmansworth Road;
- A411 Beechen Grove;
- A4178 Cassio Road;
- A412 St Albans Road;
- A411 Hempstead Road;
- A4178 Wiggenhall Road;
- The Green;

[19] https://roadtraffic.dft.gov.uk/#6/55.254/-6.053/basemap-regions-countpoints

- Baldwins Lane;
- Durrants Drive;
- Canterbury Way; and
- Little Green Lane.

3.9 Consideration was given to the speeds at which vehicles are likely to travel within the study area. Free flowing traffic conditions were modelled at speed limits, taking into account driving conditions in the study area. Queuing sections including road links approaching junctions, roundabouts and traffic lights, were modelled in accordance with Defra LAQM.TG(22)[15]. Where national speed limits apply, HDV speeds were reduced to model typical HDV speeds.

3.10 Traffic data used in the air dispersion modelling are provided in **Appendix C**.

ADMS-Roads Model Inputs

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

Table 3.1: Model Inputs Used in the Assessment Model Inputs Used in the Assessment

Parameter	Input
Emission factors	Emission factors were utilised from the Defra Emission Factor Toolkit[20] (EFT), version 12.1, for the years of assessment (2022, 2024 and 2026).
Conversion of oxides of nitrogen	Concentrations of NOx were predicted using the ADMS-Roads dispersion model. These concentrations were converted to nitrogen dioxide (NO_2) using the Defra NOx to NO_2 calculator[21], version 8.1.
Meteorological data	Hourly sequential meteorological data for the verification year of assessment (2022) were obtained for the Northolt recording station, located approximately 11.8km south. The Northolt meteorological recording station is the closest representative station to the Site. The wind rose for 2022 is provided in **Appendix D.**
Surface roughness and Monin-Obukhov length (MO) – Site	A surface roughness of 0.5m and an MO length of 30m were utilised in the air dispersion model to represent conditions at the Site and within the Study area, as the Site is on the outer edge of Watford.
Surface roughness and Monin-Obukhov length (MO) – Meteorological Station	A surface roughness of 0.75m and an MO length of 30m were utilised in the air dispersion model to represent conditions at the meteorological station. The meteorological station is located at the RAF Station Northolt.
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[22] provided by Defra as a 1km x

[20] Defra (2023) Emission Factor Toolkit [https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html]
[21] Defra (2019) NOx to NO_2 Calculator [https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc]
[22] Defra (2019) background pollutant concentration maps [https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2019]

Parameter	Input
	1km grid of the UK, for the years of assessment (2022, 2024 and 2026).
Model verification	Model verification was undertaken using WBC monitoring data available for the study area. Full details of the verification procedure are provided in **Appendix E**.
Calculation of short term PM_{10} concentrations	The following calculation, as detailed in Defra guidance[15], was utilised to calculate the number of exceedances of the 24-hour mean PM_{10} air quality objective: *Number of 24-Hour Mean Exceedance = -18.5 + 0.00145 * Annual Mean^3 + (206 / Annual Mean)*

Receptor Locations

Existing Sensitive Receptors

3.12 Existing receptor locations were identified within close proximity of the road links detailed in paragraph 3.8 and considered in the operational phase road traffic emissions assessment. Concentrations of NO_2, PM_{10} and $PM_{2.5}$ were predicted at the identified existing receptor locations for the assessment scenarios detailed in paragraph 3.7. 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 and 3m to represent average breathing heights of adults. Additionally, schools and nurseries were modelled at 1m and 0.8m to represent the lower than average breathing heights of children.

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

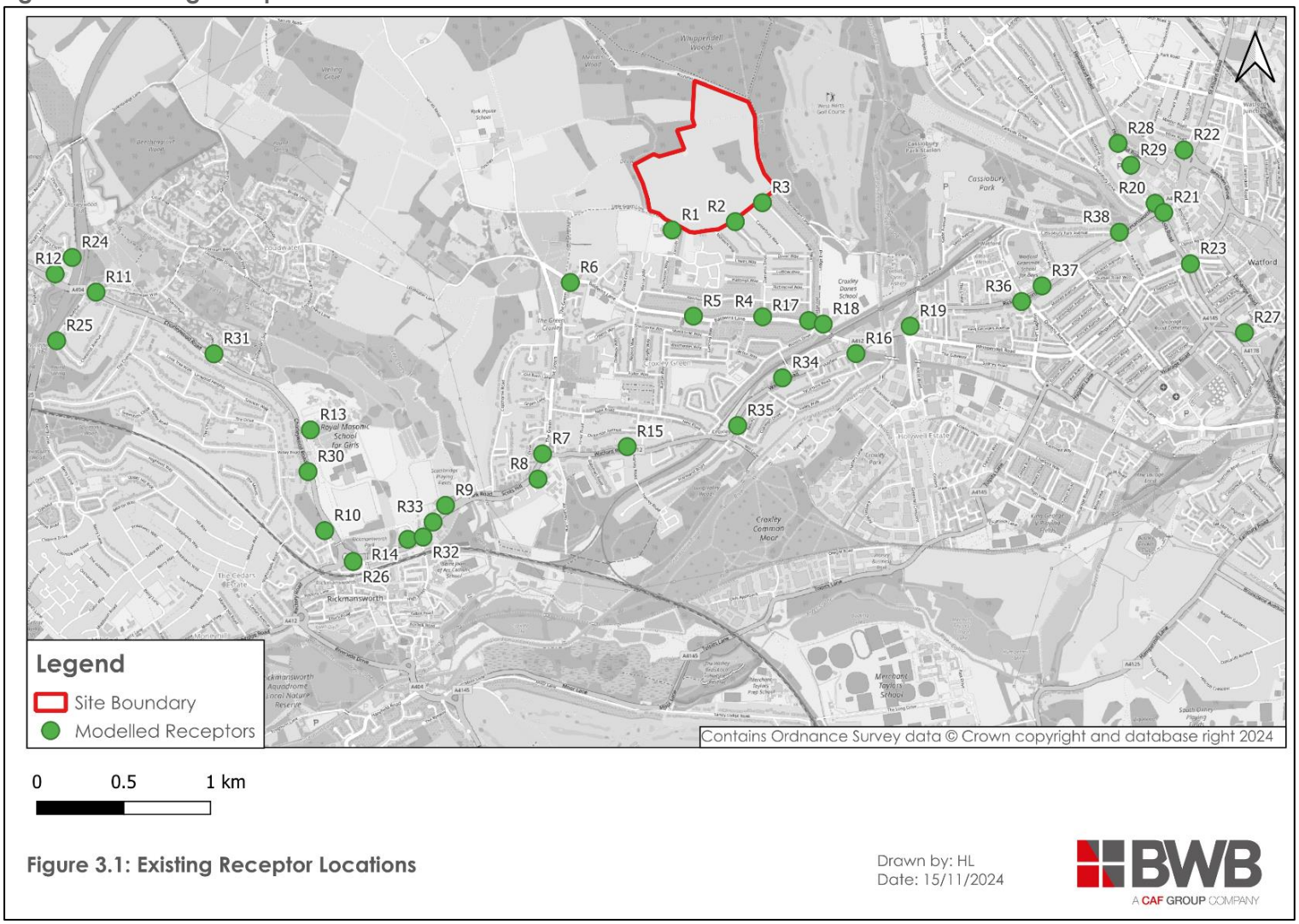
Table 3.2: Existing Sensitive Receptor Locations

Receptor	Grid Reference		Details	Height Modelled
	X	Y		(m)
R1	507670	196580	Little Green Junior School	0.8
R2	508034	196628	Residential dwelling off Durrants Drive	1.5
R3	508191	196737	Residential Dwelling off Links Way	1.5
R4	508192	196080	Residential dwelling off Baldwins Lane	1.5

Receptor	Grid Reference		Details	Height Modelled
	X	Y		(m)
R5	507794	196084	Residential dwelling off Baldwins Lane	1.5
R6	507085	196278	Residential dwelling off the Green	1.5
R7	506924	195291	Residential dwelling off The Green	3.0
R8	506898	195146	Rickmansworth School	1.0
R9	506365	194995	Rickmansworth Nursery School	0.8
R10	505669	194849	Boys & Girls Nursery Rickmansworth	0.8
R11	504352	196222	Residential dwelling off Rickmansworth Road	1.5
R12	504116	196327	Care Home off Rickmansworth Road	1.5
R13	505587	195429	The Royal Masonic School for Girls	1.0
R14	506148	194799	Rickmansworth Park Infant School	0.8
R15	507412	195333	Residential dwelling off A412 Watford Road	1.5
R16	508730	195869	Residential dwelling off Mayfare	1.5
R17	508457	196058	Residential dwelling off Links Way	1.5
R18	508541	196039	Croxley Danes School	1.0
R19	509042	196027	Residential dwellings off Rickmansworth Road	1.5
R20	510453	196734	Peace Hospice Care	1.5
R21	510503	196681	Residential dwelling off A4176 Cassio Road	1.5
R22	510619	197040	Residential dwelling off A412 Rickmansworth Road	1.5
R23	510657	196385	The Little Learners Montessori Watford	0.8
R24	504215	196422	Residential dwelling on Wyatt's Close	1.5
R25	504125	195942	Residential dwelling off Chestnut Avenue	1.5

Receptor	Grid Reference		Details	Height Modelled
	X	Y		(m)
R26	505833	194671	Residential dwelling on Homestead Road	3.0
R27	510968	195989	Watford Grammar School for Girls	1.0
R28	510240	197079	Care home on Hempstead Road	1.5
R29	510313	196953	Nursery and Primary School on Hempstead Road	0.8
R30	505573	195189	Residential Receptor on Chorleywood Road	1.5
R31	505031	195867	Residential dwelling on Chorleywood Road	1.5
R32	506236	194813	Residential dwelling on A412 Park Road	1.5
R33	506294	194899	Residential dwelling on Park Road	1.5
R34	508307	195729	Residential dwelling on Watford Road	1.5
R35	508048	195454	Residential dwelling on A412 Watford Road	1.5
R36	509684	196168	Residential dwelling on Rickmansworth Road	1.5
R37	509802	196259	Watford School of Music/Watford Grammar School for Boys	1.0
R38	510247	196567	Residential dwelling on Cassiobury Park Avenue	1.5

Figure 3.1: Existing Receptor Locations



Proposed Receptor Locations

3.14 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 507230, Y 196050 to maximum X 508480, Y 197800, modelled at a height of 1.5m, was included to predict pollutant concentrations across the Site to represent the average ground floor breathing height and to consider its suitability for the proposed sensitive end use.

Limitations and Assumptions

3.15 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.

3.16 The assessment is based on traffic data provided by Hub Transport Planning Ltd, the Transport Consultants for the project. As such any assumptions made by the transport consultants will also influence the air quality assessment.

3.17 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 EFT[20] to provide the most up to date estimate of current and future emission projections.

3.18 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.

3.19 To reduce the uncertainty associated with predicted concentrations, model verification was carried out following guidance set out in Defra guidance[15]. As the models were verified using local monitoring data and adjusted accordingly, there can be reasonable confidence in the predicted concentrations.

3.20 Consideration of committed local developments that may represent sensitive receptors to dust during the construction phase was undertaken through a review of the TRDC and WBC planning portals. Any applications submitted following the review, or not present on the portal at the time of review, were not considered.

Assessment Criteria

3.21 Predicted pollutant concentrations were compared to the current relevant air quality objectives for England[7]. The current relevant air quality standards and objectives are detailed in **Table 3.3**.

Table 3.3: Air Quality Standards and Objectives (England)

Pollutant	Averaging Period	Air Quality Objective ($\mu g.m^{-3}$)	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
	Annual mean interim target as detailed within the Environmental Improvement Plan[23]	*12*	*31 January 2028*
	Annual mean	*10*	*31 December 2040*

Italics notes future objective

3.22 Guidance is provided by the IAQM and EPIC (previously EPUK)[18] 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 3.4.** 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 3.4: 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

[23] Defra (2023) Environmental Improvement Plan 2023, First revision of the 25 Year Environment Plan

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%
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.

3.23 In accordance with IAQM and EPIC (previously EPUK) guidance[18], 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 judgement.

Defra $PM_{2.5}$ targets: Interim Planning Guidance

3.24 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 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 guidance[16] 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?*

3.25 Consideration to the interim guidance[16] has therefore been included within the assessment.

4. BASELINE CONDITIONS

Local Air Quality Management

4.1 The Site is not located within an existing AQMA, however the Chorleywood NO_2 AQMA and the Chorleywood PM_{10} AQMA are located approximately 3.2km west of the Site and were declared for potential exceedances of the annual mean NO_2 and the 24-hour PM_{10} air quality objectives for England. The AQMAs run along a section of the M25 London Orbital Motorway, to the north of Junction 18.

4.2 Additionally, the neighbouring authority of WBC has two existing AQMAs for the potential exceedances of the annual mean NO_2 air quality objective for England. The closest being AQMA No.2 Vicarage Road which is located approximately 2.4km east of Site, covering Vicarage Road and Hornets Junction.

4.3 The locations of the AQMAs are illustrated in **Figure 4.1**.

Local Air Quality Monitoring

Nitrogen Dioxide

4.4 TRDC undertake NO_2 monitoring within its administrative boundary using a network of diffusion tubes. The closest monitoring location to the Site is diffusion tube TR26 which is classified as a kerbside monitoring location. Additionally, the Site is adjacent to the administrative area of WBC. WBC undertakes NO_2 monitoring using a network of diffusion tubes and one automatic monitoring station. Diffusion tube WF64 is approximately 2km southeast of the Site, off A412 Rickmansworth Road. The automatic monitoring station, WF1, is located approximately 2.7km northeast of the Site, also off A412 Rickmansworth Road.

4.5 Bias adjusted NO_2 monitoring results, for the locations in the vicinity of the Site, are detailed in **Table 4.1** and **Figure 4.1**. At the time of assessment, 2023 monitoring data had not been published therefore 2022 data was utilised in the model verification process. The IAQM released a position statement[24] 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. Exceedances of the air quality objective are highlighted in **bold**.

Table 4.1: TRDC and WBC NO_2 Monitoring Data in 2017 – 2023

ID	Grid Reference (X,Y)	Site Type	Distance from Centre of Site	Monitored Annual Average Concentration (µg.m^{-3})						
				2017	2018	2019	2020	2021	2022	2023
WBC Monitoring										

[24] Institute of Air Quality Management (2021) Position Statement: Use of 2020 and 2021 Monitoring Datasets

ID	Grid Reference (X,Y)	Site Type	Distance from Centre of Site	Monitored Annual Average Concentration (µg.m^{-3})						
				2017	2018	2019	2020	2021	2022	2023
WF64	509721, 196184	Kerbside[D]	2.0km	-	-	-	-	-	25.2	20.7
WF1	510540, 196780	Roadside[A]	2.7km	34	32	30	21	21	21	19
WF46a	510565, 196808	Roadside[D]	2.7km	-	26.8	26.3	20.2	21.7	20.7	22.2
WF46b	510565, 196808	Roadside[D]	2.7km	-	-	-	-	-	19.8	23.9
WF46c	510565, 196808	Roadside[D]	2.7km	-	-	-	-	-	21.2	22.6
WF59	510598, 196482	Kerbside[D]	2.8km	-	-	-	-	-	24.8	23.0
TRDC Monitoring										
TR26	505720, 194697	Kerbside[D]	3.1km	-	-	-	-	-	17.2	15.6
S1, S2, S3	505264, 194251	Kerbside[D]	3.7km	-	**48.5**	39.0	**41.0**	28.0	30.9	-
S4 S5 S6	504162, 196286	Kerbside[D]	3.7km	-	30.0	29.8	29.8	22.9	19.4	-
TR24	504127, 196288	Roadside[D]	3.8km	-	-	-	-	-	26.3	22.5
TR25	504125, 195961	Kerbside[D]	3.8km	-	-	-	-	-	24.3	21.0

- data not available, [D] Diffusion Tube, [A] Automatic Monitoring Station, data presented to available precision

4.6 Monitored annual mean NO_2 concentrations were below the current annual mean objective for England between 2019 and 2023 within the administrative area of TRDC, with the exception of the triplicate location S1, S2, S3 in 2018 and 2020. Monitored annual mean NO_2 concentrations were also below the current annual mean objective for England between 2017 and 2023 at all monitoring locations within the administrative area of WBC. The data for monitoring locations WF1, WF46a, S1, S2, S3 and S4, S5, S6 suggests an overall decline in annual mean NO_2 concentration with some year on year fluctuation. No trend could be determined for WF64, WF46b, WF46c, TR26, TR24 and TR25 as only 2022 and 2023 data were available.

4.7 The TRDC triplicate tubes S1, S2, S3 and S4, S5, S6, and TR25 are classified as kerbside monitoring locations. Additionally, TR24 is classified as a roadside monitoring location, however it is adjacent to the kerb and is therefore considered to be a kerbside location. Kerbside monitoring locations are typically not used in the verification process due to the difference in proximity to road emissions compared to modelled receptors, as detailed in Defra TG.22[15]. As the kerbside monitoring locations are not representative of

relevant receptor exposure to road emissions sources, these monitoring locations were not included in verification.

4.8 The WBC monitoring locations WF64, WF1, and the triplicate diffusion tubes WF46a, WF46b and WF46c are located along Rickmansworth Road. WF64 is classified as a kerbside location within the WBC ASR[25], however it is set back approximately 1m from the kerb and was therefore considered as a roadside monitoring location within the assessment. Due to the proximity to the Site and study area, all five monitoring locations were considered representative of the modelled existing receptors within the study area.

4.9 WF59 is located along Cassio Road. WF59 is also considered a kerbside monitoring location as stated within the WBC ASR[25], however it is set back approximately 4m from the kerb and has therefore been considered as a roadside monitoring location. As this diffusion tube is in close proximity to roads within the study area, WF59 was considered to be representative of conditions for sensitive receptors within the study area.

4.10 Based on the above, all WBC diffusion tubes listed in **Table 4.1** were utilised in the verification process. More detail on the verification process can be found in **Appendix F**.

Particulate Matter (PM_{10} and $PM_{2.5}$)

4.11 WBC undertake particulate matter (PM_{10} and $PM_{2.5}$) monitoring within the vicinity of the Site, at the automatic monitoring station WF1. WF1 is located approximately 2.7km northeast of the Site. The PM_{10} monitoring data is detailed in **Table 4.2** and location of WF1 is shown **Figure 4.1**. TRDC do not undertake PM_{10} monitoring within its administrative area.

Table 4.2: WBC PM_{10} Monitoring Data in 2017 – 2023

ID	Grid Reference X,Y	Site Type	Distance from Centre of Site	Pollutant	Monitored Annual Average Concentration (µg.m^{-3})						
					2017	2018	2019	2020	2021	2022	2023
WF1	510540, 196780	Roadside	2.7km	PM_{10}	15	15	15	13	13	14	14
				$PM_{2.5}$	10	9	9	8	8	8	8

Data presented to closest available precision

4.12 The monitored PM_{10} concentrations were below the current annual mean PM_{10} objective at WF1 between 2017 and 2023. The data suggests relatively stable annual mean PM_{10} and $PM_{2.5}$ concentrations between 2017 and 2023. Additionally, no exceedances of the $PM_{2.5}$ annual mean concentration interim target of 12 µg.m^{-3} and the 2040 future objective of 10 µg.m^{-3} were recorded between 2017 and 2023.

[25] Watford Borough Council (2024) 2024 Air Quality Annual Status Report (ASR)

4.13 WF1 is considered representative of the sensitive receptors within the study area, as it is located along the A412 Rickmansworth Road within the study area.

Figure 4.1: Monitoring Locations in the Vicinity of the Site

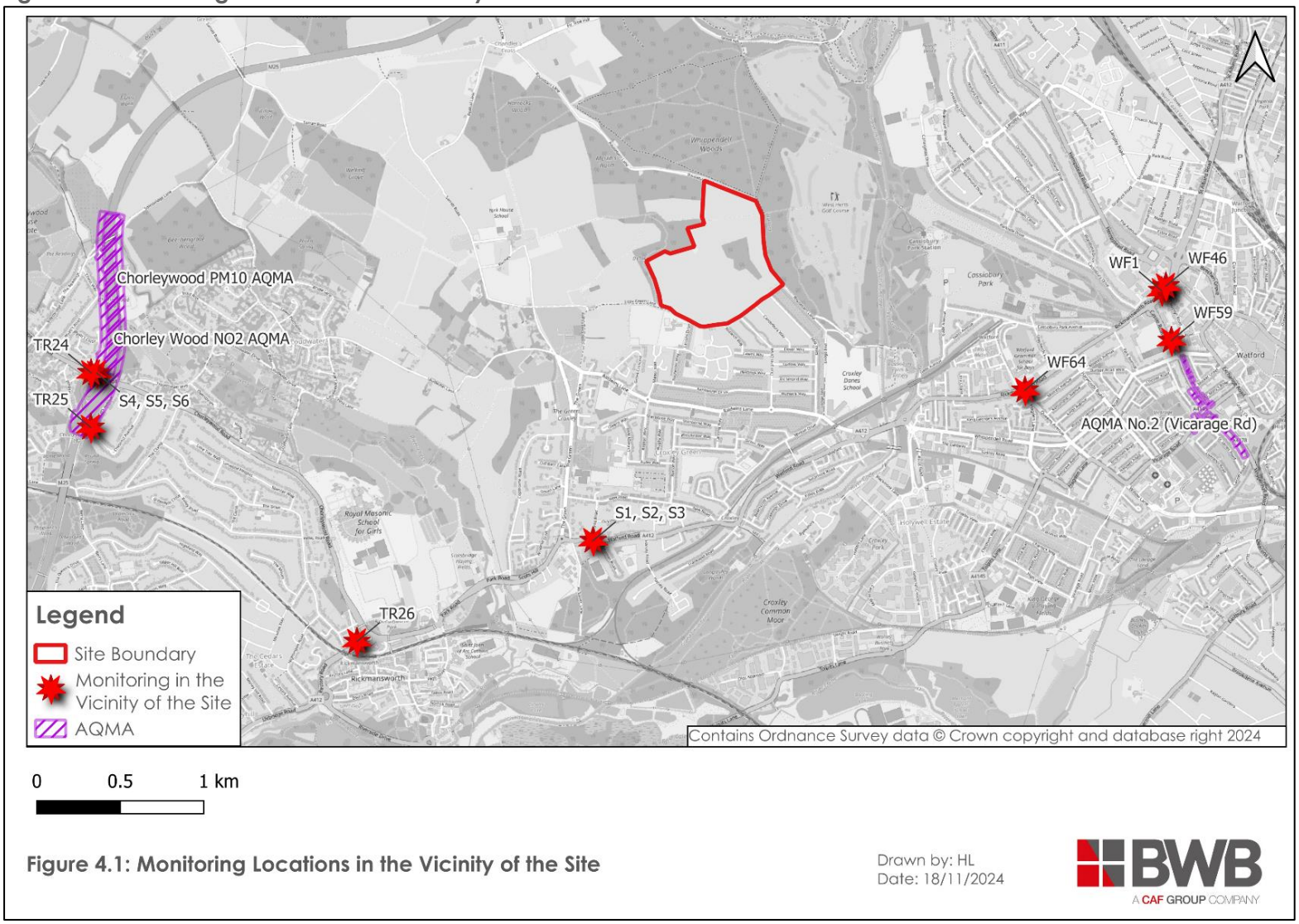


Figure 4.1: Monitoring Locations in the Vicinity of the Site

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Background Pollutant Concentrations

4.14 No representative background air quality monitoring is undertaken by TRDC within the study area. Background pollutant concentrations were therefore obtained from the latest Defra background concentration maps[22], which are provided for the UK as a 1km x 1km grid network. The latest maps at the time of writing are based on 2018 monitoring and meteorological data. Background concentrations of NO_2, PM_{10} and $PM_{2.5}$ were obtained for the grid squares covering the study area for the years of assessment (2022, 2024 and 2026). The background concentrations used in the assessment are detailed in **Table 4.3.**

Table 4.3: Background Pollutant Concentrations used in the Assessment

Pollutant	Grid Square	Monitoring Locations / Receptors	Concentration (µg.m^{-3})		
			2022	2024	2026
NO_2	509500, 196500	WF64, R19, R36, R37	13.8	12.8	12.0
PM_{10}			14.6	14.2	14.1
$PM_{2.5}$			10.0	9.7	9.6
NO_2	510500, 196500	WF1, WF46, R20, R21, R23, R29, R38	18.1	16.8	15.7
PM_{10}			15.9	15.5	15.3
$PM_{2.5}$			10.9	10.6	10.5
NO_2	501500, 196500	WF60	9.4	8.7	8.2
PM_{10}			13.4	13.0	12.9
$PM_{2.5}$			9.1	8.8	8.6
NO_2	504500, 195500	R25	13.8	12.6	11.6
PM_{10}			15.2	14.8	14.7
$PM_{2.5}$			10.2	9.9	9.7
NO_2	507500, 196500	R1, R5, R6	11.5	10.6	9.9
PM_{10}			14.2	13.8	13.6
$PM_{2.5}$			9.5	9.3	9.1
NO_2	508500, 196500	R2, R3, R4, R17, R18	11.9	11.1	10.4

Pollutant	Grid Square	Monitoring Locations / Receptors	Concentration (µg.m^{-3})		
			2022	2024	2026
PM_{10}			14.0	13.7	13.5
$PM_{2.5}$			9.6	9.3	9.2
NO_2	506500, 195500	R7, R8	12.0	11.1	10.3
PM_{10}			14.3	13.9	13.7
$PM_{2.5}$			9.6	9.3	9.1
NO_2	506500, 194500	R9, R14, R32, R33	12.7	11.8	11.0
PM_{10}			13.9	13.5	13.3
$PM_{2.5}$			9.5	9.2	9.0
NO_2	505500, 195500	R13, R30, R31	12.5	11.5	10.6
PM_{10}			14.0	13.7	13.5
$PM_{2.5}$			9.5	9.2	9.1
NO_2	510500, 197500	R22, R28	16.3	15.0	14.0
PM_{10}			15.4	15.0	14.8
$PM_{2.5}$			10.6	10.3	10.1
NO_2	510500, 195500	R27	15.1	14.2	13.4
PM_{10}			15.0	14.6	14.4
$PM_{2.5}$			10.4	10.1	9.9
NO_2	506500, 194500	R9, R14, R32, R33	12.7	11.8	11.0
PM_{10}			13.9	13.5	13.3
$PM_{2.5}$			9.5	9.2	9.0
NO_2	505500, 194500	R10-R12, R24, R26	13.8	12.7	11.8

Pollutant	Grid Square	Monitoring Locations / Receptors	Concentration (µg.m^{-3})		
			2022	2024	2026
PM_{10}			14.4	14.0	13.8
$PM_{2.5}$			9.8	9.5	9.3
NO_2	507500, 195500	R15	12.8	11.8	11.1
PM_{10}			14.5	14.1	13.9
$PM_{2.5}$			9.9	9.7	9.5
NO_2	508500, 195500	R16, R34, R35	14.1	13.1	12.3
PM_{10}			14.4	14.0	13.8
$PM_{2.5}$			9.9	9.6	9.5

4.15 Background NO_2, PM_{10} and $PM_{2.5}$ concentrations were below the current relevant air quality objectives in all grid squares utilised in the assessment. Background $PM_{2.5}$ concentrations are also below the 2028 interim target of 12µg.m^{-3} for all modelled receptors. Background $PM_{2.5}$ concentrations were below the 2040 future objective of 10µg.m^{-3} for all receptors except:

- R19-R23, R25, R28, R29, and R36-R38 in 2022; and
- R20-R23, R27-R29, and R38 in 2024 and 2026.

4.16 A review of Defra background concentration maps[22] highlighted a significant contribution of residual and secondary particulate matter towards the total background PM_{10} concentrations. It is likely that this is resulting in background PM_{10} concentrations exceeding background NO_2 concentrations in some grid squares.

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 guidance[17] 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) website[26], there are several ecological receptors within 50m of the Site boundary. A list of ecological receptors are listed below:

- Green Lane Wood is designated as Ancient Woodland (AW) within the Site boundary;
- Whippendell Wood is a Site of Special Scientific Interest (SSSI) which is adjacent to the northern boundary; and
- Dell Wood is designated as AW and is located adjacent to the northern and western boundaries of the Site.

5.6 Human receptors are also located within the above screening distances, with the closest of these receptors located off Little Green Lane. A construction phase assessment was therefore undertaken.

Step 2: Assess the Risk of Dust Impacts

Step 2A: Define the Potential Dust Emission Magnitude

5.7 The dust emission magnitudes for the construction activities were defined using the criteria detailed in the IAQM guidance[17] as detailed in **Table 5.1**. Demolition is not

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

proposed as part of the development and therefore was not considered further in the assessment.

Table 5.1: Dust Emission Magnitude Criteria and Definition

Activity	IAQM Dust Emission Magnitude	IAQM Dust Emission Magnitude Criteria
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.
	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.

5.8 The following dust emission magnitudes were defined for the proposed development:

- Earthworks – The total Site area is more than 110,000m^2. Therefore the dust emission magnitude for earthworks activities was defined as **Large**.
- Construction – The proposed development comprises up to 600 residential dwellings, a school and a mixed-use local centre. The total building volume will be more than 75,000m^3. The dust emission magnitude for construction activities was therefore defined as **Large**.
- Trackout – The development construction will be phased. It is anticipated that there will be between 20 and 50 outward HDV movements in any one day. The dust emission magnitude for trackout activities was therefore defined as **Medium**. The trackout distance utilised in the assessment was set to 250m from the Site access in accordance with the guidance.

5.9 A summary of the defined dust emission magnitudes for the development are provided in **Table 5.2**.

Table 5.2: Summary of Project Defined Dust Emission Magnitudes

Activity	Dust Emission Magnitude
Earthworks	Large
Construction	Large

Activity	Dust Emission Magnitude
Trackout	Medium

Step 2B: Define the Sensitivity of the Area

5.10 The assessment requires the determination of the sensitivity of the area for the purposes of dust soiling, human health and ecological impacts. 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 PM_{10} and site-specific factors. **Figure 5.1** was utilised to determine the number of receptors located within the distance bands provided in the IAQM guidance[17] for determining receptor sensitivity.

5.11 According to the IAQM guidance[17], the main potential impacts on ecological receptors resulting from dust emissions are direct physical effects in the form of "*reduced photosynthesis, respiration and transpiration through smothering*". Other impacts, such as chemical changes to soil "*are likely to occur only as a result of long-term demolition and construction works*". Unless species particularly sensitive to these effects are present, ecological receptors are likely to be less sensitive than human receptors.

5.12 The sensitivity of the area is defined below, in accordance with IAQM criteria[17] and summarised in **Table 5.3**.

- Dust Soiling – Residential dwellings and schools are considered highly sensitive to dust soiling impacts. There are between 10 and 100 highly sensitive receptors within 20m of the Site boundary. The sensitivity of the area to dust soiling associated with earthworks and construction was therefore defined as **High**. There are between 10 and 100 highly sensitive residential receptors and one school within 20m of the trackout route. The sensitivity of the area to dust soiling associated with trackout was therefore also defined as **High**.
- Human Health – Residential dwellings and schools are considered highly sensitive to human health impacts of PM_{10}. There are between 10 and 100 highly sensitive residential receptors within 20m of the Site boundary. As shown in **Table 4.3**, background PM_{10} concentrations in the vicinity of the Site are below 24µg.m^{-3}. The sensitivity of the area to human health impacts of PM_{10}, associated with construction and earthworks activities was therefore defined as **Low**. There are more than 100 highly sensitive receptors within 20m of the trackout route. Therefore the sensitivity of the area to human health impacts of PM_{10}, associated with the trackout route, was defined as **Medium**.
- Ecological – Green Lane Wood AW, Dell Wood AW, and Whippendell Woods SSSI are all within 20m of the Site boundary. The sensitivity of ecological receptors were discussed with the Ecologist for the project, RammSanderson Ecology Ltd. All three identified ecological receptors are potentially sensitive to dust and particulates, therefore the ecological receptors were considered to be medium sensitivity receptors. Therefore the sensitivity of ecological receptors to construction and earthworks activities were defined as **Medium**. No ecological receptors are within 50m of the trackout route, therefore the sensitivity of ecological receptors to trackout activities was not applicable.

Table 5.3: Determination of the Sensitivity of the Area

Potential Impact	Sensitivity		
	Earthworks	Construction	Trackout
Dust Soiling	High	High	High
Human Health	Low	Low	Medium
Ecological	Medium	Medium	N/A

Step 2C: Define the Risk of Impacts

5.13 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 5.4.**

Table 5.4: 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	Large	High	High Risk
Construction	Large	High	High Risk
Trackout	Medium	High	Medium Risk
Human Health Impacts			
Earthworks	Large	Low	Low Risk
Construction	Large	Low	Low Risk
Trackout	Medium	Medium	Medium Risk
Ecological Impacts			
Earthworks	Large	Medium	Medium Risk
Construction	Large	Medium	Medium Risk
Trackout	N/A	N/A	N/A

Figure 5.1: Construction Phase Assessment Dust Distance Buffers

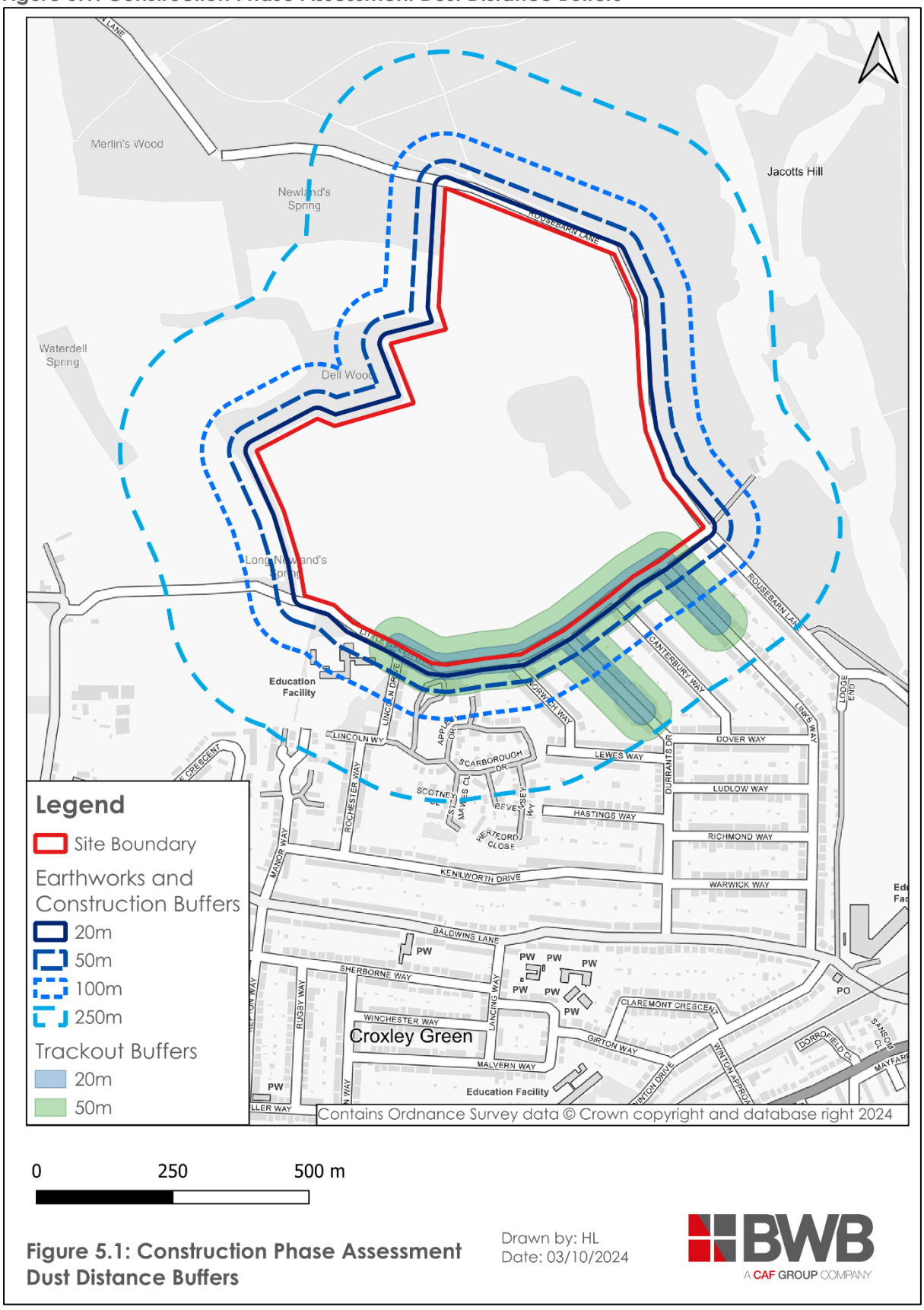

Figure 5.1: Construction Phase Assessment Dust Distance Buffers

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Step 3: Site-Specific Mitigation

5.14 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 guidance[17] 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 guidance[17]. The highest risk category identified was '**High Risk**' and the recommended mitigation taken from the IAQM guidance[17] is detailed in **Table 5.5** and **Table 5.6**.

Table 5.5: 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 500m 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 5.6: Mitigation Measures Specific to Earthworks, Construction and Trackout

Category	Mitigation Measures	
	Highly Recommended	**Desirable**
Earthworks (High Risk Site)	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	None
	Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.	

Category	Mitigation Measures	
	Highly Recommended	**Desirable**
	Only remove the cover in small areas during work and not all at once.	
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.	
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

5.15 In accordance with IAQM guidance[17], 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: 2024 Base Year and Scenario 3: 2026 Opening Year without development are detailed in **Table 6.1.**

Table 6.1: Predicted Annual Mean Pollutant Concentrations for Scenario 2: 2024 Base Year and Scenario 3: 2026 Opening Year Without Development at Existing Receptor Locations

Receptor	Scenario 2: 2024 Base Year (µg.m^{-3})			Scenario 3: 2026 Opening Year Without Development (µg.m^{-3})		
	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
R1	10.4	13.9	9.3	10.3	13.7	9.2
R2	11.0	13.8	9.4	10.9	13.6	9.3
R3	10.9	13.8	9.4	10.8	13.6	9.2
R4	11.9	14.1	9.5	11.6	13.9	9.4
R5	12.0	14.4	9.6	11.5	14.2	9.4
R6	12.0	14.4	9.6	11.5	14.2	9.4
R7	13.6	14.8	9.7	12.9	14.6	9.6
R8	12.5	14.6	9.6	12.0	14.4	9.5
R9	12.9	14.1	9.5	12.5	13.9	9.3
R10	12.6	14.2	9.6	12.4	14.0	9.4
R11	19.3	16.2	10.6	18.2	16.0	10.5
R12	17.9	15.9	10.4	17.1	15.7	10.3
R13	11.5	13.8	9.3	11.3	13.7	9.2
R14	12.6	14.0	9.4	12.3	13.8	9.3
R15	15.1	15.2	10.2	14.2	15.0	10.1

Receptor	Scenario 2: 2024 Base Year (µg.m^{-3})			Scenario 3: 2026 Opening Year Without Development (µg.m^{-3})		
	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
R16	15.5	14.9	10.1	14.8	14.7	9.9
R17	11.8	14.1	9.5	11.5	13.9	9.4
R18	11.5	14.0	9.5	11.3	13.8	9.3
R19	18.0	15.8	10.6	16.6	15.6	10.4
R20	19.2	16.6	11.2	18.4	16.4	11.0
R21	23.4	17.8	11.8	21.7	17.5	11.6
R22	20.7	16.9	11.3	18.9	16.5	11.0
R23	19.9	16.7	11.2	19.0	16.4	11.0
R24	23.0	16.7	10.9	21.0	16.4	10.7
R25	21.2	16.3	10.8	19.1	16.1	10.6
R26	14.4	14.6	9.8	13.8	14.5	9.7
R27	15.5	15.3	10.4	15.0	15.1	10.3
R28	16.8	15.9	10.7	16.1	15.7	10.6
R29	17.0	15.9	10.8	16.7	15.7	10.6
R30	12.1	14.0	9.5	11.8	13.8	9.3
R31	12.8	14.2	9.5	12.3	14.0	9.4
R32	16.5	15.1	10.1	15.4	15.0	9.9
R33	16.2	15.2	10.1	15.2	15.0	9.9
R34	15.4	14.9	10.1	14.7	14.7	9.9
R35	16.4	15.3	10.3	15.5	15.1	10.1
R36	16.1	15.4	10.3	15.2	15.1	10.2

Receptor	Scenario 2: 2024 Base Year (µg.m^{-3})			Scenario 3: 2026 Opening Year Without Development (µg.m^{-3})		
	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
R37	14.8	15.1	10.2	14.2	14.9	10.0
R38	20.5	16.9	11.3	19.5	16.7	11.2

6.2 Annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations were predicted to be below the current relevant annual mean objectives at all receptors in Scenario 2: 2024 Base Year and Scenario 3: Opening Year Without Development. Annual mean $PM_{2.5}$ concentrations were also predicted to be below the 2028 interim target of 12µg.m^{-3} at all receptors. $PM_{2.5}$ concentrations were predicted to be below the 2040 future objective of 10µg.m^{-3} at all receptors except:

- R11, R12, R15, R16, R19-R25, R27-R29, R32-R38 in Scenario 2; and
- R11, R12, R15, R19, R20-R25, R27-R29, R35-R38 in Scenario 3.

6.3 It is worth noting that the background $PM_{2.5}$ concentrations for these receptors, as listed in **Table 4.3** are predicted to be close to or exceeding 10 µg.m^{-3}.

6.4 With regard to short term air quality objectives for NO_2 and PM_{10} the predicted annual mean NO_2 are less than 60µg.m^{-3} and therefore in accordance with Defra guidance[15] it may be assumed that exceedances 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 PM_{10} short term objective; no exceedances were predicted.

Detailed Operational Phase Road Traffic Emissions Assessment

6.5 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ were predicted at identified existing receptor locations for Scenario 4: 2026 Opening Year with development, to consider the impact of development-generated vehicles on with regard to the current relevant air quality objectives.

6.6 Predicted pollutant concentrations are detailed in **Table 6.2, Table 6.3** and **Table 6.4** for NO_2, PM_{10} and $PM_{2.5}$ respectively together with Scenario 3: 2026 Opening Year 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 NO_2 Concentrations and Development Impact at Existing Receptor Locations

Receptor	Predicted NO_2 Concentration ($\mu g.m^{-3}$)				
	Scenario 3: 2026 Opening Year Without Development ($\mu g.m^{-3}$)	Scenario 4: 2026 Opening Year With Development ($\mu g.m^{-3}$)	Concentration Change* ($\mu g.m^{-3}$)	Change in Concentration Relative to Air Quality Assessment Level (%)	Impact
R1	10.3	10.3	<0.1	0	Negligible
R2	10.9	11.0	+0.1	1	Negligible
R3	10.8	10.8	<0.1	0	Negligible
R4	11.6	11.9	+0.3	1	Negligible
R5	11.5	11.9	+0.4	1	Negligible
R6	11.5	11.8	+0.3	1	Negligible
R7	12.9	13.0	+0.1	0	Negligible
R8	12.0	12.1	+0.1	0	Negligible
R9	12.5	12.5	<0.1	0	Negligible
R10	12.4	12.4	<0.1	0	Negligible
R11	18.2	18.2	<0.1	0	Negligible
R12	17.1	17.1	<0.1	0	Negligible
R13	11.3	11.3	<0.1	0	Negligible
R14	12.3	12.3	<0.1	0	Negligible
R15	14.2	14.3	+0.1	0	Negligible
R16	14.8	14.9	+0.1	0	Negligible
R17	11.5	11.7	+0.2	1	Negligible
R18	11.3	11.4	+0.1	0	Negligible
R19	16.6	16.8	+0.2	1	Negligible

Receptor	Predicted NO_2 Concentration (µg.m^{-3})				
	Scenario 3: 2026 Opening Year Without Development (µg.m^{-3})	Scenario 4: 2026 Opening Year With Development (µg.m^{-3})	Concentration Change* (µg.m^{-3})	Change in Concentration Relative to Air Quality Assessment Level (%)	Impact
R20	18.4	18.5	+0.1	0	Negligible
R21	21.7	21.9	+0.2	1	Negligible
R22	18.9	19.0	+0.1	0	Negligible
R23	19.0	19.1	+0.1	0	Negligible
R24	21.0	21.0	<0.1	0	Negligible
R25	19.1	19.1	<0.1	0	Negligible
R26	13.8	13.9	<0.1	0	Negligible
R27	15.0	15.0	<0.1	0	Negligible
R28	16.1	16.2	+0.1	0	Negligible
R29	16.7	16.7	<0.1	0	Negligible
R30	11.8	11.8	<0.1	0	Negligible
R31	12.3	12.4	<0.1	0	Negligible
R32	15.4	15.4	<0.1	0	Negligible
R33	15.2	15.2	<0.1	0	Negligible
R34	14.7	14.8	+0.1	0	Negligible
R35	15.5	15.6	+0.1	0	Negligible
R36	15.2	15.3	+0.1	0	Negligible
R37	14.2	14.3	+0.1	0	Negligible
R38	19.5	19.6	+0.2	0	Negligible

** Discrepancies in changes due to rounding effects*

Table 6.3: Predicted Annual Mean PM_{10} Concentrations and Development Impact at Existing Receptor Locations

Receptor	Predicted PM_{10} Concentration ($\mu g.m^{-3}$)				
	Scenario 3: 2026 Opening Year Without Development ($\mu g.m^{-3}$)	Scenario 4: 2026 Opening Year With Development ($\mu g.m^{-3}$)	Concentration Change* ($\mu g.m^{-3}$)	Change in Concentration Relative to Air Quality Assessment Level (%)	Impact
R1	13.7	13.7	<0.1	0	Negligible
R2	13.6	13.7	<0.1	0	Negligible
R3	13.6	13.6	<0.1	0	Negligible
R4	13.9	14.0	+0.1	0	Negligible
R5	14.2	14.4	+0.1	0	Negligible
R6	14.2	14.3	+0.1	0	Negligible
R7	14.6	14.6	<0.1	0	Negligible
R8	14.4	14.4	<0.1	0	Negligible
R9	13.9	13.9	<0.1	0	Negligible
R10	14.0	14.0	<0.1	0	Negligible
R11	16.0	16.0	<0.1	0	Negligible
R12	15.7	15.7	<0.1	0	Negligible
R13	13.7	13.7	<0.1	0	Negligible
R14	13.8	13.8	<0.1	0	Negligible
R15	15.0	15.0	<0.1	0	Negligible
R16	14.7	14.8	<0.1	0	Negligible
R17	13.9	14.0	+0.1	0	Negligible
R18	13.8	13.9	+0.1	0	Negligible
R19	15.6	15.7	+0.1	0	Negligible

Receptor	Predicted PM_{10} Concentration ($\mu g.m^{-3}$)				
	Scenario 3: 2026 Opening Year Without Development ($\mu g.m^{-3}$)	Scenario 4: 2026 Opening Year With Development ($\mu g.m^{-3}$)	Concentration Change* ($\mu g.m^{-3}$)	Change in Concentration Relative to Air Quality Assessment Level (%)	Impact
R20	16.4	16.4	<0.1	0	Negligible
R21	17.5	17.6	+0.1	0	Negligible
R22	16.5	16.6	<0.1	0	Negligible
R23	16.4	16.5	<0.1	0	Negligible
R24	16.4	16.4	<0.1	0	Negligible
R25	16.1	16.1	<0.1	0	Negligible
R26	14.5	14.5	<0.1	0	Negligible
R27	15.1	15.1	<0.1	0	Negligible
R28	15.7	15.7	<0.1	0	Negligible
R29	15.7	15.7	<0.1	0	Negligible
R30	13.8	13.9	<0.1	0	Negligible
R31	14.0	14.0	<0.1	0	Negligible
R32	15.0	15.0	<0.1	0	Negligible
R33	15.0	15.0	<0.1	0	Negligible
R34	14.7	14.8	<0.1	0	Negligible
R35	15.1	15.2	<0.1	0	Negligible
R36	15.1	15.2	<0.1	0	Negligible
R37	14.9	14.9	<0.1	0	Negligible
R38	16.7	16.7	+0.1	0	Negligible

** Discrepancies in changes due to rounding effects, short term receptors are in italics*

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

Receptor	Predicted $PM_{2.5}$ Concentration ($\mu g.m^{-3}$)				
	Scenario 3: 2026 Opening Year Without Development ($\mu g.m^{-3}$)	Scenario 4: 2026 Opening Year With Development ($\mu g.m^{-3}$)	Concentration Change* ($\mu g.m^{-3}$)	Change in Concentration Relative to Air Quality Assessment Level (%)	Impact
R1	9.2	9.2	<0.1	0	Negligible
R2	9.3	9.3	<0.1	0	Negligible
R3	9.2	9.2	<0.1	0	Negligible
R4	9.4	9.5	+0.1	0	Negligible
R5	9.4	9.5	+0.1	0	Negligible
R6	9.4	9.5	+0.1	0	Negligible
R7	9.6	9.6	<0.1	0	Negligible
R8	9.5	9.5	<0.1	0	Negligible
R9	9.3	9.4	<0.1	0	Negligible
R10	9.4	9.5	<0.1	0	Negligible
R11	10.5	10.5	<0.1	0	Negligible
R12	10.3	10.3	<0.1	0	Negligible
R13	9.2	9.2	<0.1	0	Negligible
R14	9.3	9.3	<0.1	0	Negligible
R15	10.1	10.1	<0.1	0	Negligible
R16	9.9	9.9	<0.1	0	Negligible
R17	9.4	9.4	<0.1	0	Negligible
R18	9.3	9.4	<0.1	0	Negligible
R19	10.4	10.4	<0.1	0	Negligible

Receptor	Predicted $PM_{2.5}$ Concentration ($\mu g.m^{-3}$)				
	Scenario 3: 2026 Opening Year Without Development ($\mu g.m^{-3}$)	Scenario 4: 2026 Opening Year With Development ($\mu g.m^{-3}$)	Concentration Change* ($\mu g.m^{-3}$)	Change in Concentration Relative to Air Quality Assessment Level (%)	Impact
R20	11.0	11.0	<0.1	0	Negligible
R21	11.6	11.6	<0.1	0	Negligible
R22	11.0	11.0	<0.1	0	Negligible
R23	11.0	11.0	<0.1	0	Negligible
R24	10.7	10.7	<0.1	0	Negligible
R25	10.6	10.6	<0.1	0	Negligible
R26	9.7	9.7	<0.1	0	Negligible
R27	10.3	10.3	<0.1	0	Negligible
R28	10.6	10.6	<0.1	0	Negligible
R29	10.6	10.6	<0.1	0	Negligible
R30	9.3	9.3	<0.1	0	Negligible
R31	9.4	9.4	<0.1	0	Negligible
R32	9.9	9.9	<0.1	0	Negligible
R33	9.9	9.9	<0.1	0	Negligible
R34	9.9	9.9	<0.1	0	Negligible
R35	10.1	10.1	<0.1	0	Negligible
R36	10.2	10.2	<0.1	0	Negligible
R37	10.0	10.0	<0.1	0	Negligible
R38	11.2	11.2	<0.1	0	Negligible

** Discrepancies in changes due to rounding effects, short term receptors are in italics*

6.7 Annual mean NO_2, PM_{10}, and $PM_{2.5}$ concentrations were predicted to be below the current annual mean objectives for England at all receptor locations, in both Scenario 3 and Scenario 4. Annual mean $PM_{2.5}$ concentrations were also predicted to be below the future annual mean interim target of 12µg.m^{-3} to be achieved by 2028 in both scenarios. Annual mean $PM_{2.5}$ concentrations were predicted to be below the future annual mean objective of 10µg.m^{-3} to be achieved by 2040 at all receptors except:

- R11, R12, R15, R19, R20-R25, R27-R29, R35, R36 and R38 in Scenario 3; and
- R11, R12, R15, R19, R20-R25, R27-R29, R35, R36 and R38 in Scenario 4.

6.8 The proposed development does not lead to any exceedances of the current or future air quality objectives, including receptors located within nearby AQMAs. Additionally, the background $PM_{2.5}$ concentrations for these receptors, as listed in **Table 4.3** are predicted to be close to or exceeding 10 µg.m^{-3}.

6.9 In accordance with the IAQM and EPIC (previously EPUK) guidance[18], the impacts are considered to be 'negligible' at all modelled receptor locations.

6.10 With regard to the short term air quality objectives for NO_2 and PM_{10}, the predicted annual mean NO_2 concentrations are less than 60µg.m^{-3} and therefore in accordance with Defra guidance[15] it may be assumed that exceedances of 1-hour mean objective unlikely. The calculation detailed in **Table 3.1** was used to determine potential exceedance of the 24-hour PM_{10} short term objective; no exceedances were predicted.

Impact Significance Summary

6.11 Relevant guidance, legislation and professional judgement was utilised to determine the significance of the findings of the air quality assessment. The air quality assessment was supervised by a full member of the Institute of Air Quality Management. A summary of the impact significance and justification of this are provided below.

6.12 The impact of the proposed development on air quality is considered to be 'not significant':

- Consideration was given to local planning policy[14] and the development proposals are considered to be in accordance with this policy with regard to air quality.
- Existing concentrations of NO_2, PM_{10} and $PM_{2.5}$ in the study area are predicted to be below the current relevant annual mean air quality objectives for England.
- The air quality assessment undertaken utilised robust model inputs including slowing traffic speeds at junctions, appropriate meteorological data, and surface roughness.
- The impact of development-generated road traffic on with regard to the current relevant air quality objectives is defined as 'negligible' in accordance with IAQM and EPIC (previously EPUK) guidance[18].

Site Suitability Assessment

6.13 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ were predicted across the Site for Scenario 4: 2026 Opening Year with development. Predicted pollutant concentrations are detailed in **Figure 6.1** to **Figure 6.3.**

6.14 As the Site lies between two Defra background mapping[22] grid squares, the highest 2026 background concentrations within the Site were applied for NO_2, PM_{10} and $PM_{2.5}$. This is considered to be a robust approach whereby the total pollutant concentrations predicted across the Site will be greatest.

6.15 The predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations for Scenario 4: 2026 Opening Year with development, indicate that pollutant concentrations at the proposed residential development will be below the current relevant air quality objectives in 2026 with the development in place.

6.16 Predicted annual mean $PM_{2.5}$ concentrations indicate that where proposed receptor locations are within the Site, there are no exceedances of the 2028 interim target of 12µg.m^{-3} or the 2040 future annual mean air quality objective of 10µg.m^{-3} in 2026.

6.17 With regard to short term air quality objectives for NO_2 and PM_{10} at the Site, the predicted annual mean NO_2 concentrations are less than 60µg.m^{-3} and therefore in accordance with Defra guidance[15] it may be assumed that exceedance of the 1-hour mean NO_2 objective are unlikely. The calculation detailed in **Table 3.1** was used to determine potential exceedance of the 24-hour PM_{10} short term objective; no exceedances were predicted.

Development Measures

6.18 The proposed development is not predicted to have a significant impact on air quality and therefore mitigation measures are not required to minimise air quality impacts. However, measures included within the development which may be beneficial to local air quality include dedicated provision for pedestrians and cyclists and Electric Vehicle (EV) charging points.

Figure 6.1: Predicted Annual Mean NO_2 Concentrations Across the Site

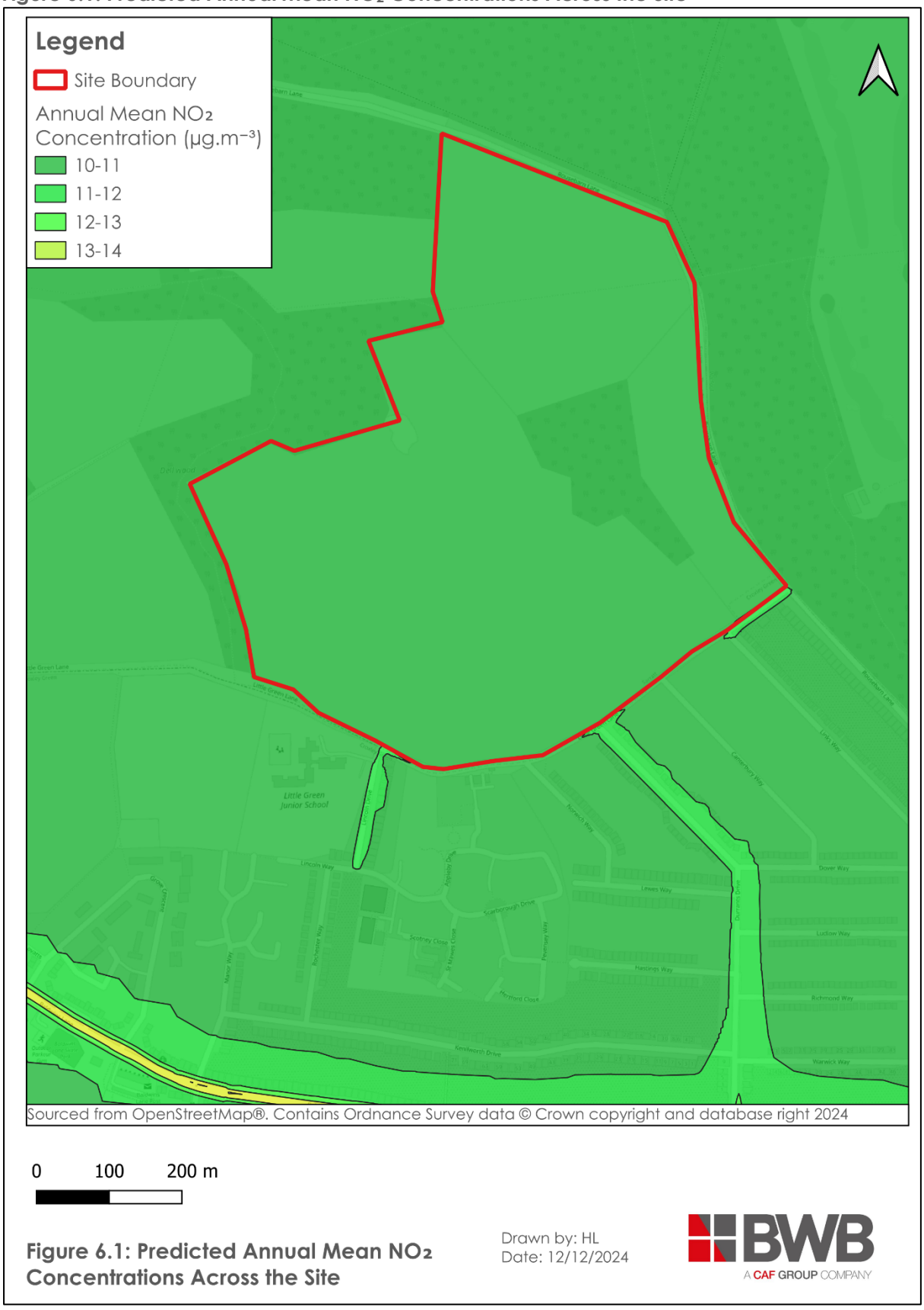

Figure 6.1: Predicted Annual Mean NO_2 Concentrations Across the Site

Drawn by: HL
Date: 12/12/2024

BWB
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Figure 6.2: Predicted Annual Mean PM_{10} Concentrations Across the Site

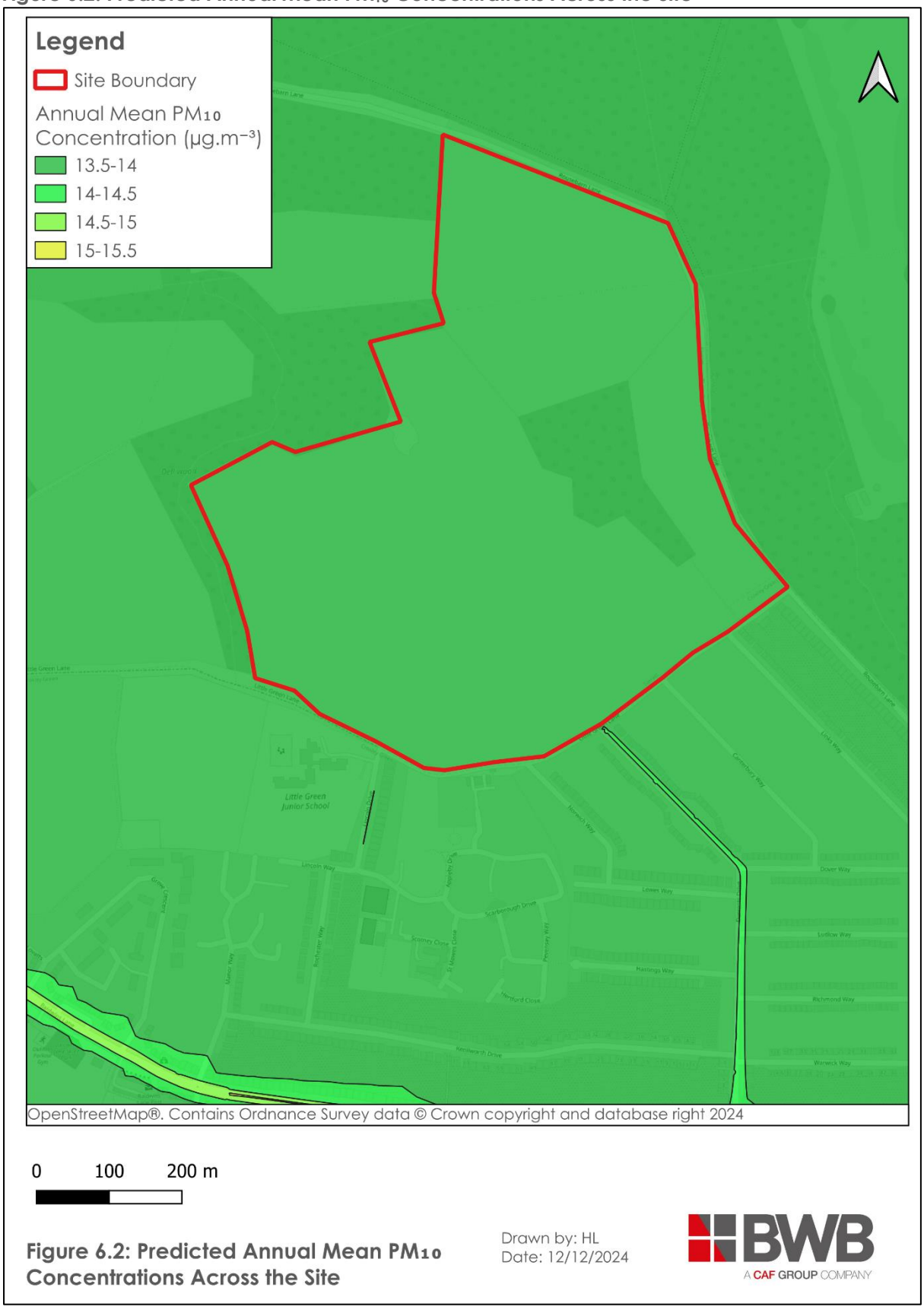

Figure 6.2: Predicted Annual Mean PM_{10} Concentrations Across the Site

Drawn by: HL
Date: 12/12/2024

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

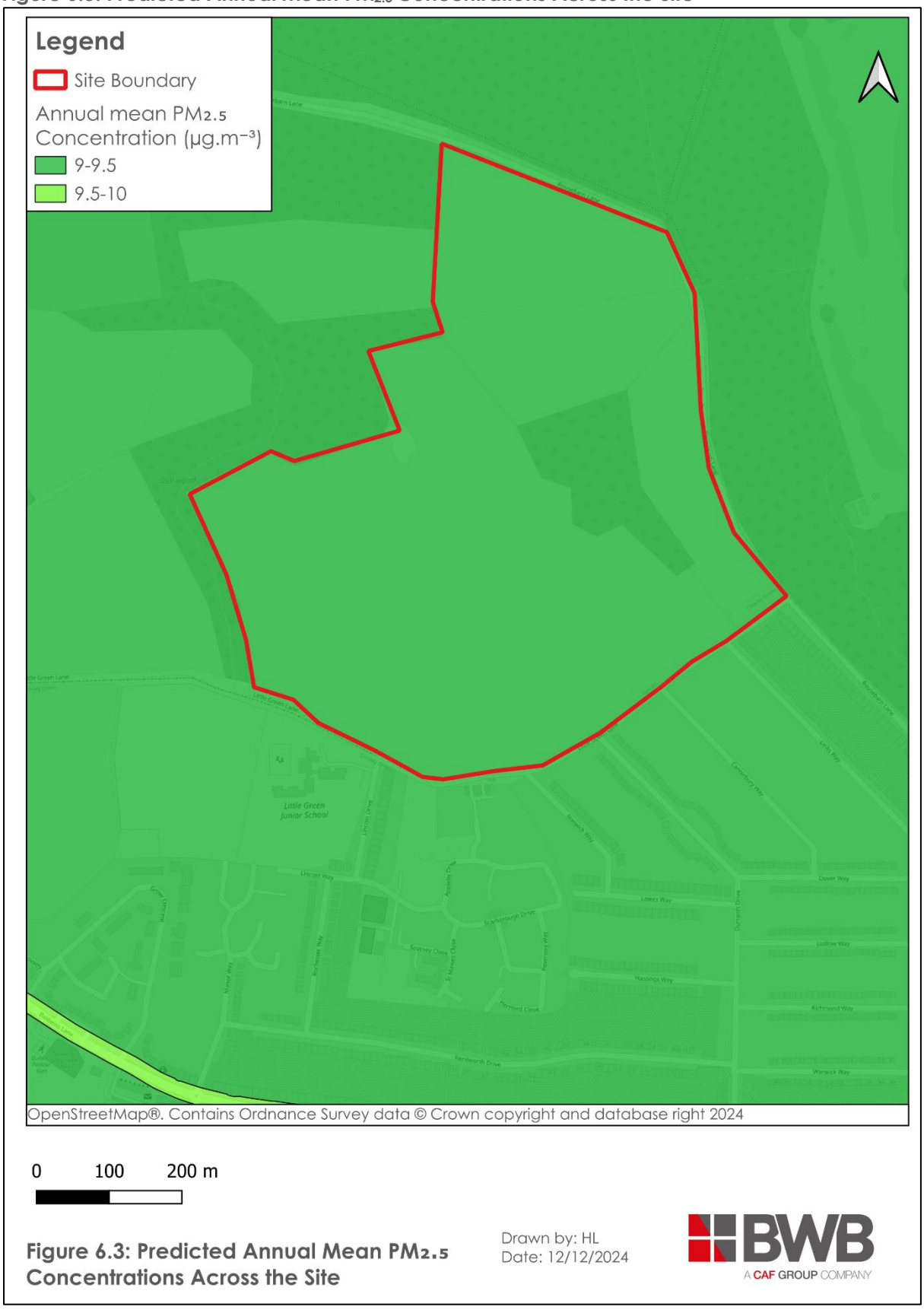

Figure 6.3: Predicted Annual Mean $PM_{2.5}$ Concentrations Across the Site

Drawn by: HL
Date: 12/12/2024

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Defra $PM_{2.5}$ Targets: Interim Planning Guidance

6.19 Defra is developing new guidance which will require planning applications will reduce population exposure to $PM_{2.5}$ from design stage. Consideration to the interim planning guidance[16], 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}. 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 schools and care homes 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'.
- When considering the design of the Site, the proposed primary school is set back from any major roads and is not expected to experience concentrations exceeding the 2040 future objective of 10µg.m^{-3}.

6.20 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 led mixed-use development at land north of Little Green Lane, Croxley Green.

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 guidance[17].

7.3 A detailed road traffic emissions assessment was undertaken to consider the impact of development-generated road traffic 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 NO_2, PM_{10} 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[15]. The development was not predicted to result in any new exceedances of the current 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) guidance[18].

7.4 Pollutant concentrations were also predicted across the Site. Concentrations of NO_2, PM_{10} and $PM_{2.5}$ were all predicted to be below the current 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 may be considered beneficial to air quality include provision for cyclists and pedestrians and EV charging points.

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.
NOx	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 ($\mu g.m^{-3}$)	A measure of concentration in terms of mass per unit volume. A concentration of $1\mu g.m^{-3}$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.

APPENDIX B: ILLUSTRATIVE MASTERPLAN

KEY

- SITE LOCATION
- PUBLIC OPEN SPACE AND AMENITY SPACE
- HARD LANDSCAPE FEATURE SQUARES/ FOCAL SPACES WITH PEDESTRIAN/CYCLE PRIORITY
- EXISTING TREES
- NEW TREE PLANTING
- WILDFLOWER / LONG GRASS
- COMMUNITY ORCHARD
- AREA FOR PLAY
- SUSTAINABLE DRAINAGE
- TRIM TRAIL ROUTE (2KM)
- PROPOSED NATIVE THICKET PLANTING
- PROPOSED ORNAMENTAL SHRUBS
- PROPOSED HEDGEROW
- SWALE
- MOWN PATHS
- PROPOSED SHARED PEDESTRIAN / CYCLE WAY ALONG CANTERBURY ROAD

KEY PRINCIPLES

1. PROPOSED DEVELOPMENT ACCESS VIA DURRANTS DRIVE AND LINKS WAY,
2. PRIMARY STREET AND BUS ROUTE,
3. FOCAL SPACE WITH AREAS OF LANDSCAPING, PLAY AND RECREATION,
4. ACTIVE TRAVEL ROUTES, TRIM/FITNESS TRAIL
5. PEDESTRIAN ROUTES PROVIDING ACCESS TO ALL AREAS OF PUBLIC OPEN SPACE,
6. RETENTION AND BUFFER TO THE ANCIENT WOODLAND AND EXISTING VEGETATION,
7. PROPOSED NATIVE WOODLAND PLANTING TO BUFFER ROUSEBARN LANE AND ANCIENT WOODLANDS,
8. NEW LANDSCAPE AND RETAINED HEDGEROW TO THE PERIMETER OF DEVELOPMENT,
9. WILDFLOWER PLANTING AND NEUTRAL GRASSLANDS PROMOTING BIODIVERSITY AND HABITAT CREATION,
10. WETLAND FEATURES WITH ASSOCIATED BANKSIDE AND AQUATIC VEGETATION,
11. COMMUNITY SPACE,
12. AREAS OF EQUIPPED PLAY AND RECREATION FOR OLDER CHILDREN/TEENAGERS,
13. LOCAL PLAY AND NATURAL PLAY FOR YOUNGER CHILDREN,
14. DWELLINGS OVERLOOKING NEWLY CREATED AREAS OF PUBLIC OPEN SPACE,
15. VIEW CORRIDOR TO DURRANTS HOUSE
16. BUS GATE.

N

0 25 50 m

REV C : UPDATED GRAPHICS TO CL COMMENTS. SB/SE (05.12.24)
REV B : UPDATED TO REV F TESTING LAYOUT. SB/SE (04.12.24)
REV A : UPDATED TO REV E TESTING LAYOUT. SB/SE (02.12.24)

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CROXLEY GREEN - ILLUSTRATIVE MASTERPLAN

| PEGASUSGROUP.CO.UK | TEAM/DRAWN BY: SB/SE | APPROVED BY: JW | DATE: 18.09.24 | SCALE: 1:1250 @ A0 | DRWG: P24-1200_DE_021_01C | CLIENT: RICHBOROUGH |

PEGASUS GROUP

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 Directive[1] sets limits for ambient concentrations of air pollutants including nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$). The air quality standards and objectives are prescribed through the Air Quality (England) Regulations 2000[2], as amended, for the purpose of the Local Air Quality Management Framework. The Air Quality (England) Regulations were amended in 2002[5] and again in 2010[6], with miscellaneous amendments added in 2020[10] following the UK exit from the EU. Additionally, an updated $PM_{2.5}$ objective was published in 2023[9] with an interim target to be achieved by 2028[23].

C.2 The UK Government are required under the Environment Act 1995[3] to produce a national Air Quality Strategy (AQS). The AQS was first published in 1997[7] and was most recently reviewed and updated in 2007[8] and most recently reviewed and updated in 2023[9]. 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 2021[4] was granted Royal Assent in November 2021 and contains amendments to Part IV of the Environment Act 1995[3] with regard to the Local Air Quality Management regime. Under the Environment Act 2021[4], 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 2021[4] 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 Act[3] 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 (AQMAs). 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)[12] was amended in December 2024 and sets out the Government's planning policies for England and how these are expected to be applied.

C.6 The NPPF[12] recognises air quality within Section 15: Conserving and enhancing the natural environment, and states that:

> *"187. 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

[…]

198. 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.

[…]

1.99 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 NPPF[12] states:

"198. 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 quality[13] 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 PPG[13] 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 PPG[13] 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 PPG[13] 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".*

C.12 The PPG[13] 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 PPG[13] 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

Three Rivers District Council, Core Strategy

C.14 TRDC adopted their Core Strategy[14] (previously named the Local Development Framework Core Strategy) in 2017. The Core Strategy is a strategic document with sets out measures to promote sustainable development within the Three Rivers District. The document contains the below policy relevant to air quality:

"*CP1 Overarching Policy on Sustainable Development*

All development in Three Rivers will contribute to the sustainability of the District. This means taking into account the need to:

[…]

o) Manage and reduce risk of and from pollution in relation to quality of land, air and water and dealing with land contamination.

[…]"

C.15 The above policy was taken into consideration throughout the undertaking of the assessment.

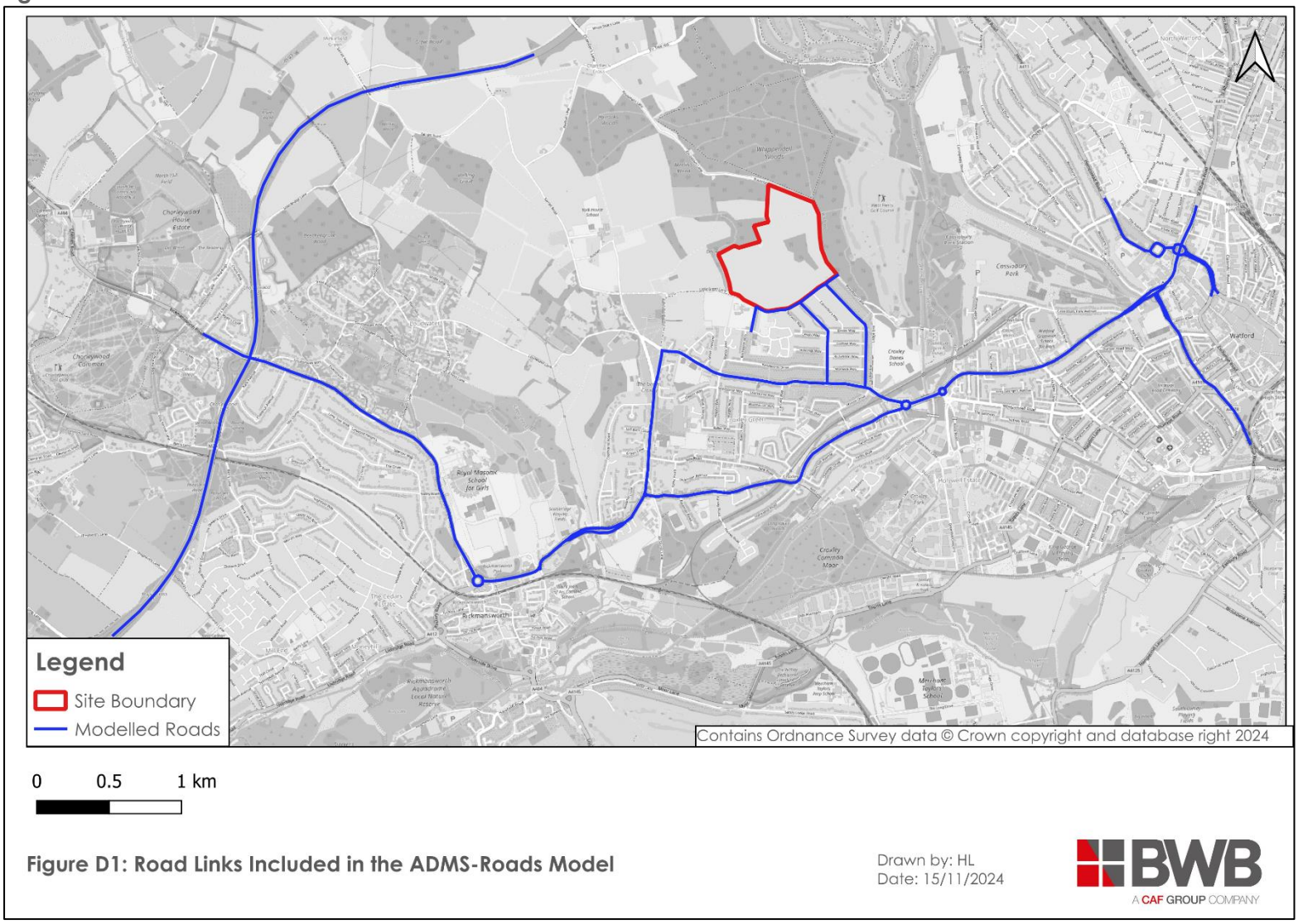
APPENDIX D: TRAFFIC DATA UTILISED IN THE AIR QUALITY ASSESSMENT

Road Link	Speed (Km.hr^{-1})		Scenario 1: 2022 Verification Year		Scenario 2: 2024 Base Year		Scenario 3: 2026 Opening Year Without Development		Scenario 4: 2026 Opening Year With Development	
	LDV	HDV	24 hour AADT Total Flow	HDV AADT Flow	24 hour AADT Total Flow	HDV AADT Flow	24 hour AADT Total Flow	HDV AADT Flow	24 hour AADT Total Flow	HDV AADT Flow
M25 Motorway	112	96	12,8118	15,374	129,296	15,516	132,055	15,847	13,2055	15,847
A404 Chorleywood Road	64	64	8,225	329	8,301	332	8,568	360	8,871	355
A412 Park Road	48	48	20,379	204	20,567	206	21,021	214	21,319	213
A412 Watford Road	48	48	20,379	204	20,567	206	21,021	212	21,117	211
Baldwins Lane	42	42	7,340	73	7,340	73	7,757	98	9,183	92
A412 Rickmansworth Road	48	48	20,379	204	20,567	206	21,021	215	21,370	214
A4178 Cassio Road	48	48	13,425	134	13,549	135	13,896	139	13,896	139
A4178 Cassio Road	48	48	8,981	90	9,064	91	9,342	93	9,342	93
A4178 Wiggenhall Road	48	48	19,580	2,545	19,760	2,569	20,202	2,629	20,219	2,629
A412 Rickmansworth Road	48	48	30,561	306	30,842	308	31,454	319	31,802	318
A411 Beechen Grove	48	48	27,586	276	27,840	278	28,406	286	28,513	285
A412 St Albans Road	48	48	19,666	197	19,847	198	20,291	203	20,325	203
A411 Hempstead Road	48	48	20,485	410	20,673	413	21,130	423	21,130	423
M25 Hunton Cross Spur	112	96	26,498	1,060	26,742	1,070	27,151	1,088	27,179	1,087
A41 North Western Avenue	96	96	27,563	827	27,817	835	28,383	851	28,383	851

Road Link	Speed (Km.hr^{-1})		Scenario 1: 2022 Verification Year		Scenario 2: 2024 Base Year		Scenario 3: 2026 Opening Year Without Development		Scenario 4: 2026 Opening Year With Development	
	LDV	HDV	24 hour AADT Total Flow	HDV AADT Flow	24 hour AADT Total Flow	HDV AADT Flow	24 hour AADT Total Flow	HDV AADT Flow	24 hour AADT Total Flow	HDV AADT Flow
A41 Colne Way	80	80	16,368	818	16,518	826	16,911	848	16,939	847
Durrants Drive	36	36	407	6	411	6	411	31	1,711	24
Canterbury Way	48	48	251	8	253	8	253	8	253	8
Links Way	41	41	1,055	16	1,065	16	1,065	43	2,365	35
Little Green Lane	33	33	508	4	513	4	513	4	513	4
Little Green Lane	34	34	429	3	433	3	433	3	433	3
Lincoln Drive	34	34	794	24	801	24	801	24	801	24
Baldwins Lane (W)	42	42	5,774	172	5,827	175	6,221	247	7,647	229
The Green	49	49	7,627	151	7,697	154	8,540	183	8,966	179

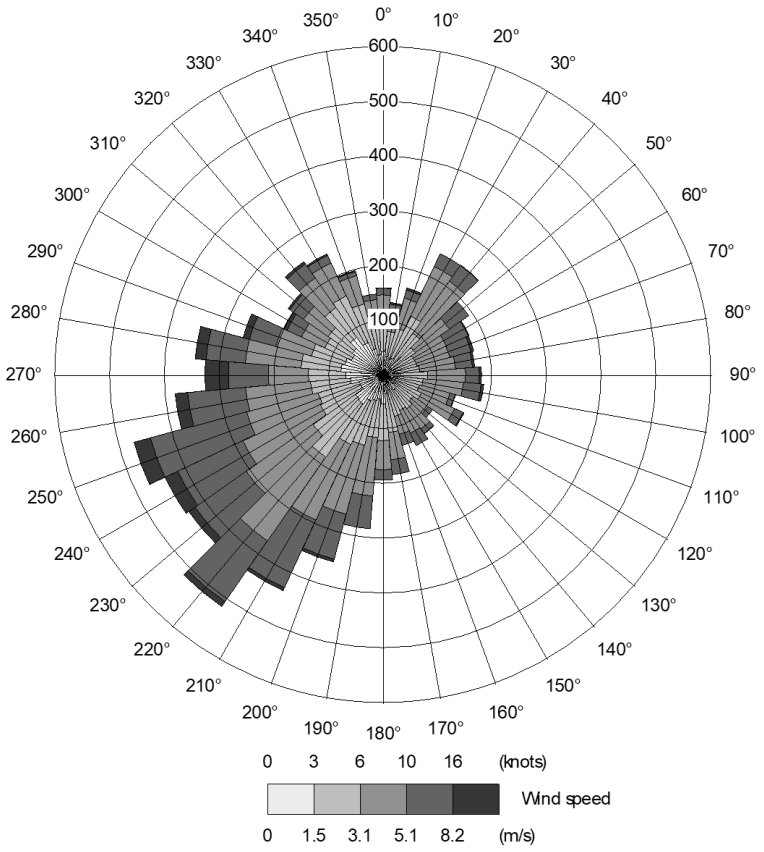
D.1 An illustration of the road links included in the ADMS-Roads model is provided in **Figure D1.**

Figure D1: Road Links Included in the ADMS-Roads Model



APPENDIX E: WIND ROSE FOR 2022 FOR NORTHOLT METEOROLOGICAL RECORDING STATION

E.1 Meteorological data for 2022 Verification Year scenario for the Northolt recording station was obtained for use in the air dispersion modelling assessment. The wind rose for 2022 is detailed below and illustrates a predominant wind direction from the southwest.



APPENDIX F: MODEL VERIFICATION

F.1 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 Defra[15]. 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.2 The model was run for Scenario 1: 2022 Verification Year to predict the 2022 annual mean road contributions of NOx at the monitoring locations in the study area. The model NOx outputs at these locations were compared to the 2022 monitored concentrations to provide adjustment factors. At the time of assessment, 2023 data were not available, therefore 2022 data were utilised for model verification. **Table F1** presents the verification process for NOx. **Figure F1** detailed the monitoring locations utilised in the model verification.

F.3 Monitoring locations WF64, WF1, WF46a, WF46b, WF46c and WF59 were utilised in the NOx model verification process. These locations were considered to be representative of the Site and study area due to their proximity to assessed roads.

F.4 TR24, TR25, TR26, and the triplicate monitoring locations S1, S2, S3 and S4, S5, S6 are all classified as kerbside diffusion tubes. As per the Defra guidance[15], kerbside locations are not typically suitable for model verification and have therefore been excluded from the NOx verification process.

F.5 Monitoring of PM_{10} and $PM_{2.5}$ is undertaken at the automatic station WF1, however it was not utilised in the verification process. PM_{10} and $PM_{2.5}$ monitoring data was compared to Defra background mapping data[22]. Upon review, the monitoring data was lower than that of Defra background mapping data, therefore the model verification for PM_{10} and $PM_{2.5}$ was not feasible. The adjustment factor calculated during the NO_x verification process was therefore utilised to adjust predicted concentrations of PM_{10} and $PM_{2.5}$.

Table F1: NOx Verification Process

Model Verification Steps	WF64	WF1	WF46a	WF46b	WF46c	WF59
2022 monitored total NO_2 ($\mu g.m^{-3}$)	25.2	21.0	20.7	19.8	21.2	24.8
2022 background NO_2 concentration ($\mu g.m^{-3}$)	13.8	18.1	18.1	18.1	18.1	18.1
Monitored road contribution NOx ($\mu g.m^{-3}$)	21.9	5.4	4.9	3.2	5.8	12.8
Modelled road contribution NOx ($\mu g.m^{-3}$)	7.3	6.6	6.0	6.0	6.0	5.3
Ratio of monitored road NOx to modelled road NOx	3.0	0.8	0.8	0.5	1.0	2.4
Adjustment factor for modelled road contribution NOx	1.492					
Adjusted modelled road contribution NOx ($\mu g.m^{-3}$)	10.9	9.9	8.9	8.9	8.9	7.9

Model Verification Steps	WF64	WF1	WF46 a	WF46 b	WF46 c	WF59
Modelled total NO_2 concentration ($\mu g.m^{-3}$)	19.6	23.3	22.8	22.8	22.8	22.3
Monitored total NO_2 concentration ($\mu g.m^{-3}$)	25.2	21.0	20.7	19.8	21.2	22.3
% difference between modelled and monitored total NO_2 concentration	-22.1	11.0	10.1	15.2	7.5	-10.2
RMSE % (should be less than 25% and ideally less than 10%)	7.8					

Road-NOx component, determined from NOx to NO_2 calculator

F.6 A road-NOx factor of **1.492** 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-NOx concentration at each receptor, before conversion to NO_2 concentrations using the NOx to NO_2 calculator provided by Defra[15].

F.7 The RMSE calculated for the verification was 7.8%. This is well within the recommended guideline variance as suggested by the Defra guidance[15]. Model performance is therefore considered to be good.

Figure F1: Monitoring Locations Utilised in the ADMS-Roads Model Verification Process

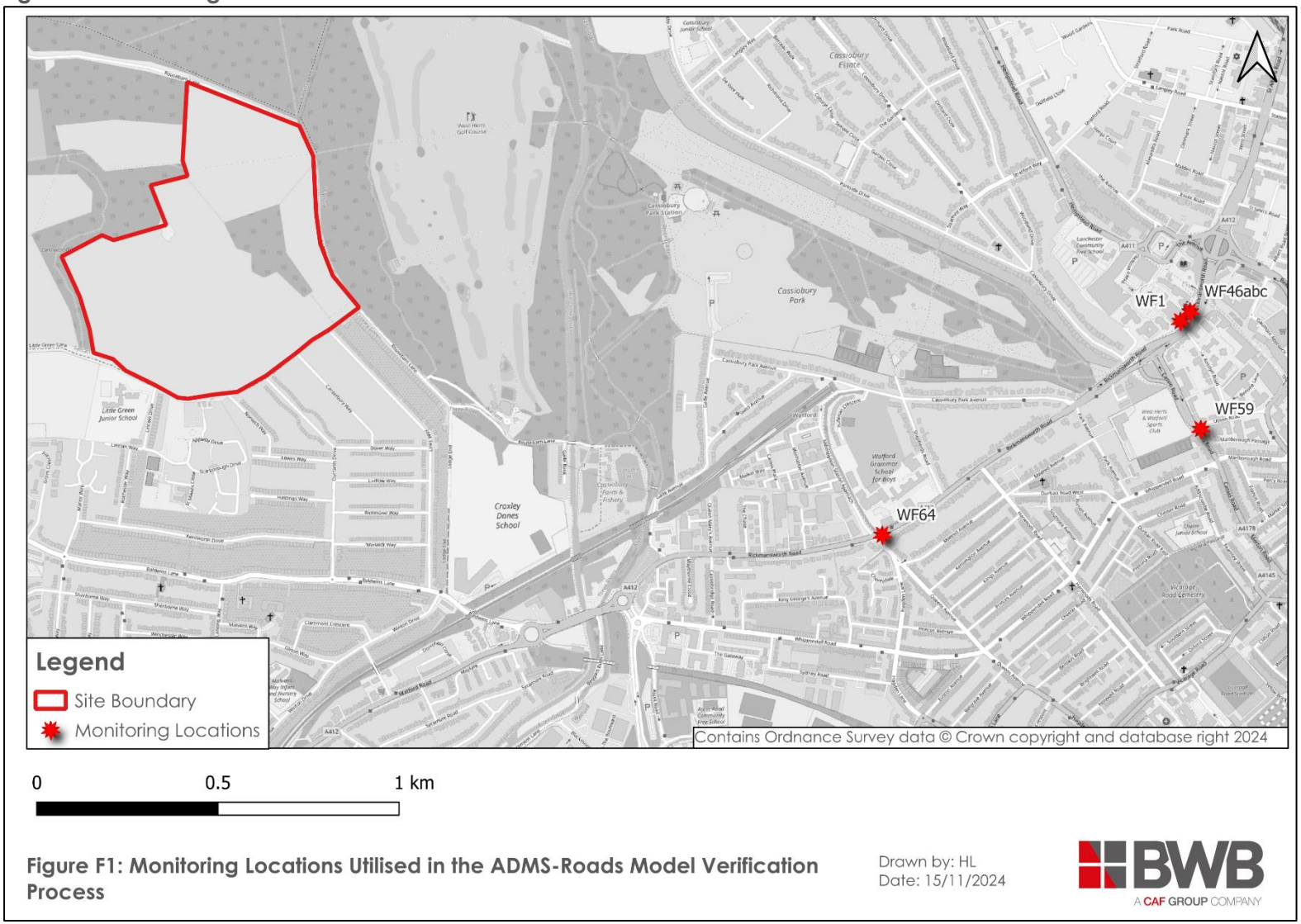


Figure F1: Monitoring Locations Utilised in the ADMS-Roads Model Verification Process

Drawn by: HL
Date: 15/11/2024

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