wardell-armstrong.com

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

GLADMAN DEVELOPMENTS LIMITED

LAND OFF HENTHORN ROAD, CLITHEROE

AIR QUALITY ASSESSMENT

DECEMBER 2025

wardell armstrong | PART OF SLR

Wardell Armstrong (part of SLR)
41-50 Futura Park, Aspinall Way, Middlebrook, Bolton, BL6 6SU
Telephone: +44 (0)1204 227 227 www.wardell-armstrong.com

DATE ISSUED:	**8th December 2025**
JOB NUMBER:	**GM13551**
REPORT NUMBER:	**001**
VERSION:	**V0.2**
STATUS:	**FINAL**

GLADMAN DEVELOPMENTS LTD

LAND OFF HENTHORN ROAD, CLITHEROE

AIR QUALITY ASSESSMENT

DECEMBER 2025

PREPARED BY:

p.p A Scarpa Environmental Scientist (Air Quality)

p.p H Fleming Environmental Scientist (Air Quality)

APPROVED BY:

M T Walton Technical Director

CONTENTS

APPENDICES

DRAWINGS	TITLE	SCALE
GM13551-001	Existing and Proposed Sensitive Receptor Locations	1:8,000

EXECUTIVE SUMMARY

A detailed air quality assessment, based on the potential impacts associated with a proposed residential development on land off Henthorn Road, Clitheroe, has been conducted using the atmospheric dispersion model, ADMS. The proposed development consists of up to 115 residential dwellings and associated infrastructure.

The assessment has considered dust and particulate matter during the construction phase, and road traffic emissions during the operational phase.

During the construction phase, the risk of dust soiling effects is classed as medium for earthworks and is classed as high for construction, and trackout; the risk of human health effects is classed as low for earthworks, construction and trackout. Mitigation measures have been proposed to further reduce any potential impacts based on best practice guidance.

For the operational phase assessment, annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations have been modelled at nineteen existing and two proposed receptor locations. Predicted annual mean concentrations have been compared to the relevant air quality objectives and target level.

The operational phase assessment has concluded that the development will result in concentrations of NO_2, PM_{10} and $PM_{2.5}$ remaining below the air quality objectives/target values, both without and with the development for the proposed 2030 Opening/Future Year. The impact of the development is predicted to be negligible at all nineteen existing sensitive receptors and two proposed receptors that were assessed. Air quality effects are therefore considered to be 'not significant'.

The assessment has demonstrated that the Proposed Development will not lead to an unacceptable risk from air pollution, or to any breach in national objectives. Therefore, there are no material reasons in relation to air quality why the proposed scheme should not proceed, subject to appropriate planning conditions.

1 INTRODUCTION

1.1 Background

1.1.1 Wardell Armstrong LLP (WA) has been commissioned by Gladman Developments Ltd to undertake an air quality assessment to accompany a planning application for a proposed residential development at land off Henthorn Road, Clitheroe.

1.1.2 The proposed development site is located to the southwest of Clitheroe, Lancashire, and comprises fields that are to the northwest and to the southeast of Henthorn Road. The site is a south-westerly extension of residential development in Clitheroe and is currently open agricultural land. The Clitheroe Waste water Treatment Works (WwTW) is located approximately 135m south of the site. The potential for odour impact from the WwTW is considered in a separate odour assessment report completed by Wardell Armstrong (REF: GM13551/002).

1.1.3 From the information provided, it is understood that the proposals comprise a residential development for up to 115 residential dwellings and associated infrastructure, over an area of 6.96ha.

1.1.4 This report details the results of the air quality assessment undertaken to accompany a planning application for the proposed development. The report discusses the potential dust and particulate matter impacts associated with the construction phase, and an assessment of the potential air quality impacts of the additional road traffic generated by the proposed development.

1.1.5 Air pollutant concentrations are considered at existing sensitive receptor locations in the vicinity of the proposed development, and at two proposed receptor locations within the development site itself.

2 LEGISLATION AND POLICY CONTEXT

2.1 Relevant Air Quality Legislation and Guidance

2.1.1 The air quality assessment has been undertaken in accordance with the following legislation and guidance:

- The Environment Act 1995, amended in 2021;
- Department of Environment, Food and Rural Affairs, The Air Quality Strategy for England, August 2023;
- The Air Quality Standards Regulations 2010;
- Department for Environment, Food and Rural Affairs, Local Air Quality Management Technical Guidance LAQM.TG(22), August 2022;
- The Institute of Air Quality Management (IAQM), Guidance on the Assessment of Dust from Demolition and Construction, January 2024;
- Ministry of Housing, Communities and Local Government, National Planning Policy Framework, December 2024, with a minor text update in February 2025; and
- Department for Communities and Local Government, Planning Practice Guidance: Air Quality, November 2019.

2.1.2 Further details of these documents are included in **Appendix A**.

2.2 Assessment Criteria

2.2.1 The relevant air quality objectives and limit values for this assessment are included within Table 1.

Table 1: Air Quality Objectives and Limit Values Relevant to the Assessment*

Pollutant	Objective/Limit Value	Averaging Period	Obligation
Nitrogen Dioxide (NO_2)	200µg/m^3, not to be exceeded more than 18 times a year	1-hour mean	All local authorities
	40µg/m^3	Annual mean	All local authorities
Particulate Matter (PM_{10})	50µg/m^3, not to be exceeded more than 35 times a year	24-hour mean	England, Wales and Northern Ireland
	40µg/m^3	Annual mean	England, Wales and Northern Ireland
Particulate Matter ($PM_{2.5}$)	Limit Value of 20µg/m^3	Annual mean	England, Wales and Northern Ireland

Table 1: Air Quality Objectives and Limit Values Relevant to the Assessment*			
Pollutant	**Objective/Limit Value**	**Averaging Period**	**Obligation**
**In accordance with the Air Quality Standards Regulations 2010*			

2.2.2 Further details of where these objectives and limit values apply are detailed in **Appendix A**.

3 ASSESSMENT METHODOLOGY

3.1 Consultation and Scope of Assessment

3.1.1 The assessment methodology was discussed and agreed with Nicola Berry, Local Authority Officer at Ribble Valley Borough Council (RVBC), via email correspondence, on 22nd October 2024.

3.1.2 A summary of the consultation undertaken is provided in Table 2.

Table 2: Summary of Consultation

Assessment Stage	Proposed Method	Response
Construction phase assessment to consider dust and particulate matter (PM_{10})	Qualitative assessment in accordance with Institute of Air Quality Management (IAQM) guidance.	No objection to method
Operational phase assessment to consider nitrogen dioxide (NO_2) and fine particulate matter (PM_{10} and $PM_{2.5}$)	Detailed assessment using the ADMS-Roads atmospheric dispersion model, in accordance with Environmental Protection UK (EPUK)/IAQM guidance, and with all predicted concentrations compared to air quality objectives/limit values.	
	2023 meteorological data from NWP (Numerical Whether Prediction) data.	
	Background concentrations from 2018 - based DEFRA default maps and from the FVC owned Urban Background monitoring location DT1.	
	Assessment undertaken using EFT v12.1 emission factors.	
	Model verification using roadside diffusion tubes DT2, DT3, DT4 and DT5	

3.1.3 Since the consultation with Nicola Berry - Environmental Health Officer at RVBC took place, background concentrations supplied by DEFRA default maps was updated from 2018 – based to 2021- based. Therefore, background concentrations will be taken from the updated 2021 -based DEFRA default maps.

3.1.4 The methodology proposed in October 2024 included model verification using roadside diffusion tubes DT2, DT3, DT4, and DT5. Since the methodology was proposed, it was decided that DT6 would also be used as part of the model verification process. Although DT6 is not situated within the AQMA (REF: Whalley Road, Clitheroe (No 1)), it is situated 75 m to the south, on the same road as the AQMA (A671 - Whalley Road).

3.2 Construction Phase Assessment

3.2.1 To assess the impacts associated with dust and particulate matter releases during the construction phase of the development, an assessment has been undertaken in accordance with guidance from the Institute of Air Quality Management (IAQM)[1]. Further details of the construction assessment methodology are provided in **Appendix B**.

3.2.2 The closest sensitive human receptors to where construction phase activities will take place are mostly residential and are detailed in Table 3. However, it should be noted that the assessment includes consideration of all sensitive receptors within 250m of the site boundary, in accordance with IAQM guidance.

Table 3: Closest Existing Sensitive Receptors Considered in the Construction Phase Assessment

Receptor	Direction from the Site	Approximate Distance from the Site Boundary (m)
Siddows Hall off Henthorn Road	North	Immediately Adjacent
Existing Residential Dwellings off Ingleton Crescent	North East	Approximately 13m at closest point
Existing Residential Dwellings off Tintagel Way	East	Approximately 12m at closest point
Existing Residential Dwellings off Ludlow Road	South East	Approximately 12m at closest point
Clitheroe Wastewater Treatment Works	South	Approximately 135m at closest point
Existing Residential Dwellings off Henthorn Road	South West	Immediately Adjacent

3.2.3 There are no ecological receptors, or potentially dust sensitive statutory designated habitat sites, within 50m of the site and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 250m from the site entrance(s). Ecological effects do not therefore need to be considered within this assessment.

[1] Institute of Air Quality Management, Guidance on the Assessment of Dust from Demolition and Construction (v2.2), January 2024

3.2.4 The criteria used to assess the construction impact of the proposed development, and the associated significance of effects at existing sensitive receptors, are included in **Appendix B**.

3.3 Operational Phase Assessment

3.3.1 The air dispersion model ADMS-Roads (CERC, Version 5.0.1.3) has been used to assess the impacts associated with road traffic emissions during the operational phase assessment. The impacts have been assessed in accordance with guidance from Environmental Protection UK (EPUK) and the IAQM[2]. Further details of the modelling and assessment methodology are provided in **Appendix C**.

3.3.2 NO_2, PM_{10} and $PM_{2.5}$ concentrations have been predicted at existing and proposed sensitive receptors, as these are the pollutants considered most likely to exceed the objectives and limit value.

3.3.3 Air dispersion modelling has been carried out to estimate pollutant concentrations, due to road traffic emissions, for three assessment scenarios as follows:

- **Scenario 1:** 2023 Verification and Base Year, the most recent year for which traffic flow information, local monitored pollution data and meteorological data is available;
- **Scenario 2:** 2030 Opening/Future Year, without the proposed development in place; and
- **Scenario 3:** 2030 Opening/Future Year, with the proposed development in place.

3.3.4 Ashley Helme, the appointed transport consultant for the scheme, have confirmed that the future year scenarios above do not include traffic from any committed developments. However, traffic growth is applied to the future year data, and this also accounts for housing growth within the road network area.

3.3.5 The assessment was completed prior to the release of the latest Emissions Factor Toolkit (EFT 13.1), which was released in March 2025. The traffic data used in the assessment is based on a higher number of proposed dwellings (160 dwellings) and so, given this has now fallen to up to 115 dwellings, the assessment is considered to provide an over prediction of air quality impacts. For this reason, it is not considered

[2] Moorcroft and Barrowcliffe et al, Land-Use Planning and Development Control: Planning for Air Quality (v1.2), January 2017

necessary to update the assessment using EFT 13.1 as any predicted impacts will be lower than those predicted in this assessment.

Existing Sensitive Receptors

3.3.6 A number of representative existing sensitive receptors (identified as ESR 1 to ESR 19) have been selected for consideration in the air quality assessment. These have been chosen based on their sensitivity and their proximity to roads which will be affected by development generated traffic.

3.3.7 Details of these receptors considered are provided in Table 4, and their locations are shown on drawing GM13551-001.

Table 4: Existing Sensitive Receptors Considered in Operational Phase Assessment

Receptor	Address	Grid Reference		Receptor Type
		Easting	Northing	
ESR 1	2 Thorn Street	373803	441545	Residential
ESR 2	1 Henthorn Road	373827	441595	Residential
ESR 3	18 Lancaster Drive	373205	441512	Residential
ESR 4	10 Bawdlands	374004	441685	Residential
ESR 5	Old Toll House, Parsons Lane	374178	441765	Residential
ESR 6	Moor Lane	374262	441483	Residential
ESR 7	20 Woone Lane	374111	441398	Residential
ESR 8	7 Eshton Terrace	374070	441370	Residential
ESR 9*	43 Whalley Road	374240	441309	Residential
ESR 10*	51 Whalley Road	374222	441260	Residential
ESR 11	153 Henthorn Road	373206	440924	Residential
ESR 12	139 Whalley Road	374114	440978	Residential
ESR 13	9 Primrose Road	374005	440700	Residential
ESR 14	St James' Church of England Primary School, Greenacre Street	374196	441298	School
ESR 15	Edisford Primary School, Siddows Avenue	373414	441532	School

Table 4: Existing Sensitive Receptors Considered in Operational Phase Assessment				
Receptor	**Address**	**Grid Reference**		**Receptor Type**
		Easting	**Northing**	
ESR 16	128 Lowergate	374349	441628	Residential
ESR 17	24 Faraday Avenue	373646	441567	Residential
ESR 18	7 Seedall Avenue	373580	441350	Residential
ESR 19	16 Ingleton Crescent	372930	440738	Residential
**Situated within an Air Quality Management Area*				

3.3.8 The criteria used to assess the operational impact of the proposed development, and the associated significance of effects at existing sensitive receptors, are included in **Appendix C**.

Proposed Sensitive Receptors

3.3.9 A number of proposed sensitive receptors (referred to as PR 1 and PR 2) have been selected within the development site boundary. These receptors are considered to be representative of the proposed residential areas which will be closest to the main existing source(s) of pollution. In this case, the main source is considered to be vehicle emissions from Henthorn Road.

3.3.10 Pollutant concentrations at the proposed receptors have been predicted for scenario 3 only (as detailed in paragraph 3.3.3). It is only necessary to consider the 'with development' scenarios for the proposed receptors as they will not experience any 'without development' conditions. It is not therefore necessary to consider the changes in pollutant concentrations at the proposed receptors.

3.3.11 Details of the proposed sensitive receptors are provided in Table 5, and their locations are shown on drawing GM13551-001.

Table 5: Proposed Sensitive Receptors Considered in the Operational Phase Assessment			
Receptor Point	**Location**	**Grid Reference**	
		Easting	**Northing**
PR 1	Location considered to be representative of the closest proposed residential property to the south of Henthorn Road.	372960	440684

Table 5: Proposed Sensitive Receptors Considered in the Operational Phase Assessment			
Receptor Point	**Location**	**Grid Reference**	
		Easting	**Northing**
PR 2	Location considered to be representative of the closest proposed residential property to the north of Henthorn Road.	372910	440701

3.3.12 Pollutant concentrations associated with road traffic emissions are expected to be highest at lower floor levels, and therefore, each of the proposed receptors (i.e. PR 1 to PR 2) have been modelled at ground level (i.e. 1.5m).

3.3.13 The predicted concentrations at the proposed receptors have been assessed against the air quality objectives and limit values detailed in Table 1.

3.4 Limitations and Uncertainties

3.4.1 Air quality assessments make use of official sources of information (i.e. vehicle emission factors and background concentrations) which have historically been considered to be overly optimistic. Monitoring data collected by the UK Government and local authorities over the past few years has shown that annual mean NO_2 concentrations remained higher than previously expected (especially in roadside locations). This was widely thought to be due to the lower than expected decline in NO_x emissions from diesel vehicles (even as new Euro standards have been introduced), coupled with an overall increase in the number of diesel vehicles on the road.

3.4.2 The vehicle emission factors used in this assessment are from Defra's Emission Factor Toolkit (EFT v12.1)[3]. The assessment was completed prior to the release of the latest Emissions Factor Toolkit (EFT 13.1), which was released in March 2025. The traffic data used in the assessment is based on a higher number of proposed dwellings (160 dwellings) and so, given this has now fallen to up to 115 dwellings, the assessment is considered to provide an over prediction of air quality impacts. For this reason, it is not considered necessary to update the assessment using EFT 13.1 as any predicted impacts will be lower than those predicted in this assessment.

[3] Defra Local Air Quality Management webpages (https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html)

3.4.3 A position statement was produced by the IAQM in 2018 which dealt specifically with the use of EFT v8.0 and the consideration of uncertainties in predicting future air quality[4]. The statement concluded that the approaches for dealing with this uncertainty should be decided on a case-by-case basis, but may include the use of a sensitivity test (i.e. where it is assumed that NO_x emissions will not reduce as quickly over time as within the EFT).

3.4.4 A later study provided evidence that EFT v9.0 may be relied upon to predict the 'most likely' future emissions reductions, as long as model verification has been undertaken using monitored data from 2016 or later[5].

3.4.5 The IAQM has now withdrawn their 2018 position statement on the consideration of uncertainties in predicting future air quality[6]. A growing body of evidence suggests that the latest COPERT vehicle emission factors used in EFT v9.0 (and later) reflect real-world NO_x emissions more accurately. As a result, the IAQM judge that "an exclusively vehicle emissions-based sensitivity test is no longer necessary". This is provided that the assessment has been verified using monitoring data from 2016 or later.

3.4.6 A recent statement from the IAQM has been released[7] concerning the use of 2020 and 2021 datasets, and the appropriate base year scenario to use in air quality assessments when undertaking model verification. IAQM now recommend that when model verification is undertaken, either 2019 or 2022 (or later) should be used as the last typical pre and post pandemic years, to help "avoid introducing additional uncertainty to the results, and that any adjustment factor so derived is appropriate". Where traffic data is based on 2019 data or before, then it remains appropriate to use a 2019 base year (with associated 2019 monitoring data). However, where traffic data is based on 2022 onwards, then a 2022 onwards base year (and associated monitoring data) should be used for model verification purposes.

3.4.7 In accordance with Defra guidance, the air quality assessment has been carried out using EFT v12.1. As model verification has been undertaken, following the latest guidance from the IAQM, it is not considered necessary to carry out a sensitivity analysis and a 2023 base year has been considered in scenario 1, as agreed with Nicola

[4] Institute of Air Quality Management, Dealing with Uncertainty in Vehicle NO_x Emissions within Air Quality Assessments v1.1, July 2018
[5] Air Quality Consultants, Performance of Defra's Emission Factor Toolkit 2013 – 2019, February 2020
[6] Available on the Institute of Air Quality Management website (https://iaqm.co.uk/wp-content/uploads/2013/02/iaqm_uncertainty_vehicle_NOx_emission_withdrawn-02.pdf)
[7] Institute of Air Quality Management, Use of 2020 and 2021 Monitoring Datasets, v1.1, December 2023

Berry, Environmental Health Officer (Pollution) at Ribble Valley Borough Council (RVBC). Further information on the vehicle emission factors used in the assessment are provided in **Appendix C**.

3.4.8 Several steps have been taken to ensure the model is as accurate and representative as possible. These comprise:

- Consultation has been undertaken with RVBC to confirm their agreement with the methodology used within the assessment;
- Detailed traffic data has been obtained from the appointed transport consultant;
- Defra LAQM tools have been incorporated into the assessment;
- Meteorological data, obtained from a representative meteorological recording station, has been incorporated into the assessment;
- Road widths and the location of ESRs in relation to each road have been measured in detail to ensure greater accuracy within the model; and
- The nearby Council-operated diffusion tube monitoring locations (REF: DT2, DT3, DT4, DT5, and DT6) have been considered within the assessment to allow model verification to take place. Model verification factor(s) have been applied to NO_x concentrations, which are then input into the Defra NO_x to NO_2 calculator tool to predict total NO_2 concentrations at each receptor considered in the assessment.

4 BASELINE SITUATION

4.1 Ribble Valley Borough Council Local Air Quality Management

4.1.1 The proposed development site is located within the administrative area of Ribble Valley Borough Council (RVBC), which is responsible for the management of local air quality.

4.1.2 There is currently one AQMA declared within the RVBC, as a result of exceedances of the annual mean NO_2 objective:

- Whalley Road, Clitheroe No 1: An AQMA encompassing a section of Whalley Road.

4.1.3 The proposed development site is situated approximately 1.2km southwest of the AQMA. Therefore, the proposed development is not situated in an area of known poor air quality. However, road traffic generated by the proposed development, may pass through the AQMA.

4.1.4 There are currently no representative background monitoring locations in the vicinity of the proposed development. There are however a number of roadside NO_2 diffusion tubes located within the existing AQMAs. Monitoring data for 2023, provided by RVBC, showed monitored annual mean NO_2 concentrations of between 20.2 and 27.6µg/m^3 in the vicinity of the proposed development.

4.2 Background Air Pollutant Concentrations

4.2.1 The air quality assessment needs to take into account background concentrations upon which the local, traffic derived pollution is superimposed.

4.2.2 As there are currently no representative NO_2, PM_{10} or $PM_{2.5}$ monitoring locations in the vicinity of the proposed development site, background concentrations have been obtained from the 2021-based Defra default concentration maps, for the appropriate grid squares[8].

4.2.3 The background pollutant concentrations used in this assessment are detailed in Table 6, overleaf.

[8] Accessed through the Defra Local Air Quality Management webpages (http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html)

Table 6: Background Pollutant Concentrations Used in the Air Quality Assessment				
Pollutant	**Annual Mean Concentrations (µg/m³)**			
	NOx *	**NO_2***	**PM_{10}****	**$PM_{2.5}$****
2023 Base Year				
ESR 1 – 3; ESR 15; ESR 17 - 18 (373500, 441500)	7.42	5.89	9.97	6.44
ESR 4 – 10; ESR 14; ESR 16 (374500, 441500)	12.14*	8.50*	10.09	6.65
ESR 11 (373500, 440500)	6.42	5.13	8.83	5.41
ESR 12 – 13 (374500, 440500)	6.24	4.99	8.46	5.29
ESR 19 (372500, 440500)	5.68	4.56	9.01	5.07
2030 Opening/Future Year				
ESR 1 – 3; ESR 15; ESR 17 - 18 (373500, 441500)	5.57	4.48	9.47	5.98
ESR 4 – 10; ESR 14; ESR 16 (374500, 441500)	9.88*	6.79*	9.57*	6.16*
ESR 11 (373500, 440500)	4.91	3.96	8.43	5.04
ESR 12 – 13 (374500, 440500)	4.79	3.87	8.07	4.93
ESR 19 (372500, 440500)	4.50	3.64	8.64	4.73
**Taken/Calculated from/using Diffusion tube DT1*				
***Taken from the Defra 2021-based background concentration maps*				

4.3 Modelled Baseline Concentrations at Existing Sensitive Receptors

4.3.1 The baseline assessment (i.e. scenarios 1 and 2) has been carried out for the existing sensitive receptors considered, in accordance with Defra guidance (i.e. using EFT v12.1). The adjusted NO_2 and unadjusted PM_{10} and $PM_{2.5}$ concentrations are detailed in Table 7.

Table 7: Predicted Adjusted NO_2 and Unadjusted PM_{10} and $PM_{2.5}$ Concentrations at Existing Sensitive Receptors for Scenarios 1 and 2						
Receptor	Calculated Annual Mean Concentrations (µg/m³)					
	Scenario 1: 2023 Base Year			Scenario 2: 2030 Opening/Future Year, Without Development		
	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
ESR 1	10.19	10.50	6.73	6.35	10.01	6.26
ESR 2	10.31	10.56	6.75	6.41	10.06	6.29
ESR 3	8.03	10.25	6.59	5.40	9.75	6.12
ESR 4	8.96	10.41	6.82	5.98	9.88	6.33
ESR 5	10.04	10.53	6.89	6.45	10.01	6.39
ESR 6	10.23	10.54	6.89	6.53	10.02	6.40
ESR 7	10.54	10.55	6.89	6.66	10.02	6.40
ESR 8	9.29	10.44	6.83	6.13	9.92	6.34
ESR 9	14.57	10.91	7.09	8.44	10.38	6.59
ESR 10	20.24	12.15	7.75	11.20	11.64	7.24
ESR 11	5.32	8.86	5.43	4.04	8.45	5.05
ESR 12	9.83	9.16	5.66	5.96	8.76	5.29
ESR 13	8.32	8.94	5.54	5.31	8.54	5.18
ESR 14	8.95	10.34	6.78	5.96	9.82	6.29
ESR 15	7.77	10.23	6.58	5.29	9.74	6.12
ESR 16	15.13	11.33	7.31	8.70	10.80	6.81
ESR 17	7.05	10.13	6.53	4.98	9.63	6.06
ESR 18	6.28	10.02	6.47	4.64	9.52	6.00
ESR 19	4.62	9.02	5.08	3.67	8.65	4.74
NO_2 concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO_2 calculator[9] in accordance with LAQM.TG(22)						

4.3.2 The results show that all predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations are below the relevant objectives and limit values.

[9] Defra Local Air Quality Management webpages (http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html)

5 IMPACT ASSESSMENT

5.1 Construction Phase Assessment

Step 2 – Impact Assessment

5.1.1 In accordance with the IAQM guidance, the main activities to be considered during the construction phase of the proposed development are demolition earthworks, construction and trackout.

5.1.2 There are no demolition activities associated with the proposed development, and therefore no further consideration is required.

5.1.3 Earthworks covers the processes of soil-stripping, ground-levelling, excavation and landscaping. Construction activities will focus on the proposed buildings, access roads and car parking areas. Trackout is defined as the transport of dust and dirt by vehicles travelling from a construction site on to the public road network. This may occur through the spillage of dusty materials onto road surfaces or through the transportation of dirt by vehicles that have travelled over muddy ground on the site. This dust and dirt can then be deposited and re-suspended by other vehicles.

Step 2A

5.1.4 Step 2A of the assessment defines the potential dust emission magnitude from earthworks, construction and trackout in the absence of site specific mitigation.

5.1.5 Examples of the criteria for the dust emission classes are detailed in **Appendix B**. The results of this step are detailed in Table 8.

Step 2B

5.1.6 Step 2B of the construction phase dust assessment defines the sensitivity of the area, taking into account the significance criteria detailed in **Appendix B**, for earthworks, construction and trackout. The sensitivity of the area to each activity is assessed for potential dust soiling, human health effects and ecological effects.

5.1.7 For demolition, earthworks and construction, there are currently between 10 and 100 receptors (mainly residential) within 20m of where these activities may take place, which is assumed to be the site boundary for the purposes of this assessment.

5.1.8 The routing of construction vehicles is unknown at this stage. Therefore, for the purposes of this assessment, worst case routing scenarios have been assumed for assessment of potential trackout impacts at nearby receptors.

5.1.9 As a result, for trackout, there are between 10 and 100 receptors (mainly residential) within 20m of where trackout may occur for a distance of up to 250m from the site entrance (assuming construction vehicles travel northeast, along the Henthorn Road).

Step 2C

5.1.10 Step 2C of the construction phase dust assessment defines the risk of impacts from each activity, by combining the dust emission magnitude with the sensitivity of the surrounding area.

5.1.11 The risk of dust impacts from each activity, with no mitigation in place, has been assessed in accordance with the criteria detailed in **Appendix B**. The results of this step are detailed in Table 8.

Summary of Step 2

5.1.12 Table 8 details the results of Step 2 of the construction phase assessment for human receptors.

Table 8: Construction Phase Dust Assessment for Human Receptors

	Activity			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Step 2A				
Dust Emission Magnitude	N/A	Medium[a]	Large[b]	Large[c]
Step 2B				
Sensitivity of Closest Receptors	N/A	High	High	High
Sensitivity of Area to Dust Soiling Effects	N/A	High	High	High
Sensitivity of Area to Human Health Effects	N/A	Low[d]	Low[d]	Low[d]
Step 2C				
Dust Risk: Dust Soiling	N/A	Medium Risk	High Risk	High Risk
Dust Risk: Human Health	N/A	Low Risk	Low Risk	Low Risk

a. Total site area estimated to be between 18,000m³ and 110,000m³.
b. Total building volume estimated to be over 75,000m³ with potentially dusty construction materials (e.g., concrete).
c. *Number of construction phase vehicles estimated to be between more than 50 movements per day.*

Table 8: Construction Phase Dust Assessment for Human Receptors				
	Activity			
	Demolition	Earthworks	Construction	Trackout
d. Background annual mean PM_{10} concentration is taken from the LAQM Defra default concentration maps, for the appropriate grid square for 2025.				

Step 3 – Mitigation

5.1.13 During the construction phase, the implementation of effective mitigation measures will substantially reduce the potential for nuisance dust and particulate matter to be generated.

5.1.14 Step 2C of the assessment has identified that the risk of dust soiling and human health effects is not negligible for all the activities and therefore site-specific mitigation will need to be implemented to ensure dust effects from these activities will be not significant.

Recommendations for Site-Specific Mitigation

5.1.15 Specific mitigation relating to dust control may be in the form of construction best practices or could include a dust management plan. Recommendations for mitigation within the IAQM guidance include:

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- Protection of surfaces and exposed material from winds until disturbed areas are sealed and stable;
- Dampening down of exposed stored materials, which will be stored as far from sensitive receptors as possible;
- 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;
- Avoidance of activities that generate large amounts of dust during windy conditions;
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery;
- Avoid dry sweeping of large areas;

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;
- Ensure vehicles entering and leaving the site are covered to prevent escape of materials during transport;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);
- Minimisation of vehicle movements and limitation of vehicle speeds – the slower the vehicle speeds, the lower the dust generation;
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever the site size and layout permits; and
- Access gates to be located at least 10m from receptors, where possible.

5.1.16 All dust and air quality complaints should be recorded and appropriate measures be taken to identify causes and reduce emissions in a timely manner. Exceptional incidents which cause dust and/or emissions, and the action taken to resolve the situation, should be recorded in a log book and made available to RVBC on request.

5.1.17 It is recognised that the final design solutions will be developed with the input of the Contractor to maximise construction efficiencies, to use modern construction techniques and sustainable materials and to incorporate the particular skills and experience offered by the appointed contractor.

Step 4 – Residual Effects

5.1.18 Step 4 of the construction phase dust assessment has been undertaken to determine the significance of the dust effects arising from earthworks, construction and trackout associated with the proposed development.

5.1.19 The implementation of effective mitigation measures during the construction phase, such as those detailed in Step 3, will substantially reduce the potential for nuisance dust and particulate matter to be generated and any residual impact should be **not significant**.

5.2 Operational Phase Assessment

Existing Sensitive Human Receptors

5.2.1 The impact assessment has been carried out for the representative existing sensitive receptors considered (i.e. ESR 1 to ESR 19) using EFT v12.1.

5.2.2 Table 9 details the predicted NO_2 concentrations for the 2030 Opening/Future Year, for both the 'Without Development' and 'With Development' scenarios, in accordance with Defra guidance (i.e. using EFT v12.1). The impact has been assessed in accordance with the descriptors included in **Appendix C**.

Table 9: Predicted Adjusted NO_2 Concentrations at Existing Sensitive Receptors for Scenarios 2 and 3 – Using the Emission Factor Toolkit v12.1

Receptor	Calculated Annual Mean NO_2 Concentrations (µg/m^3)[a]				
	Without Development	With Development		Concentration Change as Percentage of AQAL	Impact[b]
		Concentration	Percentage in Relation to AQAL		
ESR 1	6.35	6.50	<75%	<0.5%	**Negligible**
ESR 2	6.41	6.49	<75%	<0.5%	**Negligible**
ESR 3	5.40	5.44	<75%	<0.5%	**Negligible**
ESR 4	5.98	6.01	<75%	<0.5%	**Negligible**
ESR 5	6.45	6.49	<75%	<0.5%	**Negligible**
ESR 6	6.53	6.60	<75%	<0.5%	**Negligible**
ESR 7	6.66	6.77	<75%	<0.5%	**Negligible**
ESR 8	6.13	6.20	<75%	<0.5%	**Negligible**
ESR 9	8.44	8.53	<75%	<0.5%	**Negligible**
ESR 10	11.20	11.38	<75%	<0.5%	**Negligible**
ESR 11	4.04	4.21	<75%	<0.5%	**Negligible**
ESR 12	5.96	6.01	<75%	<0.5%	**Negligible**
ESR 13	5.31	5.35	<75%	<0.5%	**Negligible**
ESR 14	5.96	6.00	<75%	<0.5%	**Negligible**
ESR 15	5.29	5.31	<75%	<0.5%	**Negligible**
ESR 16	8.70	8.83	<75%	<0.5%	**Negligible**
ESR 17	4.98	4.99	<75%	<0.5%	**Negligible**
ESR 18	4.64	4.67	<75%	<0.5%	**Negligible**
ESR 19	3.67	3.85	<75%	<0.5%	**Negligible**

a. NO_2 concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO_2 calculator, in accordance with LAQM.TG(22)

b. Assessed using the Impact Descriptors from the EPUK/IAQM guidance, included in Appendix C. Changes of less than 0.5% should be described as negligible

5.2.3 Table 10 details the PM_{10} concentrations for the 2030 Opening/Future Year, for both the 'Without Development' and 'With Development' scenarios. The impact has been assessed in accordance with the descriptors included in **Appendix C**.

Table 10: Predicted Unadjusted PM_{10} Concentrations at Existing Sensitive Receptors for Scenarios 2 and 3 – Using the Emission Factor Toolkit v12.1

Receptor	Calculated Annual Mean PM_{10} Concentrations (µg/m³)				
	Without Development	With Development		Concentration Change as Percentage of AQAL	Impact[a]
		Concentration	Percentage in Relation to AQAL		
ESR 1	10.01	10.05	<75%	<0.5%	**Negligible**
ESR 2	10.06	10.09	<75%	<0.5%	**Negligible**
ESR 3	9.75	9.76	<75%	<0.5%	**Negligible**
ESR 4	9.88	9.90	<75%	<0.5%	**Negligible**
ESR 5	10.01	10.03	<75%	<0.5%	**Negligible**
ESR 6	10.02	10.04	<75%	<0.5%	**Negligible**
ESR 7	10.02	10.05	<75%	<0.5%	**Negligible**
ESR 8	9.92	9.94	<75%	<0.5%	**Negligible**
ESR 9	10.38	10.41	<75%	<0.5%	**Negligible**
ESR 10	11.64	11.70	<75%	<0.5%	**Negligible**
ESR 11	8.45	8.51	<75%	<0.5%	**Negligible**
ESR 12	8.76	8.78	<75%	<0.5%	**Negligible**
ESR 13	8.54	8.56	<75%	<0.5%	**Negligible**
ESR 14	9.82	9.82	<75%	<0.5%	**Negligible**
ESR 15	9.74	9.75	<75%	<0.5%	**Negligible**
ESR 16	10.80	10.85	<75%	<0.5%	**Negligible**
ESR 17	9.63	9.64	<75%	<0.5%	**Negligible**
ESR 18	9.52	9.53	<75%	<0.5%	**Negligible**
ESR 19	8.65	8.70	<75%	<0.5%	**Negligible**

a. Assessed using the Impact Descriptors from the EPUK/IAQM guidance, included in Appendix C. Changes of less than 0.5% should be described as negligible

5.2.4 Table 11 details the $PM_{2.5}$ concentrations for the 2030 Opening/Future Year, for both the 'Without Development' and 'With Development' scenarios. The impact has been assessed in accordance with the descriptors included in **Appendix C**.

Table 11: Predicted Unadjusted $PM_{2.5}$ Concentrations at Existing Sensitive Receptors for Scenarios 2 and 3 – Using the Emission Factor Toolkit v12.1					
Receptor	**Calculated Annual Mean $PM_{2.5}$ Concentrations ($\mu g/m^3$)**				
	Without Development	**With Development**		**Concentration Change as Percentage of AQAL**	**Impact[a]**
		Concentration	**Percentage in Relation to AQAL**		
ESR 1	6.26	6.28	<75%	<0.5%	**Negligible**
ESR 2	6.29	6.30	<75%	<0.5%	**Negligible**
ESR 3	6.12	6.13	<75%	<0.5%	**Negligible**
ESR 4	6.33	6.33	<75%	<0.5%	**Negligible**
ESR 5	6.39	6.40	<75%	<0.5%	**Negligible**
ESR 6	6.40	6.41	<75%	<0.5%	**Negligible**
ESR 7	6.40	6.41	<75%	<0.5%	**Negligible**
ESR 8	6.34	6.36	<75%	<0.5%	**Negligible**
ESR 9	6.59	6.60	<75%	<0.5%	**Negligible**
ESR 10	7.24	7.28	<75%	<0.5%	**Negligible**
ESR 11	5.05	5.08	<75%	<0.5%	**Negligible**
ESR 12	5.29	5.30	<75%	<0.5%	**Negligible**
ESR 13	5.18	5.18	<75%	<0.5%	**Negligible**
ESR 14	6.29	6.30	<75%	<0.5%	**Negligible**
ESR 15	6.12	6.12	<75%	<0.5%	**Negligible**
ESR 16	6.81	6.83	<75%	<0.5%	**Negligible**
ESR 17	6.06	6.06	<75%	<0.5%	**Negligible**
ESR 18	6.00	6.01	<75%	<0.5%	**Negligible**
ESR 19	4.74	4.77	<75%	<0.5%	**Negligible**
a. Assessed using the Impact Descriptors from the EPUK/IAQM guidance, included in Appendix C. Changes of less than 0.5% should be described as negligible					

5.2.5 The results of the assessment show that all predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations, in all scenarios considered, are below the relevant objectives and limit values.

Proposed Sensitive Human Receptors

5.2.6 Pollutant concentrations have been modelled for proposed receptors for the 2030 Opening/Future Year 'With Development' scenario, in accordance with Defra

guidance (i.e. using EFT v12.1), as detailed in Table 12.

Table 12: Predicted Adjusted NO_2, and Unadjusted PM_{10} and $PM_{2.5}$ Concentrations at Proposed Sensitive Receptors for Scenario 3 – Using Emission Factor Toolkit v12.1

Proposed Receptor	Calculated Annual Mean Concentrations (µg/m³)		
	NO_2	PM_{10}	$PM_{2.5}$
PR 1	4.27	8.52	5.09
PR 2	4.16	8.49	5.07

Assessment of Significance for Human Receptors

5.2.7 The significance of the overall effects of the proposed development has been assessed in accordance with the EPUK/IAQM guidance. This assessment is based on professional judgement and details of the assessor's experience is included in **Appendix D**.

5.2.8 The assessment of significance has taken into account a number of factors, including:

- Baseline pollutant concentrations in 2023 and 2030 are below the relevant annual mean objectives and limit values at all existing receptors considered;
- The assessment predicts a negligible impact on concentrations of NO_2, PM_{10} and $PM_{2.5}$ at all existing sensitive receptors considered, with the development in place; and
- NO_2, PM_{10} and $PM_{2.5}$ concentrations within the proposed development site are predicted to be below the relevant objectives and limit values.

5.2.9 Based on the above factors, in accordance with the EPUK/IAQM guidance, the air quality effect of the proposed development is considered to be **not significant**.

Recommendations for Mitigation

5.2.10 The impact of the proposed development is predicted to be not significant for human receptors. However, mitigation measures will assist in reducing any potential impact and general best practice measures in relation to air quality could be implemented.

5.2.11 Electric Vehicle (EV) charging points are now standard for all new residential developments with associated car parking spaces[10].

[10] The Building Regulations 2010, "Infrastructure for the Charging of Electric Vehicles" (2021)

5.2.12 However, additional mitigation measures could include the use of low NO_x boilers and the implementation of a green travel plan.

6 CONCLUSIONS

6.1 Construction Phase

6.1.1 The construction phase assessment has been undertaken to determine the risk and significance of dust and fine particulate matter effects from earthworks, construction and trackout associated with the proposed development, in accordance with guidance published by the IAQM.

6.1.2 With site specific mitigation measures in place, the significance of dust and fine particulate effects from earthworks, construction and trackout is considered to be **not significant**.

6.2 Operational Phase

Existing Sensitive Receptors

6.2.1 An air quality assessment has been undertaken to consider the potential impact of development generated vehicles on air quality at nineteen existing sensitive human receptors.

6.2.2 The assessment has been undertaken in accordance with Defra guidance, by using the vehicle emission factors from EFT v12.1. However, the traffic data used in the assessment is based on a higher number of proposed dwellings (160 dwellings) and so, given this has now fallen to up to 115 dwellings, the assessment is considered to provide an over prediction of air quality impacts. For this reason, it is not considered necessary to update the assessment using EFT 13.1 as any predicted impacts will be lower than those predicted in this assessment.

6.2.3 Pollutant concentrations in 2030, with the development in place, are below the relevant annual mean objectives and limit values at the receptors considered.

6.2.4 The assessment predicts that the development will have a negligible impact on concentrations of NO_2, PM_{10} and $PM_{2.5}$ at all nineteen existing sensitive receptors considered in 2030. The effect of the proposed development on human receptors is therefore considered to be **not significant.**

Proposed Sensitive Receptors

6.2.5 The assessment has also predicted pollutant concentrations at two proposed receptors within the development site.

6.2.6 Predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations are below the annual mean air quality objective and limit value concentrations, for 2030, at the proposed sensitive receptors

considered. Air quality effects within the site are, therefore, considered to be **not significant**.

Recommendations for Mitigation

6.2.7 The impact of the proposed development is predicted to be not significant. However, mitigation measures will assist in reducing any potential impact and general best practice measures in relation to air quality could be implemented. EV charging points are now standard for all new residential developments with associated car parking spaces. Therefore, additional mitigation measures could include the use of low NO_x boilers and the implementation of a green travel plan.

6.3 Summary

6.3.1 The assessment has demonstrated that the proposed development will not lead to an unacceptable risk from air pollution, nor will it lead to any breach of national objectives as required by national policy. There are no material reasons in relation to air quality why the proposed scheme should not proceed.

APPENDICES

Appendix A: Air Quality Legislation and Guidance

National Air Quality Strategy

A.1 The Environment Act 1995 requires the UK government to prepare a national Air Quality Strategy. The first UK strategy was published in March 1997, setting out policies for the management of ambient air quality. This was subsequently updated in 2007[1].

A.2 2007 strategy establishes the framework for air quality management in England, Scotland, Wales and Northern Ireland. Air quality standards and objectives are set out for eight pollutants which may potentially occur at levels that give cause for concern. The strategy also provides details of the role that local authorities are required to take in working towards improvements in air quality, known as the Local Air Quality Management (LAQM) regime.

A.3 Defra published an updated air quality strategy in in August 2023[2]. The revised strategy supersedes the 2007 strategy in England only and provides a framework to enable local authorities to make the best use of their powers and make improvements for their communities. It also includes guidance on the new fine particulate matter targets for England.

Air Quality Standards and Objectives

A.4 Air quality standards and objectives are set out in the strategy for the following pollutants: nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO), lead (Pb), fine particulate matter (PM_{10}), benzene (C_6H_6), 1, 3–butadiene (C_4H_6) and ozone (O_3).

A.5 Objectives for each pollutant, except O_3, were first given statutory status in the Air Quality Regulations 2000[3] and Air Quality (Amendment) Regulations 2002[4]. These objectives are defined in the strategy as:

"the maximum ambient concentration not to be exceeded, either without exception or with a permitted number of exceedances, within a specified timescale."

[1] Department of Environment, Food and Rural Affairs, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. July 2007
[2] Department of Environment, Food and Rural Affairs, Air quality strategy: framework for local authority delivery, August 2023
[3] The Air Quality Regulations 2000. SI No 928
[4] The Air Quality (Amendment) Regulations 2002

A.6 EU limit values, set out within the Ambient Air Quality Directive 2008/50/EC[5] (i.e. the CAFE Directive), were transposed into UK legislation on 11th June 2011 as The Air Quality Standards Regulations 2010. These are mostly the same as the air quality objectives in terms of concentrations; however, there are differences in determining how compliance is achieved. Although the UK is no longer part of the EU, no changes have yet been made to the objectives and limit values used in the management and assessment of air quality.

A.7 Whilst there is no specific objective for $PM_{2.5}$ in England and Wales, a limit value of 20µg/m^3 is referred to in the regulations, which has been adopted for use in this assessment (as recommended by the LAQM Helpdesk). An objective has been set for $PM_{2.5}$ in Scotland since early 2016. The Environment Act 2021 sets out a requirement to establish a target objective for $PM_{2.5}$, and this has now been set through the Environmental Targets (Fine Particulate Matter) (England) Regulations 2023. Annual mean concentrations of $PM_{2.5}$ must now meet a target of 10 µg/m^3 across England by 2040.

A.8 Examples of where these objectives and limit values apply are detailed in the Defra LAQM Technical Guidance document LAQM.TG(22)[6] and are included in Table A1.

Table A1: Examples of Where the Air Quality Objectives Should Apply

Averaging Period	Objectives Should Apply at:	Objectives Should Generally Not Apply at:
Annual mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes, etc.	Building facades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
24-hour mean and 8-hour mean	All locations where the annual mean objectives would apply, together with hotels. Gardens of residential properties[a]	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term

[5] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

[6] Department for Environment, Food and Rural Affairs, Local Air Quality Management Technical Guidance LAQM.TG(22), August 2022

Table A1: Examples of Where the Air Quality Objectives Should Apply		
Averaging Period	**Objectives Should Apply at:**	**Objectives Should Generally Not Apply at:**
1-hour mean	All locations where the annual mean and 24 and 8-hour objectives apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations to which the public might reasonably be expected to spend one hour or longer	Kerbside sites where public would not be expected to have regular access
15-minute mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer	
[a] *Such locations should represent parts of the garden where relevant public exposure is likely, for example where there is seating or play areas. It is unlikely that relevant public exposure to pollutants would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied*		

Local Air Quality Management

A.9 LAQM legislation in the Environment Act 1995 requires local authorities to conduct the periodic review and assessments of air quality. These aim to identify all those areas where the objectives are being, or are likely to be, exceeded. Where exceedances are likely to occur, local authorities are required to declare an Air Quality Management Area (AQMA).

A.10 LAQM.TG(22) presents a streamlined approach for LAQM in England and Scotland; however, Northern Ireland is still considering changes to LAQM and therefore works according to the previous regime.

A.11 The Welsh Government amended the LAQM regime in Wales in 2017 by issuing new statutory policy guidance in order to bring the system into line with the Well-being of Future Generations (Wales) Act 2015[7]. This aims to achieve compliance with the national air quality objectives in specific hotspots and to reduce exposure to pollution more widely, so as to achieve the greatest public health benefit.

[7] Well-being of Future Generations (Wales) Act 2015 (anaw 2)

A.12 Local authorities in England are required to produce Annual Status Reports (ASRs), and in Scotland and Wales, Annual Progress Reports (APRs). These replace all other reports which previously had to be submitted including Updating and Screening Assessments, Progress Reports and Detailed Assessments (which would be produced to assist with an AQMA declaration).

A.13 Local authorities now have the option of a fast track AQMA declaration option. This allows more expert judgement to be used and removes the need for a Detailed Assessment where a local authority is confident of the outcome. Detailed Assessments should however still be used if there is any doubt.

A.14 As part of the UK Government's requirement to improve air quality, selected local authorities in England are also currently investigating the feasibility of setting up Clean Air Zones (CAZs). These are areas where targeted action and co-ordinated resources aim to improve air quality within an urban setting, in order to achieve compliance with the EU limit values within the shortest possible time.

A.15 The first CAZs were implemented in Bath in March 2021, and in Birmingham in June 2021. Since then, CAZ's have also been declared in Bradford, Bristol, Portsmouth, Sheffield and Tyneside (Newcastle and Gateshead). In addition, the London Ultra Low Emission Zone (ULEZ) has now been expanded to incorporate all London Boroughs.

National Planning Policy Framework

A.16 The National Planning Policy Framework (NPPF)[8], introduced in March 2012 and most recently updated in December 2024 with a minor text update in February 2025, requires that:

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of AQMAs and CAZs, 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 plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications.

[8] Ministry of Housing, Communities and Local Government, National Planning Policy Framework, February 2025

Planning decisions should ensure that any new development in AQMAs and CAZs is consistent with the local air quality action plan."

Planning Practice Guidance

A.17 The Planning Practice Guidance (PPG)[9], updated in November 2019, states that whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impacts in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife).

A.18 Where a proposed development is anticipated to give rise to concerns about air quality, an appropriate assessment needs to be carried out. Where the assessment concludes that the proposed development (including mitigation) will not lead to an unacceptable risk from air pollution, prevent sustained compliance with national objectives or fail to comply with the requirements of the Habitats Regulations, then the local authority should proceed to decision with appropriate planning conditions and/or obligations.

[9] Department for Communities and Local Government. Planning Practice Guidance: Air Quality, November 2019

Appendix B: Methodology for Construction Phase Assessment

Institute of Air Quality Management Guidance

B.1 The methodology for the construction phase dust assessment is set out in guidance from the Institute of Air Quality Management (IAQM)[10].

Step 1

B.2 Step 1 is to screen the requirement for a more detailed assessment. The guidance states that an assessment will normally be required where there are existing sensitive human receptors within 250m of the site boundary and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 250m from the site entrance(s).

B.3 With regards to ecological receptors, the guidance states that an assessment will normally be required where there are existing receptors within 50m of the site boundary and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 250m from the site entrance(s).

B.4 Where any of these criteria are met, it is necessary to proceed to Step 2.

Step 2

B.5 Step 2 determines the potential risk of dust arising in sufficient quantities to cause annoyance and/or health or ecological impacts. The risk is related to:

- The activities being undertaken (demolition, number of vehicles and plant etc);
- The duration of these activities;
- The size of the site;
- The meteorological conditions (wind speed, direction and rainfall);
- The proximity of receptors to the activity;
- The adequacy of the mitigation measures applied to reduce or eliminate dust; and
- The sensitivity of receptors to dust.

B.6 The risk of dust impacts is determined using four risk categories: negligible, low, medium and high risk. A site is allocated to a risk category based upon the following two factors (known as Step 2A and Step 2B).

[10] Institute of Air Quality Management, Guidance on the Assessment of Dust from Demolition and Construction (v2.2), January 2024

B.7 **Step 2A** assesses the scale and nature of the works which determines the potential dust emission magnitude as small, medium or large. Examples of how the magnitude may be defined are included in Table B1.

Table B1: Determining the Dust Emission Magnitude of Construction Phase Activities

Activity	Dust Emission Class		
	Large	Medium	Small
Demolition	Total building volume >75,000m^3; Potentially dusty construction material (e.g. concrete); On-site crushing and screening; Demolition activities >12m above ground level	Total building volume 12,000 - 75,000m^3; Potentially dusty construction material; Demolition activities 6-12m above ground level	Total building volume <12,000m^3; Construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <6m above ground, demolition during wetter months
Earthworks	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 >6m in height;	Total site area 18,000-110,000m^2; Moderately dusty soil type (e.g. silt); 5-10 heavy earth moving vehicles active at any one time; Formation of bunds 3-6m in height;	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 <4m in height;
Construction	Total building volume >75,000m^3; On-site concrete batching; Sandblasting	Total building volume 12,000 - 75,000m^3; Potentially dusty construction material (e.g. concrete); On-site concrete batching	Total building volume <12,000m^3; Construction material with a low potential for dust release (e.g. metal cladding or timber)
Trackout	>50 HDV (>3.5t) outward movements[a] in any one day[b]; Potentially dusty surface material (e.g. high clay content); Unpaved road length >100m	20-50 HDV (>3,5t) outward movements[a] in any one day[b]; Moderately dusty surface material (e.g. high clay content); Unpaved road length 50-100m	<20 HDV (>3.5t) outward movements[a] in any one day[b]; Surface material with low potential for dust release; Unpaved road length <50m

a. A vehicle movement is a one way journey i.e. from A to B, and excludes the return journey
b. HDV movements during a construction project may vary over its lifetime, and the number of movements is the maximum not the average

B.8 **Step 2B** considers the sensitivity of the area to dust impacts which is defined as low, medium or high. The sensitivity categories for different types of receptors are described in Table B2.

Table B2: Sensitivity Categories for Dust Soiling, Human Health and Ecological Effects

Sensitivity Category	Dust Soiling Effects	Health effects of PM_{10}	Ecological Effects
High	Users can reasonably expect to enjoy a high level of amenity; Appearance, aesthetics or value of a property would be diminished; Examples include dwellings, museums and other culturally important collections, medium and long term car parks and car show rooms	Locations where members of the public are exposed over a period of time relevant to the air quality objective for PM_{10}; Examples include residential properties, hospitals, schools, and residential care homes	Locations with an international or national designation and the designated features may be affected by dust soiling; Locations where there is a community of a particularly dust sensitive species; Examples include a Special Area of Conservation with dust sensitive features
Medium	Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; The appearance, aesthetics or value of their property could be diminished; People or property wouldn't reasonably be expected to be continuously present or regularly for extended periods of time; Examples include parks and places of work	Locations where people are exposed as workers and exposure is over a period of time relevant to the air quality objective for PM_{10}; Examples include office and shop workers but will generally not include workers occupationally exposed to PM_{10}	Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; Locations with a national designation where the features may be affected by dust deposition; Examples include a Site of Special Scientific Interest with dust sensitive features
Low	Enjoyment of amenity would not reasonably be expected; Property would not be diminished in appearance, aesthetics or value; People or property would be expected to be present only for limited periods of time;	Locations where human exposure is transient; Examples include public footpaths, playing fields, parks and shopping streets	Locations with a local designation where the features may be affected by dust deposition; Examples include a Local Nature Reserve with dust sensitive features

Table B2: Sensitivity Categories for Dust Soiling, Human Health and Ecological Effects			
Sensitivity Category	**Dust Soiling Effects**	**Health effects of PM_{10}**	**Ecological Effects**
	Examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads		

B.9 Based on the sensitivity of individual receptors, the overall sensitivity of the area to dust soiling, human health and ecological effects is then determined using the criteria detailed in Tables B3 to B5, respectively.

Table B3: Sensitivity of the Area to Dust Soiling Effects on People and Property[ab]					
Receptor Sensitivity	**Number of Receptors**	**Distance from Source (m)[c]**			
		<20m	**<50m**	**<100m**	**<250m**
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

a. The sensitivity to the area should be derived for each of the four activities
b. Estimate the total number of receptors within the stated distance. Only the highest level of sensitivity from the table needs to be considered
c. For trackout, distances should be measured from the side of the roads used by construction traffic. Without site specific mitigation, trackout may occur for up to 250m from sites. The impact declines with distance from the site and it is only necessary to consider trackout impacts up to 50m from the edge of the road

Table B4: Sensitivity of the Area to Human Health Impacts[ab]						
Receptor Sensitivity	**Annual Mean PM_{10} Concentration[c]**	**Number of Receptors[d]**	**Distance from Source (m)[e]**			
			<20m	**<50m**	**<100m**	**<250m**
High	>32µg/m^3	>100	High	High	High	Medium
		10-100	High	High	Medium	Low
		1-10	High	Medium	Low	Low
	28-32µg/m^3	>100	High	High	Medium	Low

Table B4: Sensitivity of the Area to Human Health Impacts[ab]						
Receptor Sensitivity	**Annual Mean PM_{10} Concentration[c]**	**Number of Receptors[d]**	**Distance from Source (m)[e]**			
			<20m	**<50m**	**<100m**	**<250m**
		10-100	High	Medium	Low	Low
		1-10	High	Medium	Low	Low
	24-28µg/m^3	>100	High	Medium	Low	Low
		10-100	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	<24µg/m^3	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	>32µg/m^3	>10	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	28-32µg/m^3	>10	Medium	Low	Low	Low
		1-10	Low	Low	Low	Low
	24-28µg/m^3	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
	<24µg/m^3	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low

a. *The sensitivity to the area should be derived for each of the four activities*
b. Estimate the total number of receptors within the stated distance. Only the highest level of sensitivity from the table needs to be considered
c. Most straightforwardly taken from the national background maps, but should also take account of local sources. The values are based on 32µg/m^3 being the annual mean concentration at which an exceedance of the 24-hour mean objective is likely in England, Wales and Northern Ireland. In Scotland, there is an annual mean objective of 18µg/m^3
d. In the case of high sensitivity receptors with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, just include the number of properties
e. For trackout, distances should be measured from the side of the roads used by construction traffic

Table B5: Sensitivity of the Area to Ecological Impacts[ab]		
Receptor Sensitivity	**Distance from the Source (m)[c]**	
	<20	**<50**
High	High	Medium
Medium	Medium	Low
Low	Low	Low

a. *The sensitivity to the area should be derived for each of the four activities*
b. Only the highest level of sensitivity from the table needs to be considered
c. For trackout, distances should be measured from the side of the roads used by construction traffic

B.10 These two factors are combined in **Step 2C** to determine the risk of dust impacts with no mitigation applied.

B.11 The risk of dust effects is determined for four types of construction phase activities, with each activity being considered separately. If a construction phase activity is not taking place on the site, then it does not need to be assessed. The four types of activities to be considered are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout.

B.12 The risk of dust being generated by demolition activities at the site is determined using the criteria in Table B6.

Table B6: Risk of Dust Impacts for Demolition			
Sensitivity of Area	**Dust Emission Magnitude**		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

B.13 The risk of dust being generated by earthworks and construction at the site is determined using the criteria in Table B7.

Table B7: Risk of Dust Impacts for Earthworks and Construction			
Sensitivity of Area	**Dust Emission Magnitude**		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

B.14 The risk of dust being generated by trackout at the site is determined using the criteria in Table B8.

Table B8: Risk of Dust Impacts for Trackout			
Sensitivity of Area	**Dust Emission Magnitude**		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

Step 3

B.15 Step 3 of the assessment determines the site-specific mitigation required for each of the activities, based on the risk determined in Step 2. Mitigation measures are detailed in guidance published by the Greater London Authority[11], recommended for use outside the capital by LAQM guidance, and the IAQM guidance document itself. Professional judgement should be used to determine the type and scale of mitigation measures required.

B.16 If the risk is classed as negligible, no mitigation measures beyond those required by legislation will be necessary.

Step 4

B.17 Step 4 assesses the residual effect, with mitigation measures in place, to determine whether or not these are significant.

[11] Greater London Authority, The Control of Dust and Emissions from Construction and Demolition: Supplementary Planning Guidance, 2014

Professional Judgement

B.18 The IAQM guidance makes reference to the use of professional judgement when assessing the risks of dust and fine particulate matter from demolition and construction sites. Details of the experience of the personnel involved with the project are provided in **Appendix D**.

Appendix C: Methodology for Operational Phase Assessment

Air Dispersion Modelling Inputs

C.1 The air dispersion model ADMS-Roads (CERC, Version 5.0.1) has been used to assess the potential air quality impacts associated with development-generated road traffic emissions. This dispersion model is widely used and accepted for the purpose of undertaking assessments to support both planning and Environmental Permit applications.

Traffic Flow Data

C.2 The ADMS-Roads model requires the input of detailed road traffic flow data for those routes which may be affected by the proposed development. Traffic flow data has been provided for this project by Ashley Helme, the appointed transport consultants for the project. The study extent of the model is shown in Figure C.1.

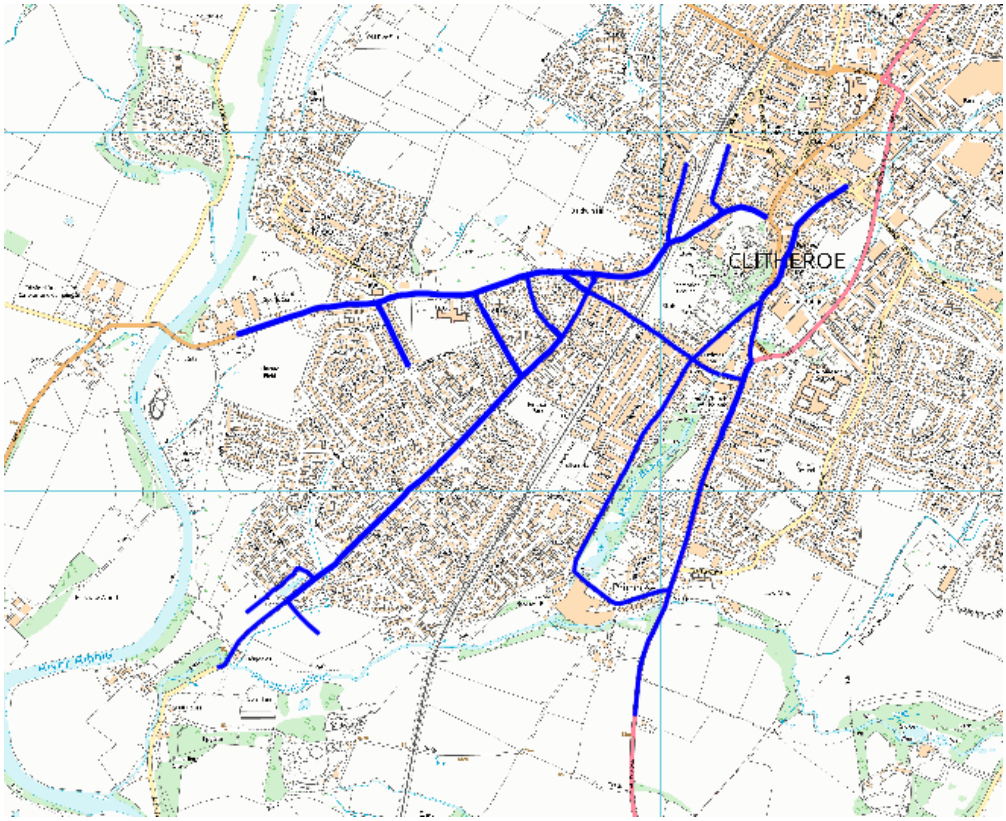


Figure C.1: Study Extent of Air Dispersion Model. The roads modelled in the assessment can be seen in blue (‘*Reproduced from Ordnance Survey Maps © Crown Copyright All Rights Reserved Licence No. 0100031673’)*

C.3 Data has been provided as 24-hour Annual Average Daily Traffic (AADT) flows, with HGV percentages. No average speed information was available and therefore speed limits have been used, with a reduction to 15kph in locations where congestion or the slowing down of vehicles would be expected.

C.4 The traffic flow data used in the assessment is included in Table C1.

Table C1: 24-hour AADT traffic data used in the assessment

Junction ID	Link Name	Speed Info (kph)	Scenario 1: 2023 Verification and Base Year		Scenario 2: 2030 Without Development		Scenario 3: 2030 Opening/Future Year, With Development	
			LGV	HGV	LGV	HGV	LGV	HGV
SA001	Henthorn Road N	48	308	6	333	6	1358	25
SA002a	Site Access (North)	15	0	0	0	0	227	2
SA002b	Site Access (South)	32	0	0	0	0	807	8
Junc1002	Lancaster Drive	48	2827	55	3038	59	3286	33
Junc1003	B6243 Edisford Road W	48	5808	131	6241	140	6310	142
Junc2001	B6243 Edisford Road E	48	6801	160	7308	172	7455	176
Junc2002	Seedall Avenue	32	566	3	608	4	608	4
Junc2003	B6243 Edisford Road W	48	5808	131	6241	140	6310	142
Junc3001	B6243 Edisford Road E	48	6801	160	7308	172	7455	176
Junc3002	Faraday Avenue	32	221	0	237	0	237	0
Junc5001	B6243 Edisford Road E	48	6801	160	7308	172	7455	176
Junc5002	Henthorn Road	48	3438	14	3694	15	3891	16
Junc5003	B6243 Edisford Road W	48	5808	131	6241	140	6310	142
Junc6001	Henthorn Road N	48	308	6	333	6	1358	25
Junc6002	Eshton Terrace	25	6791	89	7297	96	7912	104
Junc6003	Henthorn Road S	48	308	6	333	6	333	6
Junc7001	Station Road	48	9461	243	10166	261	10484	269
Junc7002	B6243 E	48	2337	92	2511	99	2533	100
Junc7003	B6243 W	48	9848	170	10581	183	10925	189
Junc8001	Lowergate	48	6206	232	6669	249	6842	256
Junc8002	Moor Lane S	48	9721	239	10445	257	10835	266
Junc8003	Woone Lane	48	5718	35	6144	37	6580	40
Junc9002	B6243 E	48	2337	92	2511	99	2533	100
Junc9003	B6243 W	48	9848	170	10581	183	10925	189
Junc10001	Woone Lane N	48	5643	40	6063	43	6499	46

Table C1: 24-hour AADT traffic data used in the assessment								
Junction ID	Link Name	Speed Info (kph)	Scenario 1: 2023 Verification and Base Year		Scenario 2: 2030 Without Development		Scenario 3: 2030 Opening/Future Year, With Development	
			LGV	HGV	LGV	HGV	LGV	HGV
Junc10002	Greenacre Street	48	3545	58	3809	62	3938	64
Junc1004	Eshton Terrace	48	6791	89	7297	96	7912	104
Junc1101	Whalley Road N	48	12687	352	13633	378	14021	389
Junc1102	Whalley Road S	48	12836	343	13793	368	14172	378
Junc1103	Greenacre Street	48	3545	58	3809	62	3938	64
Junc1201	Whalley Road N	48	12687	352	13633	378	14021	389
Junc1203	Whalley Road S	48	12836	343	13793	368	14172	378

Vehicle Emission Factors

C.5 The air quality assessment has used vehicle emission factors calculated using the Emissions Factor Toolkit (EFT) version 12.1, released in August 2024. The assessment was completed prior to the release of the latest Emissions Factor Toolkit (EFT 13.1), which was released in March 2025. The traffic data used in the assessment is based on a higher number of proposed dwellings (160 dwellings) and so, given this has now fallen to up to 115 dwellings, the assessment is considered to provide an over prediction of air quality impacts. For this reason, it is not considered necessary to update the assessment using EFT 13.1 as any predicted impacts will be lower than those predicted in this assessment.

C.6 As discussed in the section 3.4 of the report, in accordance with the latest guidance from the IAQM, a sensitivity analysis has not been undertaken as model verification has been undertaken using data from later than 2016[12].

C.7 As a result, vehicle emission factors from EFT v12.1 have been used for the assessment, with the appropriate year factors applied to the modelling scenarios.

Street Canyons

C.8 LAQM.TG(22) states that '*street canyons can generally be defined as narrow streets where the height of buildings on both sides of the road is greater than the road width*'.

[12] Available on the Institute of Air Quality Management website (https://iaqm.co.uk/wp-content/uploads/2013/02/iaqm_uncertainty_vehicle_NOx_emission_withdrawn-02.pdf)

The principal effects of a street canyon on the dispersion of pollution from a road source are:

- Pollution being channelled along the canyon;
- Pollution being dispersed across the canyon by circulating flow at road height;
- Pollutants being trapped in recirculation regions;
- Pollutants leaving the canyon between gaps in the buildings;
- Pollutants leaving the canyon from the canyon top; and
- Pollutants leaving the canyon from the downstream end of the canyon.

C.9 The model has included several street canyons.

Meteorological Data

C.10 The meteorological data used in the air quality modelling has been obtained from ADM Limited and is from Numerical Weather Prediction (NWP) data, covering the period between 1st January and 31st December 2023. This has complete data capture for wind and temperature.

C.11 The 2023 wind rose for the Numerical Weather Prediction (NWP) is shown in Figure C2.

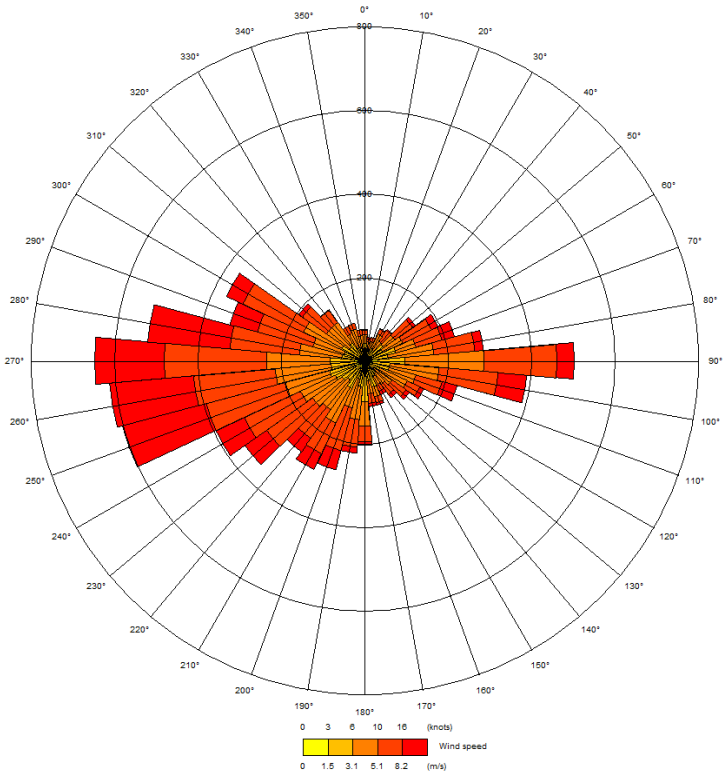


Figure C.2: 2023 Wind Rose for Numerical Weather Prediction (NWP) data used.

Dispersion and Meteorological Site Characteristics

C.12 The characteristics for the dispersion site and meteorological sites, included in the ADMS-Roads model, are detailed in Table C2.

Table C2: Dispersion and Meteorological Site Characteristics

Setting	Dispersion Site	Meteorological Site
Surface Roughness	0.5m	0.5m
Surface Albedo	0.23	0.23
Minimum Monin-Obukhov Length	30m	1m
Priestley-Taylor Parameter	1	1

NO_x to NO_2 Conversion

C.13 In accordance with the guidance within LAQM.TG(22), the ADMS-Roads model has been run to predict the road-contribution NO_x concentrations for each receptor location. These have then been converted to NO_2 concentrations using the Defra NO_x to NO_2 calculator[13].

Model Validation and Verification

C.14 LAQM.TG(22) refers to model validation as *"the general comparison of modelled results against monitoring data carried out by model developers"*. ADMS-Roads is widely accepted by regulatory authorities for use in this type of assessment.

C.15 Model verification is used to check the performance of the model at a local level. The verification of the ADMS-Roads air dispersion model is achieved by modelling concentration(s) at existing monitoring location(s) in the vicinity of the proposed development, and comparing the modelled concentration(s) with the measured concentration(s).

C.16 Following review of the 2024 Annual Status Report (ASR) for Ribble Valley Borough Council (RVBC), it is understood there are roadside air quality monitoring locations on the affected road network (Ref: DT2, DT3, DT4, DT5, and DT6). Therefore, these diffusion tube have been used to verify the results of the model.

[13] Defra Local Air Quality Management web pages [http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html]

Monitoring Locations Excluded from the Verification Procedure

C.17 Some monitoring locations have been excluded from model verification, due to the complex nature of the conditions around some of diffusion tube, which the ADMS model is not able to accurately replicate. In reference to the siting of diffusion tubes, Paragraph 7.206 of LAQM.TG(22) states that:

> *"The site should be open to the sky, with no overhanging vegetation or buildings. It is important to place diffusion tubes where there is free circulation of air around the tube, but the opposite extreme should also be avoided, i.e. areas of higher than usual turbulence. For this reason, the tube should not be located on the corner of a building. Care should be taken to avoid any very localised sources, sinks of NO_2, or disturbances to the airflow. Avoid placing diffusion tubes in any form of recess, and the fittings should be mounted so that the tubes can be changed easily. For example, tubes should be mounted greater than 10m from the following:*
>
> - *Heater flues (particularly low-level balanced flues);*
> - *Bushes or trees overhanging or surrounding the tube location;*
> - *Air conditioning outlets;*
> - *Extractor vents; or*
> - *Underground ventilation shafts."*

C.18 One additional Ribble Valley Borough Council (RVBC) operated diffusion tube location was originally included in the model verification process: "DT7". The 2023 modelled results at these locations were much lower than the 2023 monitored results, therefore, the suitability of the locations for use in model verification was investigated.

C.19 The diffusion tube DT7 is situated along Thorne Street, Clitheroe. As seen in Figures C.3 and C.4 (images taken from 'Google Streetview' in July 2021, the closest year to the 2023 Base Year), the diffusion is positioned in a private carpark and in close proximity to railway tracks- therefore is positioned in very close proximity to localised sources of air pollution, which are very difficult to accurately represent in a model. Following the guidance outlined in LAQM.TG(22), this location has been excluded from the model verification process.

Figure C.3: Photograph of dissusion tube 'DT7', located along Thorne Street, Clitheroe (Google Streetview, 2025, digital images, Google Maps (http://maps.google.com), photograph of Thorne Street, Clitheroe, taken July 2021)

Figure C.4: Photograph of dissusion tube 'DT7', located along Thorne Street, Clitheroe (Google Streetview, 2025, digital images, Google Maps (http://maps.google.com), photograph of Thorne Street, Clitheroe, taken July 2021)

PM_{10} and $PM_{2.5}$ Monitoring Locations

C.20 As no PM_{10} or $PM_{2.5}$ monitoring locations are situated along roads where traffic flow data is available, it has not been possible to carry out model verification for modelled PM_{10} or $PM_{2.5}$ concentrations.

Monitoring Locations Included in Model Verification

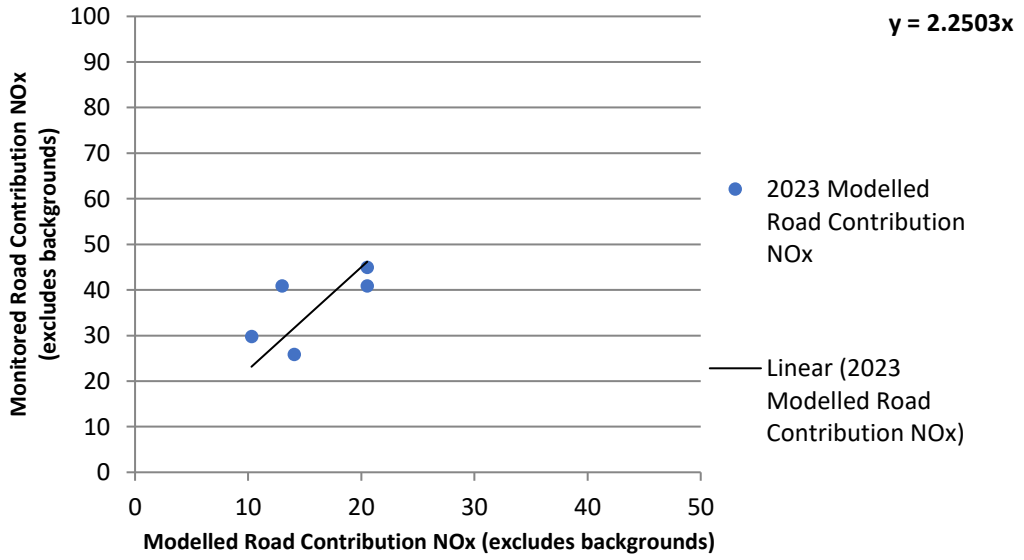
C.21 The monitoring data that has been used in the model verification procedure is detailed in Table C3.

Table C3: NO_2 Monitoring Data Used for Verification Purposes

Monitoring Location Reference	Type	Approximate Grid Reference		2023 Bias Adjusted NO_2 Annual Average Concentration (µg/m^3)
		Easting	Northing	
DT2	Roadside Diffusion Tube	374232	441292	27.60
DT3	Roadside Diffusion Tube	374232	441292	26.10
DT4	Roadside Diffusion Tube	374222	441314	20.20
DT5	Roadside Diffusion Tube	374217	441252	25.60
DT6	Roadside Diffusion Tube	374175	441153	21.80

C.22 The modelled road-contribution NO_x concentration for the diffusion tube has been compared against the measured road-contribution NO_x concentration for the same location. The measured concentrations have been derived using the Defra NO_x to NO_2 calculator, taking into account the background NO_x concentration for the local area.

C.23 The comparison is shown in the below graph. The equation of the trend line is based on linear regression through zero, which provides an overall adjustment factor of 2.2503.



C.24 This adjustment factor has been applied to the modelled road-contribution NO_x concentrations. The total NO_2 concentrations have been derived by combining the adjusted road-contribution NO_x concentration and background NO_2 concentration, using the Defra NO_x to NO_2 calculator.

C.25 A final comparison has been made between the total measured NO_2 concentration and total modelled NO_2 concentrations, as shown in Table C4. Following adjustment, modelled concentrations are within 25% of measured concentrations.

C.26 A Root Mean Square Error (RMSE) calculation has been undertaken as part of the model verification for NO_2 concentrations. This has been carried out for the monitoring location included within the model verification, in accordance with the guidance detailed in LAQM.TG(22). The RMSE calculation following adjustment is detailed in Table C4.

Table C4: RMSE Calculation for Nitrogen Dioxide Concentrations

Diffusion Tube Location	After Verification			
	Observed Value	Predicted Value	Difference (%)	RMSE
DT2	27.60	28.05	1.63	2.56
DT3	26.10	28.05	7.47	
DT4	20.20	22.57	11.73	
DT5	25.60	21.61	-15.59	
DT6	21.80	19.09	-12.43	

C.27 LAQM.TG(22) states that *"ideally an RMSE value within 10% of the objective would be derived"*, although a value of within 25% is considered acceptable.The results of the calculation show that following model verification, the RMSE value is within 25% (i.e. 10µg/m^3) of the objective (i.e. 40µg/m^3). Therefore, the model is considered to be performing to an acceptable standard.

Assessment Criteria

Assessing the Impact of a Proposed Development on Human Receptors

C.28 Guidance has been prepared by Environmental Protection UK (EPUK) and the IAQM[14] with relation to the assessment of the air quality impacts of proposed developments and their significance.

C.29 The impact of a development is usually assessed at specific receptors, and takes into account both the long-term background concentrations, in relation to the relevant Air Quality Assessment Level (AQAL) at these receptors, and the change with the development in place.

C.30 The impact descriptors for individual receptors are detailed in Table C5.

Table C5: Impact Descriptors for Individual Receptors

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

**Percentage pollutant concentrations have been rounded to whole numbers, to make it easier to assess the impact. Changes of 0% (i.e. less than 0.5% or 0.2µg/m^3) should be described as Negligible*

Determining the Significance of Effects

C.31 Impacts on air quality, whether adverse or beneficial, will have an effect on human health that can be judged as either 'significant' or 'not significant'.

C.32 Once the impact of the proposed development has been assessed for the individual impacts, the overall significance is determined using professional judgement. This takes into account a number of factors such as:

[14] Moorcroft and Barrowcliffe et al, Land-Use Planning and Development Control: Planning for Air Quality (v1.2), January 2017

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

Appendix D: Professional Experience of Assessors

D.1 The assessment of air quality impacts, and the significance of the associated effects, takes into account the professional judgement of the assessor. Details of the experience of the personnel involved with the project are provided below:

Arlishia Scarpa **Environmental Scientist**
BSc (Hons), MSc, AMIAQM, AMIEnvSc **(Air Quality)**

Arlishia joined Wardell Armstrong (now part of SLR) after completing a BSc in Ecology and Environment at the University of Liverpool and an MSc in Environmental Practice at the Manchester Metropolitan University. Arlishia specialises in air quality issues and has undertaken air quality assessments for a wide range of residential and commercial sites. Arlishia has produced numerous air quality assessments, air quality neutral assessments and emissions mitigation assessments. Arlishia is skilled in advanced atmospheric dispersion modelling using ADMS-Roads and Geographical Information Systems (GIS). Arlishia is involved in all aspects of air quality assessment, from carrying out air quality monitoring studies to analysing data and writing technical reports.

Hannah Fleming **Environmental Scientist**
BSc (Hons), AIAQM, AMIEnvSc **(Air Quality)**

Hannah joined Wardell Armstrong (now part of SLR) in 2022 after finishing a Bachelor of Science degree in Environmental Science from the University of Leeds and is part of the Acoustic and Air Quality team. Hannah has experience of carrying out air quality assessments for a variety of developments, including residential and commercial. She is involved in all aspects of the assessment, from carrying out air quality monitoring studies to analysing data, modelling and writing technical reports or chapters as part of an Environmental Statement.

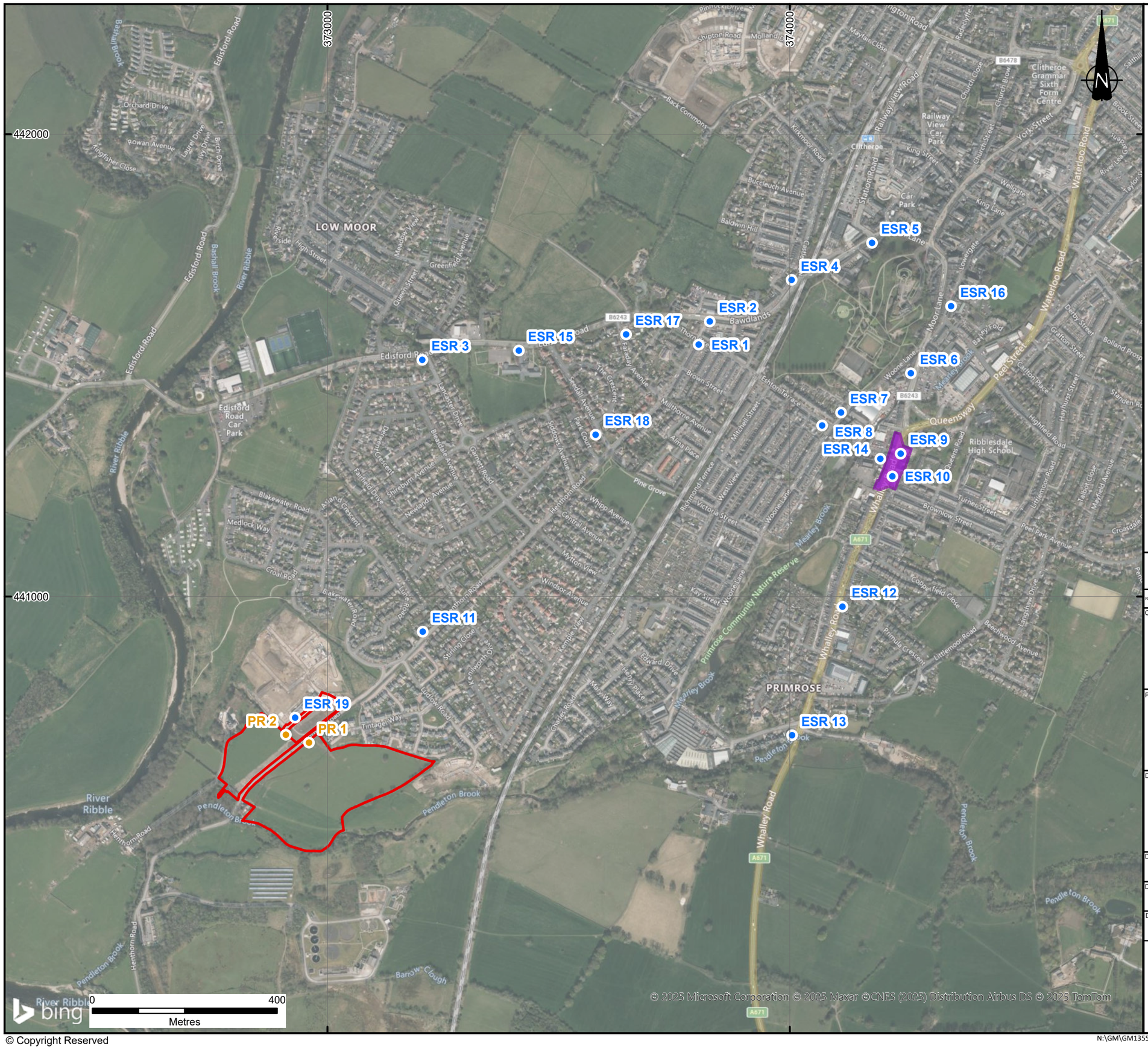
Malcolm Walton **Technical Director**
BSc (Env Health) Dip (Acoustics & Noise Control)
MCIEH AMIOA

Malcolm holds a Bachelor of Science degree in Environmental Health and the Diploma in Acoustics and Noise Control. Malcolm is a Member of the Chartered

Institute of Environmental Health and an Associate Member of the Institute of Acoustics. Malcolm joined Wardell Armstrong (now part of SLR) in September 2001 following 12 years working as an Environmental Health Officer in several local authorities, responsible for the enforcement of environmental legislation and in particular air pollution and noise nuisance.

Malcolm has experience in the technical co-ordination of environmental appraisal of large schemes to UK and international standards. Malcolm regularly carries out and co-ordinates noise and air quality assessment work associated with planning applications including EIA work and PPC permit application/compliance. He regularly acts as expert witness in planning inquiries in respect of noise, air quality and odour.

DRAWINGS



KEY

- Site Boundary
- Whalley Road, Clitheroe No.1 Air Quality Management Area
- Existing Sensitive Receptors
- Proposed Receptors

Notes:

Boundaries are indicative. Aerial imagery shown for context purposes only.

REVISION	DETAILS	DATE	DRAWN	CHKD	APPD
A	FIRST ISSUE	08/12/2025	HF	PT	MTW

CLIENT

GLADMAN DEVELOPMENTS LTD

PROJECT

HENTHORN ROAD, CLITHEROE

DRAWING TITLE

EXISTING AND PROPOSED SENSITIVE RECEPTOR LOCATIONS

DRG No.	REV	SUIT. CODE
GM13551- 001	A	--

DRG SIZE	SCALE	DATE
A3	1:8,000	08/12/2025

DRAWN BY	CHECKED BY	APPROVED BY
HF	PT	MTW

wardell armstrong PART OF SLR

N:\GM\GM13551 - Henthorne Road Clitheroe\03 - Design\GIS\GM13551-001 Air Quality Receptor Location Plan.aprx

wardell-armstrong.com

STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)1782 276 700

BIRMINGHAM
Two Devon Way
Longbridge Technology Park
Longbridge
Birmingham
B31 2TS
Tel: +44 (0)121 580 0909

BOLTON
41-50 Futura Park
Aspinall Way
Middlebrook
Bolton
BL6 6SU
Tel: +44 (0)1204 227 227

BRISTOL
3rd Floor
Brew House
Jacob Street
Tower Hill
Bristol
BS2 0EQ
Tel: +44 (0) 330 088 6631

BURY ST EDMUNDS
Armstrong House
Lamdin Road
Bury St Edmunds
Suffolk
IP32 6NU
Tel: +44 (0)1284 765 210

CARDIFF
Tudor House
16 Cathedral Road
Cardiff
CF11 9LJ
Tel: +44 (0)292 072 9191

CARLISLE
Marconi Road
Burgh Road Industrial Estate
Carlisle
Cumbria
CA2 7NA
Tel: +44 (0)1228 550 575

EDINBURGH
The Tun
4 Jackson's Entry
Edinburgh
EH8 8PJ
Tel: +44 (0) 330 088 6631

GLASGOW
24 St Vincent Place
Glasgow
G1 2EU
Tel: +44 (0)141 428 4499

LEEDS
36 Park Row
Leeds
LS1 5JL
Tel: +44 (0)113 831 5533

LONDON
Summit House
12 Red Lion Square
London
WC1R 4QH
Tel: +44 (0) 330 088 6631

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

International office:

ALMATY
29/6 Satpaev Avenue
Hyatt Regency Hotel
Office Tower
Almaty
Kazakhstan
050040
Tel: +7(727) 334 1310

wardell armstrong

PART OF SLR