

APPENDIX 10.1

AIR QUALITY ASSESSMENT



Redrow Homes Ltd

Land at Stakehill, Rochdale

Air Quality Assessment

Report No.: 444805-01 (02)

FEBRUARY 2023



RSK GENERAL NOTES

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Summary

RSK Environment Ltd (RSK) was commissioned to prepare an assessment of the potential air quality impacts associated with the proposed development on Land at Stakehill, Rochdale.

The application site lies within the administrative area of Rochdale Borough Council (RBC). The assessment has been undertaken with reference to existing air quality in the area and relevant air quality legislation, policy and guidance.

Construction phase impacts of the proposed development on local air may potentially arise due to the generation and re-suspension of dust and particulate matter during the construction phase. The risk of dust impacts were assessed according to a widely used methodology published by the Institute of Air Quality Management (IAQM). Mitigation measures are recommended based on the potential dust risks and with the implementation of appropriate mitigation measures, no significant impacts are anticipated during the construction phase.

The main potential operational phase air quality impact is likely to be emissions from road traffic associated with the proposed development (i.e. changes in flow volume and distribution). A detailed assessment of operational impacts has been undertaken using the ADMS-Roads atmospheric dispersion model. Latest guidance and data were used within the assessment. The assessment methodology and results are presented within this report.

The key air pollutants of concern were nitrogen dioxide (NO₂) and particulate matter (PM₁₀ and PM_{2.5}). Concentrations of these key pollutants were predicted at the most relevant receptor locations using the dispersion model for three scenarios - the base year 2019 (S1), the proposed opening year 2033 without (S2) and with (S3) the proposed development in place.

The modelling predicts that the air quality standards for NO₂, PM₁₀ and PM_{2.5} will be met at all receptor locations considered in the assessment, for both the S2 and S3 scenarios. The impacts of the proposed development on NO₂, PM₁₀ and PM_{2.5} concentrations, without mitigation, are predicted to be 'negligible' at all receptor locations. Predicted concentrations across the proposed development site itself are predicted to meet the air quality standards for both the S2 and S3 scenarios, therefore the development will not introduce new exposure to poor air quality.

It is not considered that any specific mitigation measures will be required for the operational phase. Nevertheless, it is recommended that best practice mitigation measures (such as a travel plan and the provision of electric vehicle charging points) should be included to minimise the potential impact of the development on local air quality.

Abbreviations

AADT	Annual Average Daily Traffic
ADMS-Roads	Atmospheric Dispersion Modelling System – Roads (a dispersion modelling software application)
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQS	Air Quality Standards
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMP	Dust Management Plan
EC	European Commission
EFT	Emission Factors Toolkit – developed by Defra
EPUK	Environmental Protection UK
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
NPPF	National Planning Policy Framework
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
PM _{2.5}	Particulate matter of size fraction approximating to <2.5mm diameter
PM ₁₀	Particulate matter of size fraction approximating to <10mm diameter
RBC	Rochdale Borough Council
RSK	RSK Environment Limited

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1 INTRODUCTION

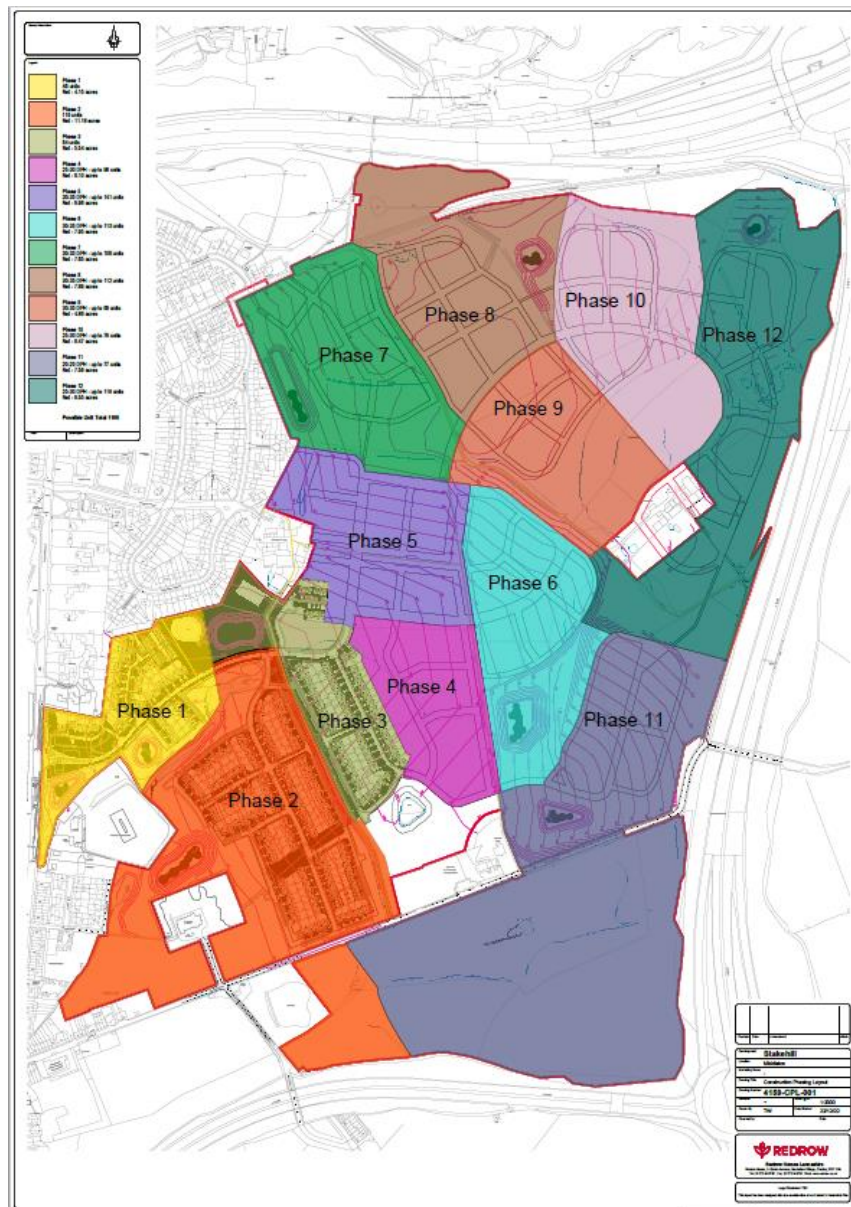
RSK Environment Ltd (RSK) was commissioned to prepare an assessment of the potential air quality impacts associated with the proposed development on Land at Stakehill, Rochdale. The hybrid planning application (part in outline, part in detail) includes up to 1,500 new homes across the site, of which approximately 400 dwellings will form part of Phase 1 (the detailed elements), and the remaining up to 1,100 units will be in outline. The development will also comprise a new local centre, green infrastructure comprising planting, ecological enhancements, SuDS and play areas, new pedestrian and cycle routes and associated access.

The Site extends to approximately 89 hectares (ha) and comprises agricultural land uses enclosed by existing urban development to the west. To the north, east and south, the Site is bound by road infrastructure. Thornham New Road forms the northern boundary of the Site. To the east is the A627(M), and adjacent to the south of the Site is the A627(M) Spur. The A664 bounds the Site to the southwest.

The approximate grid reference for the centre of the application site is 389158, 409362. The site lies within the administrative area of Rochdale Borough Council (RBC). Figure 1.1 shows the proposed development site layout.

This report presents the findings of an assessment of existing baseline air quality, the potential impacts on local air quality during the construction phase of the proposed development and predicted impacts on existing and proposed sensitive receptors as a result of additional traffic emissions generated by the proposed development once operational. Mitigation measures are recommended, where appropriate.

Figure 1.1: Proposed Development Site Location Plan



2 LEGISLATION, PLANNING POLICY AND GUIDANCE

2.1 Air Quality Strategy

UK air quality policy is published under the umbrella of the Environment Act 1995, Part IV and specifically Section 80, the National Air Quality Strategy. The latest *Air Quality Strategy for England, Scotland, Wales and Northern Ireland – Working Together for Clean Air*, published in July 2007 sets air quality standards and objectives for ten key air pollutants to be achieved between 2003 and 2020.

The EU (European Unit) Air Quality Framework Directive (1996) established a framework under which the EU could set limit or target values for specified pollutants. The directive identified several pollutants for which limit or target values have been, or will be set in subsequent 'daughter directives'. The framework and daughter directives were consolidated by Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe, which retains the existing air quality standards and introduces new objectives for fine particulates (PM_{2.5}).

The Clean Air Strategy 2019 supersedes the policies outlined in the 2007 strategy. This latest strategy aims to have a more joined-up approach, outlining actions the Government plans to take to reduce emissions from transport, homes, agriculture and industry. However, the air quality objectives remain as previously detailed within the 2007 strategy.

2.1.1 Air Quality Standards

The air quality standards (AQSS) in the United Kingdom are derived from European Commission (EC) directives and are adopted into English law via the Air Quality (England) Regulations 2000 and Air Quality (England) Amendment Regulations 2002. The Air Quality Limit Values Regulations 2003 and subsequent amendments implement the Air Quality Framework Directive into English Law. Directive 2008/50/EC was translated into UK law in 2010 via the Air Quality Standards Regulations 2010.

The relevant¹ AQS to England and Wales to protect human health are summarised in Table 2.1.

Table 2.1: Air Quality Standards (AQS) Relevant to the Proposed Development

Substance	Averaging period	Exceedances allowed per year	Ground level concentration limit (µg/m ³)
Nitrogen dioxide (NO ₂)	1 calendar year	-	40
	1 hour	18	200
Fine particles (PM ₁₀)	1 calendar year	-	40

¹ Relevance, in this case, is defined by the scope of the assessment.

Substance	Averaging period	Exceedances allowed per year	Ground level concentration limit ($\mu\text{g}/\text{m}^3$)
	24 hours	35	50
Fine particles ($\text{PM}_{2.5}$)	1 year	-	20

2.1.2 The Environment Act

These objectives are to be used in the review and assessment of air quality by local authorities under Section 82 of the Environment Act (1995). If exceedances are measured or predicted through the review and assessment process, the local authority must declare an Air Quality Management Area (AQMA) under Section 83 of the act, and produce an Air Quality Action Plan (AQAP) to outline how air quality is to be improved.

On the 10th of November 2021, the new Environment Act (2021) passed royal assent, which amends the Environment Act (1995) to reinforce the local air quality management (LAQM) framework in order to encourage cooperation at the local level and broaden the range of organisations that play a role in improving local air quality.

2.2 Planning Policy

The land use planning process is a key means of improving air quality, particularly in the long term, through the strategic location and design of new developments. Any air quality concern that relates to land use and its development can, depending on the details of the proposed development, be a material consideration in the determination of planning applications.

2.2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was revised and published in July 2021, superseding the previous NPPF with immediate effect. The NPPF includes a presumption in favour of sustainable development.

Section 15 of the NPPF deals with Conserving and Enhancing the Natural Environment, and states that the intention is that the planning system should prevent ‘*development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability*’ and goes on to state that ‘*new development [should be] appropriate for its location*’ and ‘*the effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account.*’

With specific regard to air quality, the NPPF states that: ‘*Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure*

provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.”

2.2.2 Local Planning Policy

Rochdale Adopted Core Strategy (October 2016)

RBC policies for managing developments are laid out in the Rochdale Adopted Core Strategy for Rochdale District which include RBC policies relating to air quality.

Policy G9 Reducing the Impact of Pollution, Contamination and Land Instability states the following:

“We will reduce all forms of pollution, contamination and land instability in the borough, by:

- a. Focusing on measures that reduce air pollution in Air Quality Management Areas, and other areas where pollution levels are unacceptable, particularly around motorways and main roads;*
- b. Requiring that development does not have impacts that lead to an unacceptable increase in air, water, noise, light or other pollution;*
- c. Ensuring sensitive new developments such as housing, schools and hospitals are not adversely affected by existing sources of pollution such as roads and certain types of industry;*
- d. Requiring a Low Emissions Strategy (LES) where development requires a Transport Assessment, and in other circumstances as appropriate;*
- e. Requiring that any risks arising from contaminated land or land instability, and appropriate actions to address these risks, are identified prior to any development taking place on that land and the identified actions taken;*
- f. Requiring that any risk to surface water and ground water resources from the disturbance of contaminated land be ascertained and preventative measures devised and carried out; and*
- g. Using planning conditions or obligations to control pollution from new development, or the impact of pollution on new development.”*

In addition, **Policy DM1 General Development Requirements** states the following:

“All development proposals, including changes of use of land and buildings, extensions and alterations, will be expected to demonstrate that they:

....

- d. Mitigate against any impacts due to noise, air, dust, light and odour pollution, traffic generation or inadequate access, where such mitigation is identified as being necessary;*

....

- f. Do not have an adverse impact on health, through its impact or the effect of existing problems e.g. land contamination, or poor air quality;*

....”

Rochdale Borough Unitary Development Plan (June 2006)

The Unitary Development Plan is still in place until the RBC’s Allocations Development Plan is adopted.

Policy EM/2 Pollution states the following:

“If the emission of pollutants from a proposed development cannot readily be controlled by other environmental legislation, such development will not be permitted where it would be likely to result in an increase in air, water, noise, light or other pollution, which would be harmful to the environment, and to land uses and land users in the area.

Where permission is granted, it will be subject to appropriate conditions or obligations to ensure that air, water and noise pollution is kept to acceptable levels.

New housing or other environmentally sensitive development will not be permitted where existing pollution levels are unacceptable and cannot satisfactorily be reduced.”

2.3 Best Practice Guidance Documents

2.3.1 Guidance on the Assessment of Dust from Demolition and Construction

The Institute of Air Quality Management (IAQM) published a guidance document (Holman *et al.*, 2014) on the assessment of construction phase impacts (herein the ‘IAQM construction dust guidance’). The guidance was produced to provide advice to developers, consultants and environmental health officers on how to assess the impacts arising from construction activities. The emphasis of the methodology is on classifying sites according to the risk of impacts (in terms of dust nuisance, PM₁₀ impacts on public exposure and impact upon sensitive ecological receptors) and to identify mitigation measure appropriate to the level of risk identified.

2.3.2 Local Air Quality Management Review and Assessment Technical Guidance

The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their air quality review and assessment work. This guidance, referred to in this document as the Local Air Quality Management Technical Guidance (Defra, 2022) (‘LAQM.TG.22’).

2.3.3 Land-Use Planning & Development Control: Planning for Air Quality

Environmental Protection UK’s (EPUK) and the IAQM jointly published a revised version of the guidance note ‘Land-Use Planning & Development Control: Planning for Air Quality’ in 2017 (herein the ‘EPUK-IAQM guidance’) to facilitate consideration of air quality within local development control processes. It provides a framework for air quality considerations, promoting a consistent approach to the treatment of air quality issues within development control decisions.



The guidance includes methods for undertaken an air quality assessment and an approach for assessing the significance of effects. The guidance note is widely accepted as an appropriate reference method for this purpose.

3 ASSESSMENT SCOPE AND METHODOLOGY

3.1 Overall Approach

The approach taken for assessing the potential air quality impacts of the proposed development may be summarised as follows:

- Baseline characterisation of local air quality;
- Qualitative assessment of the construction phase fugitive dust impacts using the 2014 IAQM guidance;
- Advanced dispersion modelling assessment of air quality impacts of the proposed development traffic under the following three scenarios:
 - i. Scenario 1 (S1) - 'Baseline' scenario representing the 'existing' air quality situation in 2019;
 - ii. Scenario 2 (S2) - 'Without Development' scenario (2033, the expected year of opening, without the proposed development in place); and
 - iii. Scenario 3 (S3) - 'With Development' scenario (2033, the expected year of opening and with the proposed development in place).
- Recommendation of mitigation measures, where appropriate, to ensure any adverse effects on air quality are minimised.

3.2 Baseline Characterisation

Existing or baseline air quality refers to the concentrations of relevant substances that are already present in ambient air. These substances are emitted by various sources, including road traffic, industrial, domestic, agricultural and natural sources.

A desk based study has been undertaken including a review of monitoring data available from RBC and estimated background data from the LAQM Support website maintained by Defra. Consideration has also been given to potential sources of air pollution in the vicinity of the application site. Background concentrations have been mapped by Defra at a grid resolution of 1x1km for the whole of the UK.

3.3 Construction Phase Impact Assessment

3.3.1 Construction Dust and Particulate Matter

Construction works for the proposed development have the potential to lead to the release of fugitive dust and particulate matter. An assessment of the likely significant effects of construction phase dust and particulate matter at sensitive receptors has therefore been undertaken following the IAQM's construction dust guidance.

Three separate dust impacts were considered:

- Disamenity to dust soiling;

- The risk of health effects due to an increase in exposure to PM₁₀; and
- Harm to ecological receptors.

In order to assess the potential impacts construction activities are divided into four types:

- Demolition;
- Earthworks;
- Construction; and
- Trackout².

The risk of dust and PM₁₀ arising to cause disamenity and/or health or ecological impacts was based on an assessment of likely emissions magnitude and the sensitivity of the surrounding environment. The risk category may be different for each of the four 'construction' activities.

Annex A sets out the construction dust assessment methodology in detail as per the IAQM construction dust guidance. Once the level of risk has been determined, then site specific mitigation proportionate to the level of risk can be identified (as detailed in Annex B).

The Magic Map application available online by Defra was used to identify statutory ecological receptors near the proposed development site area.

3.3.2 Emissions to Air from Construction Traffic and Plant

Exhaust emissions from construction phase vehicles and plant may have an impact on local air quality adjacent to the routes used by these vehicles to access the application site and in the vicinity of the application site itself. Information on the number of vehicles and plant associated with the construction phase has been estimated by the client, and a qualitative impact assessment has been undertaken based on professional judgement and considering the following factors:

- The likely duration of the construction phase;
- The potential number and type of construction traffic and plant that could be required; and
- The number and proximity of sensitive receptors to the application site and along the likely construction vehicle routes.

² Trackout is defined as the transport of dust and dirt from the construction / demolition sites onto public road network, where it may be deposited and then re-suspended by vehicles using the network.

3.4 Operational Phase Impact Assessment

3.4.1 Point Source Emissions

It is understood that no significant stationary sources (for example, boilers or combined heat and power (CHP) plant) are proposed with the development and therefore, this report has not considered emissions related to energy generation any further.

3.4.2 Traffic Emissions

The proposed development will generate additional traffic emissions in the local area. NO₂, PM₁₀ and PM_{2.5} are generally regarded as the most significant air pollutants released by vehicular combustion processes (as they tend to be more likely to be close to exceeding statutory limits in an urban environment), or subsequently generated by vehicle emissions in the atmosphere through chemical reactions.

The EPUK-IAQM 2017 guidance provides an approach for determining the significance of air quality impacts associated with a development in relation to emissions from traffic. To assess the impacts of a development on the surrounding area, the guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion. The approach is further described in Annex C including the descriptors for the impact significance.

The following subsectors provide further information regarding proposed methodology and dispersion model input for the air quality impact assessment.

3.4.3 Modelling Software

ADMS-Roads is an advanced dispersion model developed by the UK consultancy CERC (Cambridge Environmental Research Consultants). ADMS-Roads is widely used and validated within the UK and Europe. The model allows for the skewed nature of turbulence within the atmospheric boundary layer. ADMS-Roads is capable of processing hourly sequential meteorological data, whilst taking the turbulence caused by vehicles into account in calculating the dispersion profiles of emitted pollutants. ADMS-Roads enables the user to predict concentrations of pollutants of concern at multiple receptor locations.

ADMS-Roads (Version 5.0.0.1) has been used for assessing potential road traffic emission air quality impacts resulting from the operational phase of the proposed development, and the potential exposure of future residents at the proposed development site to poor air quality.

3.4.4 Modelling Scenarios

The following scenarios have been considered in this assessment:

- Scenario 1 (S1): 2019 Base year model verification;

- Scenario 2 (S2): 2033 Opening Year – without the Proposed Development;
- Scenario 3 (S3): 2033 Opening Year – with the Proposed Development.

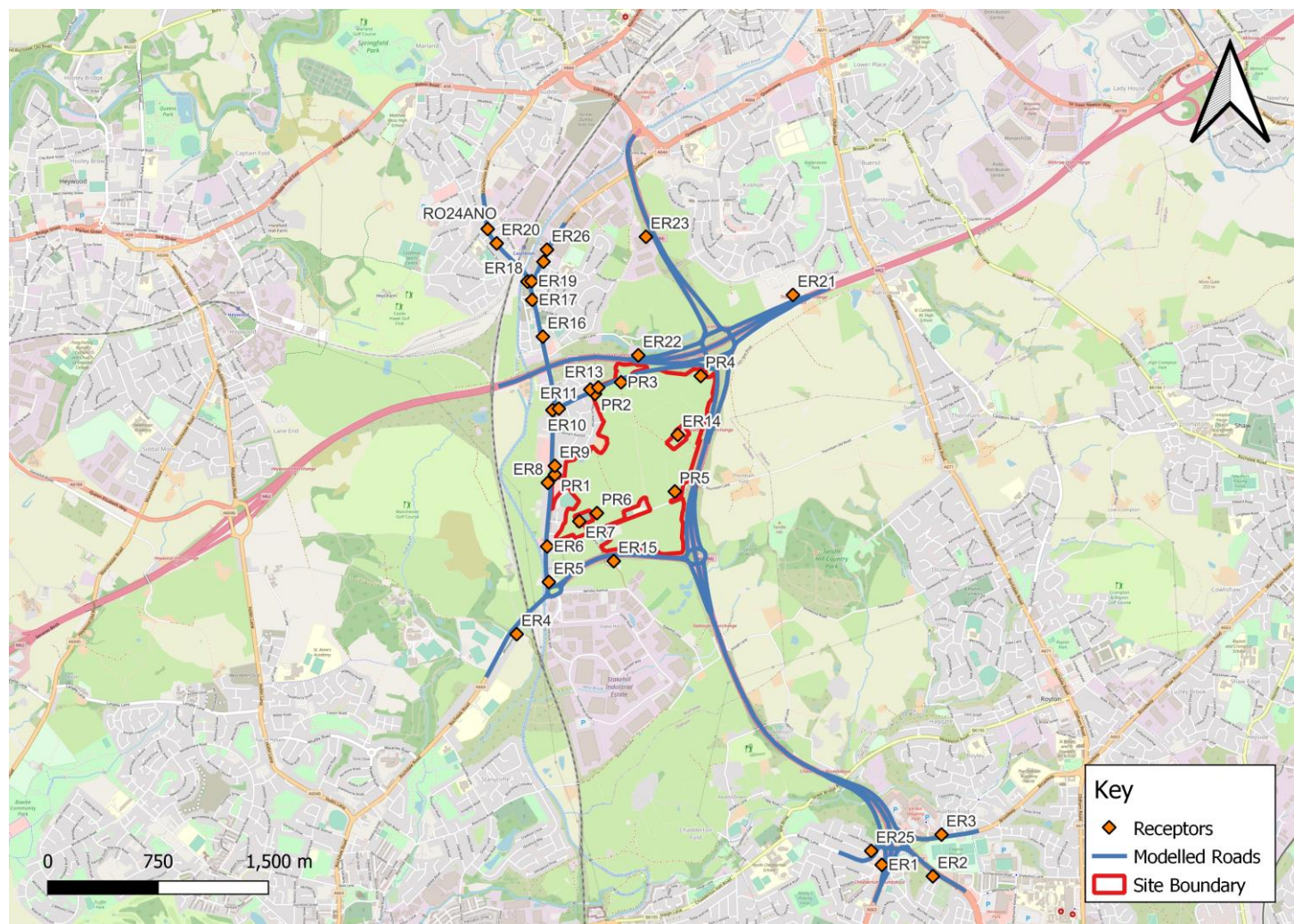
The 2019 base year was used as the baseline year in this assessment, for the purpose of model verification (i.e. S1) as the most recent year in which a full year of bias-adjusted and ratified local monitoring data is available. It is understood that the development is anticipated to be operational in 2033.

3.4.5 Traffic Data

Traffic data used in the air quality assessment was provided by the appointed project transport consultant, SCP. The traffic data used in the air quality dispersion modelling is presented in Annex D.

The road network included in the dispersion model is presented in Figure 3.1. Guidance in LAQM.TG.22 and professional judgement was used to estimate speeds for use within the assessment, including reduced speeds at junctions.

Figure 3.1: The Roads and Receptors Included in the Dispersion Modelling Assessment



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3.4.6 Traffic Emission Factors

Version 11.0 of the Emissions Factor Toolkit (EFT), published by Defra, was used to derive vehicle emissions factors (i.e. the amount of pollution emitted from the average vehicle fleet, in g/km/s) for NO_x, PM₁₀ and PM_{2.5}. Within the EFT, emission factors are available for 2018 through to 2050 for England (not London), and 2018 to 2030 for Wales, Scotland, Northern Ireland and London. The Defra 'Emission Factors Toolkit' only support assessment years 2018-2030 inclusive. Emission outputs for 2031 to 2050 can be provided by the tool, however the input assumptions embedded with the tool may not fully align with those applied for the purposes of NAEI projections.

EFT version 11.0 takes into account the most recent evidence relating to factors such as advances in vehicle and exhaust technology and changes in composition of the vehicle fleet. The emission factors consequently reduce over time. Emission factors for 2019 were used to estimate vehicle emissions for S1 modelling scenario and 2033 emission factors were used for S2 and S3.

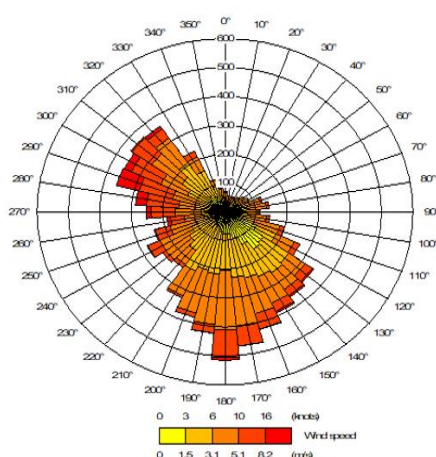
3.4.7 Time-Varying Profile

Vehicle movements vary with time. Diurnal profiles for the roads included within the model were not available and instead the UK National Profile 2019 published by the Department for Transport (DfT) was applied to all of the assessed roads. The diurnal profile is presented in Annex D. A value of 1 on the y-axis is equivalent to the hourly average flow over 24 hours.

3.4.8 Meteorological Data

2019 hourly sequential meteorological data from the Rostherne No.2 meteorological station was employed in the dispersion model. This meteorological station is located approximately 27.5km southwest of the study area and is considered to be representative of the development site condition. The windrose derived from the 2019 dataset is presented in Figure 3.2. The predominant wind direction was from the south-west.

Figure 3.2 Windrose from the Rostherne No.2 Meteorological Station in 2019



3.4.9 Sensitive Receptor Locations

Pollutant concentrations were predicted at a number of existing and proposed sensitive receptor locations at the proposed site and along the roads included in the study where the greatest changes in traffic flows were predicted due to the operational phase. A height of 1.5m was used for human receptors to represent the approximate average breathing height of an adult. Details of all specific human receptors included in the modelling study (and hence the air quality impacts assessed) are summarised in Table 3.1. The locations of all assessed receptors are shown in Figure 3.1.

Table 3.1: Diffusion Tubes and Receptors Included in the Dispersion Modelling Assessment

Receptor ID	Receptor Location	Grid Reference		Height (m)
		X	Y	
Diffusion tubes used for verification				
RO24ANO	A664/Manchester Road	388089	410822	2.5
Existing Receptors				
ER1	Existing receptor, A663/Broadway (south of Chadderton Roundabout)	390757.02	406506.04	1.5
ER2	Existing residential receptor, A627/Chadderton Way	391103.93	406427.93	1.5
ER3	Existing residential receptor, A663/Broadway (east of Chadderton Roundabout)	391163.29	406710.35	1.5
ER4	Existing residential receptor, A664/Rochdale Road (west of Slattocks Roundabout)	388278.88	408075.83	1.5
ER5	Existing residential receptor, A664/Rochdale Road (north of Slattocks Roundabout)	388498.38	408428.54	1.5
ER6	Existing residential receptor, A664/Rochdale Road (north of Thornham Lane)	388487.54	408669.74	1.5
ER7	Existing receptor, north of Thornham Lane	388706.32	408839.71	1.5
ER8	Existing receptor, A664/Manchester Road (south of proposed western site access)	388493.16	409101.14	1.5
ER9	Existing residential receptor, A664/Manchester Road (north of Sautridge Close)	388541.11	409215.97	1.5
ER10	Existing residential receptor, A664/Manchester Road (south of Earl Street)	388525.62	409593.82	1.5
ER11	Existing residential receptor, Thornham New Road (west of Fox Hill Road)	388569.21	409603.38	1.5
ER12	Existing residential receptor, Thornham New Road (west of Cherrington Drive)	388783.42	409732.24	1.5
ER13	Existing residential receptor, Thornham New Road (east of Cherrington Drive)	388837.21	409746.2	1.5
ER14	Existing residential receptor, Thornfields	389376.77	409423.85	1.5
ER15	Existing residential receptor, A627(M)	388939.56	408569.43	1.5

Receptor ID	Receptor Location	Grid Reference		Height (m)
		X	Y	
	(east of Stakehill Lane)			
ER16	Existing residential receptor, A664/Manchester Road (north of Olive Street)	388461.86	410091.57	1.5
ER17	Existing residential receptor, A664/Manchester Road (south of Ark Royal)	388390.01	410340.75	1.5
ER18	Existing receptor, A664/Manchester Road	388357.91	410464.63	1.5
ER19	Existing receptor, A664/Queensway (south of Albion Street)	388386.25	410467.23	1.5
ER20	Existing residential receptor, A664/Manchester Road	388149.78	410724.52	1.5
ER21	Existing residential receptor, M62 (east of Thornham Interchange)	390160.85	410370.24	1.5
ER22	Existing receptor, M62 (west of Thornham Interchange)	389109.37	409963.6	1.5
ER23	Existing receptor, A627(M) (north of Thornham Interchange)	389163.75	410766.47	1.5
ER24	Existing residential receptor, A664/Queensway (between Hillcrest Road and Cross Street)	388467.16	410599.15	1.5
ER25	Existing residential receptor, Burnley Lane	390685.27	406600.84	1.5
ER26	Existing receptor, A664/Queensway (north of Hugo Street)	388491.04	410680.66	1.5
Proposed Sensitive Residential Receptors				
PR1	Proposed receptor, on site	388540.82	409155.89	1.5
PR2	Proposed receptor, on site	388815.09	409702.87	1.5
PR3	Proposed receptor, on site	388992.09	409781.3	1.5
PR4	Proposed receptor, on site	389533.86	409822.47	1.5
PR5	Proposed receptor, on site	389356.04	409039.99	1.5
PR6	Proposed receptor, on site	388826.1	408894.77	1.5

3.4.10 Street Canyon

Following a review of the local area it was noted that several areas in Rochdale could be considered as potential street canyons. A street canyon is a place where the street has continuous buildings (or other structures e.g. dense canopy) that would inhibit the dispersion of pollutants and therefore lead to elevated pollutant concentrations within the canyon area.

The A664/Manchester Road and A664/Queensway have terraced buildings. The buildings and walls present are considered likely to cause 'street canyon' effects along some sections of the roads (A664/Manchester Road - north of Olive Street; A664/Queensway - the section between Hillcrest Road and Cross Street;

A664/Queensway - north of Hugo Street), and therefore impede the dispersion of pollutants. Therefore, street canyons were applied within the model, where appropriate.

3.4.11 Background Air Quality Data Used in the Modelling

Background concentration of NO₂ was taken from one of the nearby diffusion tubes (RO3ANO). This monitoring location is classed as 'urban background' and considered likely to be representative of conditions at the proposed development site and receptor locations.

Given that there are currently no nearby representative background monitoring locations for PM₁₀ and PM_{2.5}, background concentrations for PM₁₀ and PM_{2.5} were obtained from the 2018-based background maps on the Defra LAQM Support website, which provides estimated annual average background concentrations of PM₁₀ and PM_{2.5} on a 1 km² grid basis. The Defra LAQM background concentration maps assume that background concentrations will improve (i.e. reduce) over time, in line with predicted reduction in vehicle emissions as well as reduction in emissions from other sources. For a conservative approach, Defra background data for 2019 has been used for all modelled scenarios. The background concentrations included in the dispersion modelling assessment are presented in Table 3.2.

Table 3.2: Estimated 2019 Background NO₂, PM₁₀ and PM_{2.5} Concentrations used in the Dispersion Modelling Assessment

Receptor ID	2019 Annual Average (µg/m ³)			Source
	NO ₂	PM ₁₀	PM _{2.5}	
RO24ANO	22.1	12.30	8.36	NO ₂ – 2019 monitored data from diffusion tube RO3ANO
ER1	22.1	12.30	8.22	
ER2	22.1	11.98	8.08	
ER3	22.1	11.98	8.08	
ER4	22.1	11.64	7.68	
ER5	22.1	11.64	7.68	
ER6	22.1	11.64	7.68	
ER7	22.1	11.64	7.68	PM ₁₀ & PM _{2.5} – 2019 estimated data from Defra 2018 based Background maps
ER8	22.1	12.91	8.40	
ER9	22.1	12.91	8.40	
ER10	22.1	12.91	8.40	
ER11	22.1	12.91	8.40	
ER12	22.1	12.91	8.40	

Receptor ID	2019 Annual Average ($\mu\text{g}/\text{m}^3$)			Source
	NO ₂	PM ₁₀	PM _{2.5}	
ER13	22.1	12.91	8.40	
ER14	22.1	12.92	8.31	
ER15	22.1	11.64	7.68	
ER16	22.1	12.30	8.36	
ER17	22.1	12.30	8.36	
ER18	22.1	12.30	8.36	
ER19	22.1	12.30	8.36	
ER20	22.1	12.30	8.36	
ER21	22.1	13.18	8.56	
ER22	22.1	12.92	8.31	
ER23	22.1	13.13	8.61	
ER24	22.1	12.30	8.36	
ER25	22.1	12.30	8.22	
ER26	22.1	12.30	8.36	
PR1	22.1	12.91	8.40	
PR2	22.1	12.91	8.40	
PR3	22.1	12.91	8.40	
PR4	22.1	12.92	8.31	
PR5	22.1	12.92	8.31	
PR6	22.1	11.64	7.68	

3.4.12 Other Model Input Parameters

In order to represent the nature of the study area and surrounding area, a surface roughness length of 0.5m was included in the model. The Monin-Obukhov length (related to atmospheric stability) was assumed to be 30m (Cities and large towns). Settings were adjusted at the meteorological data site; a surface roughness length of 0.3m and a Monin-Obukhov length of 10m (Small towns <50,000) were used.

3.4.13 Model Verification and Results Processing

The ADMS-Roads dispersion model has been widely validated for this type of assessment and is considered to be fit for purpose. Model validation undertaken by the

software developer will not have included validation in the vicinity of the development considered in this assessment. To determine the performance of the model at a local level, a comparison of modelled results with the results of monitoring carried out within the study area was undertaken. This process of verification attempts to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results, and was carried out following the methodology specified in LAQM.TG.22.

There are twenty-eight diffusion tube locations within Rochdale. Three of them (i.e. RO2ANO, RO3ANO, RO24ANO) are located within the study area. Diffusion tube RO24ANO was used for model verification as it is a roadside location, traffic data is available and it is considered to be the monitoring location most representative of the development site. Therefore, the 2019 monitored annual mean NO₂ concentration from RO24ANO has been used to verify the predicted road NO_x concentrations. Diffusion tube RO2ANO is situated to the east of the A664/Manchester Road and to the north of the M62. RO3ANO is situated to the east of the A664/Manchester Road and to the south of the M62. Diffusion tubes RO2ANO and RO3ANO have not been included in the modelling study as they are situated too far away from the road (20m and 15m respectively).

Full details of the verification calculations are presented within Annex E.

An adjustment factor of 1.14 was obtained as part of the verification process for NO₂. The adjustment factor was applied to the modelled road-NO_x component before estimation of annual mean NO₂ concentrations using the NO_x: NO₂ calculator (version 8.1) available from the Defra website.

Local monitoring data are not available for concentrations of PM₁₀ and PM_{2.5} and consequently, the predicted road-PM₁₀ and road-PM_{2.5} contributions were adjusted using the factor calculated for road-NO_x, before adding the appropriate background concentrations. This approach is consistent with guidance given in LAQM.TG.22.

LAQM.TG.22 advises that an exceedance of the 1 hour mean NO₂ objective is unlikely to occur where the annual mean concentration is below 60µg/m³, where road transport is the main source of pollution. This concentration has been used to screen whether the hourly mean objective is likely to be achieved.

Once processed, the predicted concentrations (full results presented in Section 5) were compared against the current statutory limit values and objectives for NO₂, PM₁₀ and PM_{2.5} set out in Table 2.1.

The modelling input parameters for the dispersion modelling assessment are presented in Table 3.3.

Table 3.3 Summary of Inputs to the Dispersion Model

Parameter	Brief description	Input into Model
Emission year	Predicted emission rates depend on the year of emission being used	2019 for S1, 2033 for S2 and S3
Road source emissions	Road source emission rates calculated from traffic flow data using an emission factor toolkit from AQC or Defra EFT	EFT v11.0
Time varied emissions	Diurnal variations of emissions applied to road sources	2019 national diurnal profile
Road elevation	Elevation of road above ground level	Elevation has been applied to areas where the motorway goes over roads. No terrain file used.
Road width	Width of road (m)	Road widths determined based on approximate measurement of roads (internet mapping)
Road type	Selection of different types of road to be assessed, inputted into the emission factor toolkit calculations	'Urban (not London)' and 'Motorway (not London)' settings
Road speeds	Speed of the road effects the vehicle emissions to air	Standard speed limits used and professional judgement with slowing at junctions or bends
Meteorology	Representative hourly sequential meteorological data	Rostherne No.2 meteorological station 2019
Latitude	Allows the location of the model area to be determined	53.6°
Surface roughness	This defines the surface roughness of the model area	0.5m at the proposed site and 0.3m at the meteorological site
Monin-Obukhov length	A boundary layer parameter required to precisely describe the atmospheric stability conditions and to predict dispersion of pollutants released from road traffic	30m at the proposed site and 10m the meteorological site

3.4.14 Uncertainties and Assumptions

The following uncertainties and assumptions have been made in the air quality assessment:

- In the absence of measured PM₁₀ and PM_{2.5} at the proposed development location, estimated background data from the Defra LAQM website were used in the assessment. In reality, baseline air quality levels vary with time and location but in the absence of on-site baseline monitoring data, the assumption that the baseline concentrations obtained from the above-mentioned data source is applicable to the site location, is considered appropriate.
- Emissions from the average vehicle fleet using the local road network cannot be known, and therefore it is assumed those generated by the EFT provide an accurate representation of emissions generated by vehicles which currently and will use the modelled roads.
- There will be uncertainties introduced because the modelling has simplified real-world processes into a series of algorithms. For example, it has been assumed that wind conditions measured at the Rostherne No.2 meteorological station in 2019 were representative of wind conditions at the site. Furthermore, it has been assumed that the subsequent dispersion of emitted pollutants will conform to a Gaussian distribution over flat terrain in order to simplify the real-world dilution and dispersion conditions.
- An important step in the assessment is verifying the dispersion model against measured data. The model verification was based on the comparison of model results based on 2019 traffic data with 2019 measured NO₂ diffusion tube data. As no PM₁₀ or PM_{2.5} monitoring data were available near the site area, the adjustment factors used for the predicted roadside NO_x concentrations have been applied to the predicted PM₁₀ and PM_{2.5} concentrations, as per guidance provided in the LAQM.TG.22.
- The national diurnal profile published by the Department for Transport for 2019, has been assumed to be applicable for the roads assessed.
- There is an element of uncertainty in all measured and modelled data. All values presented in this report are best possible estimates.

4 BASELINE AIR QUALITY CHARACTERISATION

4.1 Local Emissions Sources

The application site is located in an area where the main source of air pollution is likely to be roads therefore, the principal pollutants relevant to this assessment are considered to be NO₂, PM₁₀ and PM_{2.5}. Thornham New Road forms the northern boundary of the site. To the east is the A627(M), and adjacent to the south of the site is the A627(M) Spur. The A664 bounds the site to the southwest.

4.2 Local Authority Review and Assessment of Air Quality

As directed by the Environment Act 1995, local authorities are required to review and assess air quality with respect to the standards and objectives for the pollutants specified in the Government's National Air Quality Strategy (2007). Local Authorities are required to undertake annual reporting of the concentrations of defined pollutants in their area.

Where objectives are not predicted to be met, local authorities must declare an AQMA. In addition, local authorities are required to produce an AQAP, which outlines measures aimed at improving air quality within the designated AQMA.

Following a review of local air quality, it is noted that the site is partially located within the Greater Manchester Combined Authority AQMA, declared for exceedances of the annual mean nitrogen dioxide (NO₂) AQS.

4.3 Baseline Monitoring Data

4.3.1 Local Authority Air Quality Monitoring Data

According to the Greater Manchester Combined Authority Air Quality Annual Status Report for 2021 (published in June 2022), there was 1 automatic station (monitoring NO₂, PM₁₀ and PM_{2.5}) and 27 diffusion tube sites operational in RBC in 2021. The annual average NO₂ concentrations for 2020 and 2021 at monitoring locations within 1km of the site are presented in Table 4.1. None of these diffusion tubes exceeded the annual mean AQS in 2020 or 2021.

Table 4.1: Annual Mean NO₂ Concentrations at the Diffusion Tube Location within 1km of the Proposed Development Site

Site ID	Site Type	Approx. Distance from Site (km)	Annual Mean NO ₂ Concentration (µg/m ³)	
			2020	2021
RO2ANO	Urban Background	0.25	21.7	-
RO3ANO	Urban Background	0.35	16.0	16.4
AQS			40	

4.3.2 LAQM-Support Estimated Background Data

Estimated background air quality data are available from the LAQM Support website operated by Defra. The website provides estimated annual average background concentrations of NO₂, PM₁₀ and PM_{2.5} on a 1 km² grid basis.

Table 4.2 reproduces estimated annual average background NO₂, PM₁₀ and PM_{2.5} concentrations at the proposed development site for 2022-2024. No exceedances of the annual average AQSs for NO₂, PM₁₀ or PM_{2.5} have been predicted. As background concentrations are predicted to fall with time, background concentrations in future years would not be expected to exceed their respective annual mean standards after the proposed development opening year.

Table 4.2: Defra LAQM Estimated Background Annual Average NO₂, PM₁₀ and PM_{2.5} Concentrations at the Proposed Development Site (from 2018 base map)

Assessment Year	Estimated Annual Average Pollutant Concentrations Derived from the LAQM Support Website		
	Annual Average NO ₂ (µg/m ³)	Annual Average PM ₁₀ (µg/m ³)	Annual Average PM _{2.5} (µg/m ³)
2022	18.02	12.48	7.98
2023	17.18	12.38	7.90
2024	16.28	12.29	7.83
AQS	40	40	20

Notes: Presented concentrations for 1km² grid centred on 389500, 409500; approximate centre of the Site is 389158, 409362.

5 IMPACT ASSESSMENT

5.1 Construction Phase

5.1.1 Construction Dust and Particulate Matter

Fugitive dust emissions arising from construction activities are likely to be variable in nature and will depend upon the type and extent of the activity, soil type and moisture, road surface conditions and weather conditions. Periods of dry weather combined with higher than average wind speeds have the potential to generate more dust.

Construction activities that are often the most significant potential sources of fugitive dust emissions are:

- Earth moving, due to the handling, storage and disposal of soil and subsoil materials;
- Construction aggregate usage, due to the transport, unloading, storage and use of dry and dusty materials (such as cement and sand);
- Movement of heavy site vehicles on dry or untreated haul routes; and,
- Movement of vehicles over surfaces where muddy materials have been transferred off-site (for example, on to public highways).

Fugitive dust arising from construction activities is mainly of a particle size greater than the PM₁₀ fraction (that which can potentially impact upon human health), however it is noted that construction activities may contribute to local PM₁₀ concentrations. Appropriate dust control measures can be highly effective for controlling emissions from potentially dust generating activities identified above, and adverse effects can be greatly reduced or eliminated.

5.1.2 Potential Dust Emission Magnitude

With reference to the IAQM criteria outlined in Annex A, the dust emission magnitudes for earthworks, construction and trackout activities are summarised in Table 5.1. Information was provided by the client, and for any information not available assumptions have been made based on the size of the development and professional judgement. There is no demolition proposed, hence the assessment for demolition is not included.

Table 5.1: Summary of Dust Emission Magnitudes (Before Mitigation)

Activity	IAQM Criteria	Dust Emission Magnitude
Demolition	N/A	N/A
Earthworks	- Total site area is >10,000m². - The soil at the site is expected to be sand and gravel underlain by clay. Therefore, soil type is considered to be potentially dusty. - The number of heavy earthmoving vehicles active at any one time is estimated to be 5-10. - The height of stockpiled materials is estimated to be 4-8m. - The total material to be moved is estimated to be >100,000 tonnes. - Earthworks are anticipated to take place all year round.	Large
Construction	- Total building volume is estimated to be >100,000m³. - It is unknown whether on-site concrete batching or sandblasting is proposed. - Construction materials are considered to be potentially dusty.	Large
Trackout	- The number of HDV outward movements in any one day is estimated to be 10-50. - Vehicles are estimated to travel on unpaved roads >100m in length. - The surface soil type is sand/gravel.	Medium-Large

5.1.3 Sensitivity of the Area

As per the IAQM guidance, the sensitivity of the area takes into account a number of factors, including:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM₁₀, the local background concentration; and,
- Site specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

Consideration is given to human and ecological receptors and the trackout route proposed. With regard to trackout routes, it is considered that construction traffic could access and exit the application site via Rochdale Road or Thornham New Road.

Figure 5.1 and 5.2 show maps indicating the earthworks/construction and trackout buffers for identifying the sensitivity of the area and Table 5.2 presents the determined sensitivity of the area. Construction activities are relevant up to 350m from the proposed development site boundary whereas trackout activities are only considered relevant up to 50m from the edge of the roads likely to be affected by trackout (up to

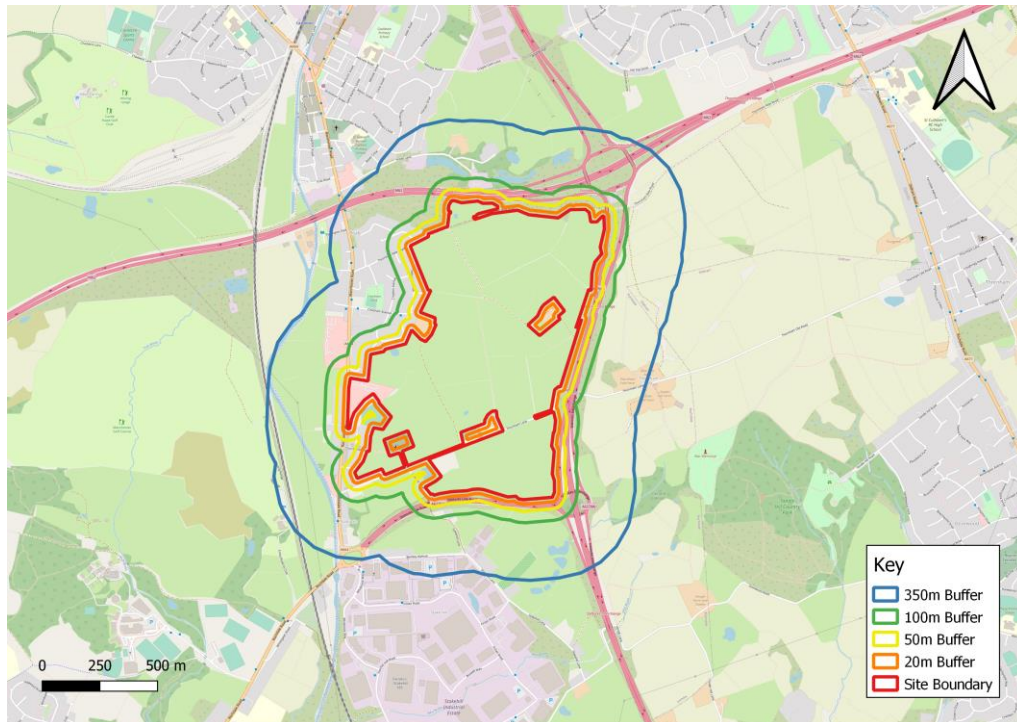
500m from site entrance as per 'large' dust emission magnitude), as per the IAQM guidance.

No designated ecological receptors have been identified within 50m of the site boundary. However, parts of the Rochdale Canal Site of Special Scientific Interest (SSSI)/Special Area of Conservation (SAC) are located within 50m of the trackout route.

Table 5.2: Sensitivity of the Area

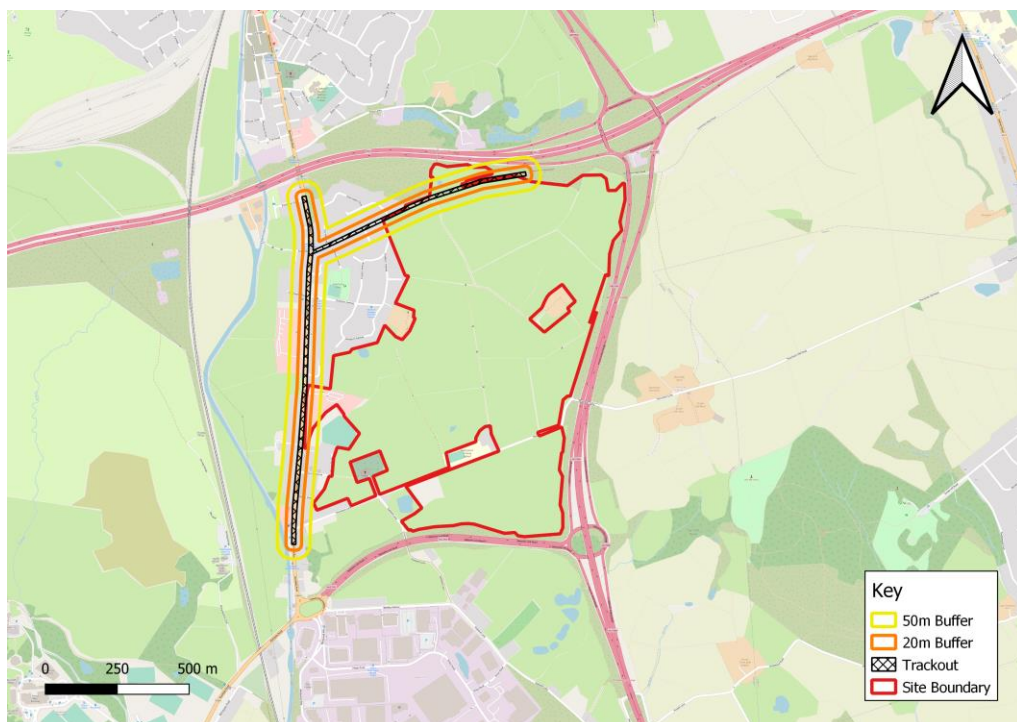
Potential Impact		Sensitivity of the surrounding area		
		Demolition	Earthworks and Construction	Trackout
Dust soiling	Receptor sensitivity	N/A	High	High
	Number of receptors		10-100	10-100
	Distance from source		<20m	<20m
	Overall Sensitivity of the Area		High	High
Human health	Receptor sensitivity		High	High
	Annual mean PM ₁₀ concentration		<24µg/m ³	<24µg/m ³
	Number of receptors		10-100	10-100
	Distance from Source		<20m	<20m
	Overall Sensitivity of the Area		Low	Low
Ecological	Receptor sensitivity		N/A	Medium
	Distance from source		N/A	<20m
	Overall Sensitivity of the Area		N/A	Medium

Figure 5.1: Earthworks and Construction Activities Buffer Map



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Figure 5.2: Trackout Activities Buffer Map



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5.1.4 Risk of Impacts

The dust emission magnitudes from Table 5.1 have been combined with the sensitivity of the area from Table 5.2, to determine the risk of impacts of construction activities before mitigation, as summarised in Table 5.3. Based on these dust risk categories, site specific mitigation measures have been defined as detailed in Section 6 and Annex B.

Table 5.3: Summary of the Dust Risk from Construction Activities

Potential Impact	Dust Risk Impact			
	Demolition	Earthworks	Construction	Trackout
Dust soiling	N/A	High Risk	High Risk	Medium-High Risk
Human health		Low Risk	Low Risk	Low Risk
Ecological		N/A	N/A	Low-Medium Risk

5.1.5 Exhaust Emissions from Construction Plant and Vehicles

The operation of vehicles and equipment powered by internal combustion engines results in the emission of exhaust gases containing pollutants including NO_x, PM₁₀, volatile organic compounds, and carbon monoxide. The quantities emitted depend on factors such as engine type, service history, pattern of usage and fuel composition.

Construction traffic will comprise haulage/construction vehicles and vehicles used for workers' trips to and from the application site. The greatest impact on air quality due to emission from construction phase vehicles will be in areas adjacent to the application site access and nearby road network. It is anticipated that construction traffic will access the application site via Rochdale Road or Thornham New Road. The number of HDV outward movements per day is estimated to be 10-50 HDVs, which is considered unlikely to bring about a significant change in air quality.

The operation of site equipment and machinery will result in emissions to the atmosphere of exhaust gases, but with suitable controls and site management such emissions are unlikely to be significant (as per LAQM.TG.22).

5.2 Operational Phase

5.2.1 Traffic Emission Dispersion Modelling Results

Detailed dispersion modelling has been undertaken with the use of the ADMS-Roads dispersion model software, following guidance in accordance with LAQM.TG.22. The modelled concentrations have been verified and results processed as detailed in Section 3 and Annex E.

Full results are presented in Annex F and a summary is provided below.

5.2.1.1 Nitrogen Dioxide (NO₂)

The AQS for annual mean NO₂ concentrations is 40µg/m³. The results of the assessment show that concentrations are predicted to meet the annual mean NO₂ AQS at all assessment receptors.

Table 5.4 shows the comparison of annual mean NO₂ concentrations between the S2 '2033 without proposed development', S3 '2033 with proposed development' scenarios at the assessed receptor locations. The percentage changes in annual mean NO₂ concentrations relative to the AQS and the classification of impact magnitudes with reference to the EPUK-IAQM guidance are also presented.

The proposed development is not predicted to cause any new exceedances of the annual mean NO₂ AQS.

The changes in annual mean NO₂ concentrations as a result of the proposed development and traffic redistribution, range between 0% and 2% of the air quality assessment level (AQAL). The impacts of the proposed development on nearby sensitive receptors are predicted to be 'negligible' at all receptor locations.

LAQM.TG.22 notes that 'exceedances of the 1-hour mean AQS for NO₂ are only likely to occur where annual mean concentrations are 60µg/m³ or above'. In the opening year of 2033, annual mean NO₂ concentrations (see Table 5.4) are not predicted to exceed 60µg/m³ at any receptors. Therefore, it is not anticipated that the hourly mean NO₂ AQS would be exceeded at the site prior to or when the proposed development becomes operational.

Table 5.4: Predicted Annual Mean NO₂ Impact

Receptor ID	Annual Mean NO ₂ Concentration					
	AQ-S2 - 2033 Without Proposed Development		AQ-S3 - 2033 With Proposed Development		Change Between AQ-S2 and AQ-S3 as % of AQAL*	Impact**
	NO ₂ Concentration (µg/m ³)	As % of AQAL	NO ₂ Concentration (µg/m ³)	As % of AQAL		
ER1	24.66	62	24.66	62	0%	Negligible
ER2	23.37	58	23.39	58	0%	Negligible
ER3	24.62	62	24.64	62	0%	Negligible
ER4	22.80	57	22.85	57	0%	Negligible
ER5	25.35	63	25.87	65	1%	Negligible
ER6	25.28	63	25.89	65	2%	Negligible
ER7	22.48	56	22.52	56	0%	Negligible
ER8	23.33	58	23.56	59	1%	Negligible
ER9	23.20	58	23.42	59	1%	Negligible
ER10	24.14	60	24.52	61	1%	Negligible
ER11	23.43	59	23.65	59	1%	Negligible
ER12	22.98	57	23.05	58	0%	Negligible
ER13	23.07	58	23.18	58	0%	Negligible
ER14	22.85	57	22.87	57	0%	Negligible
ER15	22.78	57	22.83	57	0%	Negligible
ER16	24.86	62	25.29	63	1%	Negligible
ER17	23.98	60	24.31	61	1%	Negligible
ER18	24.50	61	24.69	62	0%	Negligible
ER19	25.11	63	25.39	63	1%	Negligible
ER20	25.38	63	25.68	64	1%	Negligible
ER21	25.02	63	25.03	63	0%	Negligible

Receptor ID	Annual Mean NO ₂ Concentration					
	AQ-S2 - 2033 Without Proposed Development		AQ-S3 - 2033 With Proposed Development		Change Between AQ-S2 and AQ-S3 as % of AQAL*	Impact**
	NO ₂ Concentration (µg/m ³)	As % of AQAL	NO ₂ Concentration (µg/m ³)	As % of AQAL		
ER22	26.20	66	26.22	66	0%	Negligible
ER23	23.05	58	23.05	58	0%	Negligible
ER24	23.40	59	23.43	59	0%	Negligible
ER25	23.73	59	23.73	59	0%	Negligible
ER26	23.39	58	23.41	59	0%	Negligible
PR1	-	-	23.36	58	-	-
PR2	-	-	22.90	57	-	-
PR3	-	-	23.13	58	-	-
PR4	-	-	23.62	59	-	-
PR5	-	-	22.98	57	-	-
PR6	-	-	22.49	56	-	-
*As recommended in the EPUK-IAQM guidance, percentages have been rounded to whole numbers. Changes less than 0.5% i.e. 0%, have been described as negligible.						
**Impacts are determined in accordance with EPUK-IAQM guidance.						
Note: NO _x : NO ₂ calculator only covers the years 2018 to 2030. Therefore, year 2030 was used in S2 and S3 scenarios for NO _x to NO ₂ conversion calculations.						

5.2.1.2 Particulate Matter (PM₁₀)

Table 5.5 shows the comparison of annual mean PM₁₀ concentrations between the 'S2 2033 without proposed development' and 'S3 2033 with proposed development' scenarios at the assessed receptor locations. The percentage changes in annual mean PM₁₀ concentrations relative to the AQS and the classification of impact magnitudes with reference to the EPUK-IAQM guidance are also presented.

Predicted annual mean concentrations of PM₁₀ are all below the AQS of 40µg/m³ for all modelled scenarios.

The proposed development is not predicted to cause any new exceedances of the annual mean PM₁₀ AQS.

The changes in annual mean PM₁₀ concentrations as a result of the proposed development range between 0% and 1% of the AQAL. The impacts of the proposed development on nearby sensitive receptors in relation to PM₁₀ concentrations are predicted to be 'negligible' at all receptor locations.

LAQM.TG.22 indicates that the number of annual exceedances of the 24-hour mean PM₁₀ AQS can be estimated using the following formula: $-18.5 + 0.00145 \times \text{annual mean}^3 + (206/\text{annual mean})$. Table 5.6 presents results for the 24-hour mean PM₁₀ concentrations as number of day greater than 50µg/m³ for S2 and S3. The AQS for 24-hour mean PM₁₀ concentrations is 50µg/m³ to be exceeded no more than 35 times a year. The number of days exceeding 50µg/m³ predicted is a maximum of 2 days/annum, which is well below the AQS.

The results indicate that in the opening year of 2033, no exceedances of the annual mean PM₁₀ AQS are predicted with the proposed development at any of the proposed receptors.

Table 5.5: Predicted Annual Mean PM₁₀ Impact

Receptor ID	Annual Mean PM ₁₀ Concentration					
	AQ-S2 - 2033 Without Proposed Development		AQ-S3 - 2033 With Proposed Development		Change Between AQ-S2 and AQ-S3 as % of AQAL*	Impact**
	PM ₁₀ Concentration (µg/m ³)	As % of AQAL	PM ₁₀ Concentration (µg/m ³)	As % of AQAL		
ER1	13.12	33	13.13	33	0	Negligible
ER2	12.68	32	12.69	32	0	Negligible
ER3	13.44	34	13.45	34	0	Negligible
ER4	12.07	30	12.11	30	0	Negligible
ER5	13.58	34	13.90	35	1	Negligible
ER6	13.39	33	13.74	34	1	Negligible
ER7	11.81	30	11.83	30	0	Negligible
ER8	13.59	34	13.72	34	0	Negligible
ER9	13.57	34	13.71	34	0	Negligible
ER10	13.99	35	14.21	36	1	Negligible
ER11	13.58	34	13.71	34	0	Negligible
ER12	13.28	33	13.32	33	0	Negligible
ER13	13.33	33	13.39	33	0	Negligible
ER14	13.18	33	13.18	33	0	Negligible
ER15	11.90	30	11.92	30	0	Negligible
ER16	13.90	35	14.19	35	1	Negligible
ER17	13.42	34	13.63	34	1	Negligible
ER18	13.56	34	13.68	34	0	Negligible
ER19	13.85	35	14.01	35	0	Negligible
ER20	14.07	35	14.24	36	0	Negligible
ER21	14.35	36	14.35	36	0	Negligible

Receptor ID	Annual Mean PM ₁₀ Concentration					
	AQ-S2 - 2033 Without Proposed Development		AQ-S3 - 2033 With Proposed Development		Change Between AQ-S2 and AQ-S3 as % of AQAL*	Impact**
	PM ₁₀ Concentration (µg/m³)	As % of AQAL	PM ₁₀ Concentration (µg/m³)	As % of AQAL		
ER22	14.59	36	14.60	37	0	Negligible
ER23	13.45	34	13.46	34	0	Negligible
ER24	12.95	32	12.97	32	0	Negligible
Er25	13.02	33	13.02	33	0	Negligible
ER26	12.95	32	12.96	32	0	Negligible
PR1	-	-	13.66	34	-	-
PR2	-	-	13.25	33	-	-
PR3	-	-	13.33	33	-	-
PR4	-	-	13.47	34	-	-
PR5	-	-	13.21	33	-	-
PR6			11.81	30		

*As recommended in the EPUK-IAQM guidance, percentages have been rounded to whole numbers. Changes less than 0.5% i.e. 0%, will be described as negligible.

**Impacts are determined in accordance with EPUK-IAQM guidance.

Table 5.6: Predicted 24-Hour Mean PM₁₀ Impact

Receptor ID	24-Hour Mean PM ₁₀ * (number of day >50µg/m ³)		
	AQ-S2 - 2033 Without Proposed Development	AQ-S3 - 2033 With Proposed Development	Change between AQ-S2 and AQ-S3
ER1	0	0	0
ER2	1	1	0
ER3	0	0	0
ER4	1	1	0
ER5	0	0	0
ER6	0	0	0
ER7	1	1	0
ER8	0	0	0
ER9	0	0	0
ER10	0	0	0
ER11	0	0	0
ER12	0	0	0
ER13	0	0	0
ER14	0	0	0
ER15	1	1	0
ER16	0	0	0
ER17	0	0	0
ER18	0	0	0
ER19	0	0	0
ER20	0	0	0
ER21	0	0	0
ER22	0	0	0
ER23	0	0	0
ER24	1	1	0
ER25	1	1	0
ER26	1	1	0

Receptor ID	24-Hour Mean PM ₁₀ * (number of day >50µg/m ³)		
	AQ-S2 - 2033 Without Proposed Development	AQ-S3 - 2033 With Proposed Development	Change between AQ-S2 and AQ-S3
PR1	-	1	-
PR2	-	2	-
PR3	-	1	-
PR4	-	1	-
PR5	-	1	-
PR6	-	1	-

*Rounded to whole days

5.2.1.3 Particulate Matter (PM_{2.5})

Table 5.7 shows the comparison of annual mean PM_{2.5} concentrations between the 'S2 2033 without proposed development' and 'S3 2033 with proposed development' scenarios at the assessed receptor locations. The results as percentages of the AQAL (i.e. the UK AQSS) are also presented which are used in the determination of significance of impacts (based on the EPUK-IAQM guidance).

Predicted annual mean concentrations of PM_{2.5} are all below the AQS of 20µg/m³ for all modelled scenarios. The proposed development is not predicted to cause any new exceedances of the annual mean PM_{2.5} AQS.

The changes in annual mean PM_{2.5} concentrations as a result of the proposed development range between 0% and 1% of the AQAL. The impacts of the proposed development on nearby sensitive receptors in relation to PM_{2.5} concentrations, are predicted to be 'negligible' at all receptor locations.

The results indicate that in the opening year of 2033, no exceedances of the annual mean PM_{2.5} AQS are predicted with the proposed development at any of the proposed receptors.

Table 5.7: Predicted Annual Mean PM_{2.5} Impact

Receptor ID	Annual Mean PM _{2.5} Concentration					Impact**
	AQ-S2 - 2033 Without Proposed Development		AQ-S3 - 2033 With Proposed Development		Change Between AQ-S2 and AQ-S3 as % of AQAL*	
	PM _{2.5} Concentration (µg/m ³)	As % of AQAL	PM _{2.5} Concentration (µg/m ³)	As % of AQAL		
ER1	8.73	44	8.73	44	0%	Negligible
ER2	8.47	42	8.48	42	0%	Negligible
ER3	8.89	44	8.90	44	0%	Negligible
ER4	7.92	40	7.94	40	0%	Negligible
ER5	8.75	44	8.93	45	1%	Negligible
ER6	8.65	43	8.84	44	1%	Negligible
ER7	7.78	39	7.79	39	0%	Negligible
ER8	8.77	44	8.85	44	0%	Negligible
ER9	8.76	44	8.84	44	0%	Negligible
ER10	9.00	45	9.13	46	1%	Negligible
ER11	8.78	44	8.85	44	0%	Negligible
ER12	8.62	43	8.64	43	0%	Negligible
ER13	8.64	43	8.68	43	0%	Negligible
ER14	8.47	42	8.47	42	0%	Negligible
ER15	7.83	39	7.85	39	0%	Negligible
ER16	9.27	46	9.42	47	1%	Negligible
ER17	8.99	45	9.10	46	1%	Negligible
ER18	9.07	45	9.13	46	0%	Negligible
ER19	9.23	46	9.32	47	0%	Negligible
ER20	9.34	47	9.44	47	0%	Negligible
ER21	9.28	46	9.28	46	0%	Negligible

Receptor ID	Annual Mean PM _{2.5} Concentration					
	AQ-S2 - 2033 Without Proposed Development		AQ-S3 - 2033 With Proposed Development		Change Between AQ-S2 and AQ-S3 as % of AQAL*	Impact**
	PM _{2.5} Concentration (µg/m ³)	As % of AQAL	PM _{2.5} Concentration (µg/m ³)	As % of AQAL		
ER22	9.33	47	9.34	47	0%	Negligible
ER23	8.80	44	8.80	44	0%	Negligible
ER24	8.73	44	8.74	44	0%	Negligible
ER25	8.64	43	8.64	43	0%	Negligible
ER26	8.73	44	8.73	44	0%	Negligible
PR1	-	-	8.82	44	-	-
PR2	-	-	8.60	43	-	-
PR3	-	-	8.65	43	-	-
PR4	-	-	8.65	43	-	-
PR5	-	-	8.49	42	-	-
PR6	-	-	7.78	39	-	-
*As recommended in the EPUK-IAQM guidance, percentages have been rounded to whole numbers. Changes less than 0.5% i.e. 0%, will be described as negligible.						
**Impacts are determined in accordance with EPUK-IAQM guidance.						

5.2.2 Summary

Overall, the impact of the proposed development on NO₂, PM₁₀ and PM_{2.5} concentrations at sensitive human receptors, prior to mitigation, is negligible; all receptor locations are not expected to be significantly impacted.

Predicted concentrations across the proposed development site itself show that future occupants are not predicted to be exposed to air quality exceeding the UK AQSS.

6 MITIGATION MEASURES & RESIDUAL IMPACTS

6.1 Construction Phase Mitigation

The dust emitting activities outlined in Section 5.1 can be effectively controlled by appropriate dust control measures and any adverse effects can be greatly reduced or eliminated.

Prior to commencement of construction activities, it is anticipated that an agreement on the scope of a dust management plan (DMP, this may be as part of a Construction Environmental Management Plan (CEMP)) for the construction phase will be reached with the Local Authority to ensure that the potential for adverse environmental effects on local receptors is minimised. The DMP should include *inter alia*, measures for controlling dust and general pollution from site construction operations, and include details of any monitoring activities, if appropriate. Controls should be applied through the construction period to ensure that emissions are mitigated.

The dust risk categories identified have been used to recommend appropriate, site-specific mitigation measures, and are presented in Annex B.

6.2 Operational Phase Mitigation

As identified in Section 5, the proposed development is not expected to have a significant effect on local air quality in the absence of mitigation. The results indicate annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} are predicted to be below the relevant AQs. Therefore, the effect of air quality on existing sensitive receptors and future occupiers of the proposed development is judged to be negligible. Nevertheless, best practice mitigation measures should be considered to further reduce any residual effects on air quality, which could include but are not limited to:

- Implementation of a travel plan; and
- Installation of electric vehicle charging points.

7 CONCLUSIONS

An air quality assessment has been prepared for the proposed residential development on Land at Stakehill, Rochdale, with reference to existing air quality in the area and relevant air quality legislation, policy and guidance.

Construction phase impacts were assessed following the IAQM construction dust guidance. Mitigation measures are recommended to reduce the risk of dust and particulate matter being generated and re-suspended. With implementation of the appropriate measures, no significant impacts are anticipated during the construction phase.

The principal air quality impact once the proposed development is complete and operational is likely to be emissions from the increased traffic on local roads surrounding the site. An assessment of operational phase impacts has been undertaken using the ADMS-Roads atmospheric dispersion model.

Concentrations of the key pollutants (NO₂, PM₁₀ and PM_{2.5}) were predicted at relevant receptor locations for the base year and for 2033 without and with the proposed development. The air quality impacts were assessed as 'negligible' with respect to annual mean NO₂, PM₁₀ and PM_{2.5} at all assessed sensitive receptors. Therefore, the overall air quality impact of the development may be considered 'not significant'. Therefore, it is not considered that any specific mitigation measures will be required for operational phase. Nevertheless, it is recommended that best practice mitigation measures, as detailed in Section 6.2, should be included to minimise the potential impact of the development on local air quality.

No significant stationary combustion sources such as combined heat and power (CHP) plants or biomass boilers are proposed within the development.

Based on the results of the assessment, it is judged that with appropriate construction phase mitigation, the proposed development complies with relevant national and local planning policies and that there are no air quality constraints.

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ANNEX A - CONSTRUCTION DUST ASSESSMENT METHODOLOGY

This annex contains the construction dust assessment methodology used in the assessment.

To assess the potential impacts, construction activities are divided into demolition, earthworks, construction and trackout. The descriptors included in this section are based upon the IAQM 2014 guidance. The assessment follows the steps recommended in the guidance.

Step 1: Screen the requirement for assessment

The first step is to screen out the requirement for a construction dust assessment, this is usually a somewhat conservative level of screening. An assessment is usually required where there is:

- a 'human receptor' within:
 - 350m of the boundary of the site; or
 - 50m of the route used by construction vehicles on the public highway, up to 500m from the site entrance(s).
- an 'ecological receptor':
 - 50m of the boundary of the site; or
 - 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

Step 2A: Defining the Potential Dust Emission Magnitude

Demolition

The dust emission magnitude category for demolition is varied for each site in terms of timing, building type, duration and scale. Examples of the potential dust emission classes are provided in the guidance as follows:

- **Large:** Total building volume >50,000m³, potentially dusty construction material, on-site crushing and screening, demolition activities >20m above ground level;
- **Medium:** Total building volume 20,000m³ – 50,000m³, potentially dusty construction material, demolition activities 10m – 20m above ground level; and,
- **Small:** Total building volume <20,000m³, construction material with low potential for dust release, demolition activities <10m above ground, demolition during wetter months.

Earthworks

The dust emission magnitude category for earthworks is varied for each site in terms of timing, geology, topography and duration. Examples of the potential dust emission classes are provided in the guidance as follows:

- **Large:** Total site area >10,000m², potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds >8m in height, total material moved >100,000 tonnes;
- **Medium:** Total site area 2,500 – 10,000m², moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 4 – 8m in height, total material moved 20,000 – 100,000 tonnes; and,

- **Small:** Total site area < 2,500m², 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, total material moved <10,000 tonnes, earthworks during wetter months.

Construction

The dust emission magnitude category for construction is varied for each site in terms of timing, building type, duration, and scale. Examples of the potential dust emissions classes are provided in the guidance as follows:

- **Large:** Total building volume >100,000m³, piling, on site concrete batching;
- **Medium:** Total building volume 25,000 – 100,000m³, potentially dusty construction material (e.g. concrete), piling, on site concrete batching; and,
- **Small:** Total building volume <25,000m³, construction material with low potential for dust release (e.g. metal cladding or timber).

Trackout

Factors which determine the dust emission magnitude class of trackout activities are vehicle size, vehicle speed, vehicle number, geology and duration. Examples of the potential dust emissions classes are provided in the guidance as follows:

- **Large:** >50 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;
- **Medium:** 10 – 50 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 – 100m; and,
- **Small:** <10 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50m.

Step 2B: Defining the Sensitivity of the Area

The sensitivity of the area is defined for dust soiling, human health and ecosystems. The sensitivity of the area takes into account the following factors:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM₁₀, the local background concentration; and,
- Site-specific factors, such as whether there are natural shelters such as trees, to reduce the risk of wind-blown dust.

Table A1 was used to define the sensitivity of different types of receptors to dust soiling, health effects and ecological effects.

Table A1: Sensitivity of the Area Surrounding the Site

Sensitivity of Area	Dust Soiling	Human Receptors	Ecological Receptors
High	- Users can reasonably expect a enjoyment of a high level of amenity. - The appearance, aesthetics or value of their property would be diminished by soiling. - The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. - Examples include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms.	- Locations where members of the public are exposed over a time period relevant to the air quality objective for PM₁₀ (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day) - Examples include residential properties, hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	- Locations with an international or national designation <i>and</i> the designated features may be affected by dust soiling. - Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain. - Examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.
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 by soiling. - The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. - Examples include parks and places of work.	- Locations where the people exposed are workers and exposure is over a time period relevant to the air quality objective for PM₁₀ (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). - Examples include office and shop workers, but will generally not include workers occupationally exposed to PM₁₀, as protection is covered by Health and Safety at Work legislation.	- 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. - Example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.
Low	- The enjoyment of amenity would not reasonably be expected. - Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling. - There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. - Examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.	- Locations where human exposure is transient. - Indicative examples include public footpaths, playing fields, parks and shopping streets.	- Locations with a local designation where the features may be affected by dust deposition. - Example is a local Nature Reserve with dust sensitive features.

Based on the sensitivities assigned of the different types of receptors surrounding the site and numbers of receptors within certain distances of the site, a sensitivity classification for the area can be defined for each. Tables A2 to A4 indicate the method used to determine the sensitivity of the area for dust soiling, human health and ecological impacts, respectively.

For trackout, as per the guidance, it is only considered necessary to consider trackout impacts up to 50m from the edge of the road.

Table A2: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distances from the Source (m)			
		<20	<50	<100	<350
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

Table A3: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Conc.	Number of Receptors	Distances from the Source (m)				
			<20	<50	<100	<200	<350
High	>32µg/m ³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m ³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m ³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m ³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32µg/m ³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32µg/m ³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28µg/m ³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m ³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

Table A4: Sensitivity of the area to Ecological Impacts

Receptor Sensitivity	Distances from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Step 2C: Defining the Risk of Impacts

The final step is to use both the dust emission magnitude classification with the sensitivity of the area, to determine a potential risk of impacts for each construction activity, before the application of mitigation. Tables A5 to A7 indicate the method used to assign the level of risk for each construction activity.

Table A5: Risk of Dust Impacts from 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

Table A6: Risk of Dust Impacts from Earthworks/Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A7: Risk of Dust Impacts from Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

ANNEX B - SITE-SPECIFIC CONSTRUCTION PHASE RECOMMENDED MITIGATION MEASURES

The IAQM 2014 guidance divides site-specific mitigation measures are divided into general measures applicable to all sites, and measures specific to earthworks, construction and trackout. Depending on the level of risk assigned in relation to each type of construction activity, different mitigation is assigned. The method for assigning mitigation measures as detailed in the IAQM guidance has been used. For those 'general' mitigation measures, the greatest risk category assigned to the assessed construction activities should be applied. Therefore, in this case, the 'high risk' 'general' site mitigation measures have been recommended.

There are two categories of mitigation measure – 'highly recommended' and 'desirable', which are indicated according to the dust risk level identified in Table 5.3. Desirable measures are presented in *italics*.

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of people accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.

Dust Management

- 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. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real-time PM10 continuous monitoring and/or visual inspections.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site or the action taken to resolve the situation in the log book.
- Hold regular liaison meetings with other high risk construction sites within 500 m 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 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 if asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.
- Carry out regular site inspections to monitor compliance with any dust management plan, record inspection 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.
- Agree dust deposition, dust flux, or real-time PM₁₀ continuous monitoring locations with the Council (if deemed appropriate upon consultation).

Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors as far as possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Fully enclose site specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating Vehicles/Machinery

- Ensure all NRMM meet the required emission standards.
- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
- Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas.
- 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.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes 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 any dry spillages and clean up as soon as reasonably practicable after the event using wet clean methods.

Waste Management

- Avoid bonfires or burning of waste materials.

Measures Specific to Demolition

No demolition is proposed.

Measures Specific to Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable
- Use Hessian, mulchers or trackifiers where it is not possible to re-vegetate to cover with topsoil, as soon as practicable
- Only remove the cover in small areas during work and not all at once.

Measures Specific to Construction

- Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
- *For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.*

Measures Specific to Trackout

- 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.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent the escape of materials during transport.

- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Record any inspections of haul routes and subsequent action in site log book.
- Implement 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 10 m from receptors where possible.

ANNEX C - OPERATIONAL PHASE IMPACT SIGNIFICANCE CRITERIA

This annex contains the significance criteria used in the assessment for the operational impact assessment from the 2017 EPUK-IAQM guidance.

To assess the impacts of a development on the surrounding area, the EPUK-IAQM 2017 guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion. Table C1 presents the suggested framework, provided within the EPUK/IAQM guidance, for describing the impacts.

Table C1: Impact Descriptors for Individual Receptors

Long term average concentration at receptors 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% 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
Notes AQAL = Air Quality Assessment Level, which for this assessment related to the UK Air Quality Strategy Objectives. Where the % change in concentrations is <0.5%, the change is described as 'negligible' regardless of the concentration. Where concentrations increase the impact is described as adverse, and where it decrease as beneficial.				

The EPUK/IAQM guidance notes that the criteria in Table C1 should be used to describe impacts at individual receptors and should only be considered as a starting point to make a judgement on significance of effects, as other influences may need to be accounted for. The EPUK/IAQM guidance states that the assessment of overall significance should be based on professional judgement, taking into account several factors, including:

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

The EPUK/IAQM guidance states that for most road transport related emissions, long-term average concentrations are the most useful for evaluating the severity of impacts.

ANNEX D - TRAFFIC DATA

This annex contains the traffic data used in the dispersion modelling assessment, provided by the Transport Consultants (SCP) for the development. Traffic data for the M62 (i.e. count point 56048), A627(M) between Slattocks Interchange and Chadderton Roundabout (i.e. count point 46072) and A627(M) above Slattocks Interchange (i.e. count point 36074) was obtained from DfT road traffic statistics. Included are traffic flow data in AADT and the percentage Heavy Duty Vehicles (HDV), the speed included for each road link and the diurnal profile used. Reduced speeds were used at junctions, roundabout, roads with traffic light and pedestrian lane.

Table D1 24-hour Traffic Flows (AADT) and Speed Data used in the Dispersion Modelling Assessment

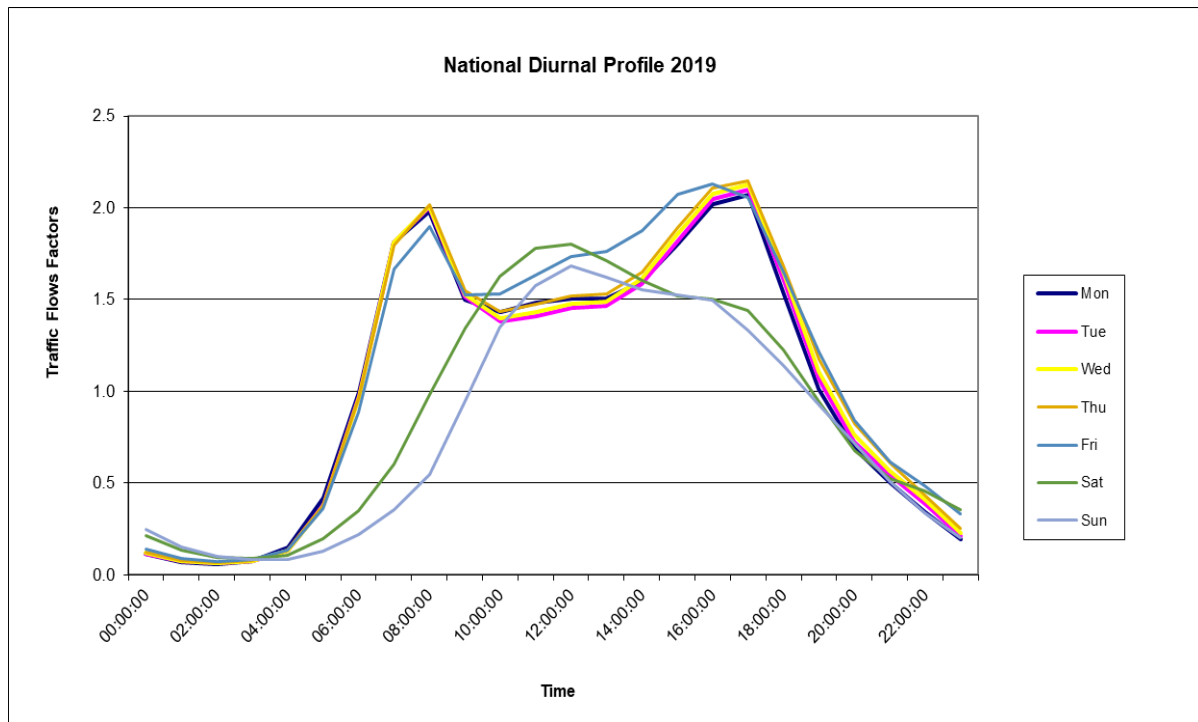
Figure D1 Diurnal Profile Included in the Dispersion Modelling Assessment

Table D1: 24-hour Traffic Flows (AADT) and Speed Data used in the Dispersion Modelling Assessment

Ref	Road Link	Average Speed (kph)	S1 '2019 Base year'		S2 2033 'Without the proposed development'		S3 2033 'With the proposed development'	
			Total AADT	HDV%	Total AADT	HDV%	Total AADT	HDV%
1	A58/Bolton Road	64	20,049	4.1%	22,716	4.1%	23,555	4.0%
2	Silk Street	48	6,675	4.1%	7,563	4.4%	7,563	4.4%
3	A58/Manchester Road (west of Rochdale Bypass)	64	28,068	4.0%	31,803	4.0%	33,004	3.9%
4	Manchester Road	48	2,103	2.3%	2,382	2.3%	2,382	3.1%
5	B6452 Roch Walley Way	64	15,194	3.2%	17,216	3.2%	17,817	3.1%
6	A58/Manchester Road (east of Rochdale Bypass)	64	36,013	3.7%	40,805	3.7%	41,406	3.7%
7	Rochdale Bypass	64	32,916	4.0%	37,297	4.0%	37,297	4.0%
8	A664/Manchester Road	48	15,683	4.8%	17,770	4.8%	19,840	4.3%
9	Albion Street (west of A664/Queensway)	48	3,056	4.7%	3,463	4.7%	3,463	4.7%
10	A664/Queensway (north of Albion Street)	48	5,049	4.6%	5,721	4.6%	5,721	4.6%
11	A664/Manchester Road (between A664/Queensway and Albion Street)	48	12,627	4.6%	14,307	4.6%	16,377	2.4%
12	A664/Queensway (south of Albion Street)	48	10,323	4.0%	11,697	4.0%	13,394	3.4%
13	Albion Street (east of A664/Queensway)	48	2,212	1.9%	2,506	1.9%	2,506	1.9%
14	A664/Manchester Road (north of M62)	48	12,426	4.8%	14,079	4.8%	17,847	3.8%
15	West of Thornham Interchange	112	17,400	6.7%	19,716	6.7%	19,934	6.6%
16	A627(M) (north of Thornham Interchange)	112	35,358	5.4%	40,063	5.4%	40,063	5.5%
17	East of Thornham Interchange	112	9,984	6.3%	11,313	6.3%	11,471	6.3%
18	East of Thornham Interchange	112	11,030	9.4%	12,497	9.4%	12,639	9.4%
19	A627(M) (south of Thornham Interchange)	112	50,150	5.7%	56,824	5.7%	57,225	5.7%
20	West of Thornham Interchange	112	13,684	6.4%	15,504	6.4%	15,748	6.3%
21	A664/Manchester Road (south of M62)	48	15,729	4.1%	17,822	4.1%	22,631	3.2%

Ref	Road Link	Average Speed (kph)	S1 '2019 Base year'		S2 2033 'Without the proposed development'		S3 2033 'With the proposed development'	
			Total AADT	HDV%	Total AADT	HDV%	Total AADT	HDV%
22	Thornham New Road	48	798	2.3%	905	2.3%	1,520	1.4%
23	A664/Manchester Road (north of proposed western site access)	48	15,562	4.0%	17,633	4.0%	22,416	3.2%
24	Earl Street	48	207	0.0%	234	0.0%	234	0.0%
25	A664/Manchester Road (south of proposed western site access)	48	16,182	4.1%	18,336	4.1%	22,756	3.3%
26	Thornham Lane	48	678	1.6%	768	1.6%	768	1.7%
27	A664/Rochdale Road	48	16,378	4.2%	18,557	4.2%	22,977	3.4%
28	A627(M) (east of Slattocks Roundabout)	64	16,039	6.0%	18,173	6.0%	20,213	5.4%
29	Bentley Avenue	48	1,499	4.6%	1,699	4.6%	1,699	4.6%
30	Whitbrook Way	48	8,760	9.2%	9,926	9.2%	10,159	9.0%
31	A664/Rochdale Road (west of Slattocks Roundabout)	48	19,710	3.4%	22,332	3.4%	24,479	3.1%
32	A627(M)	64	16,326	5.9%	18,499	5.9%	20,539	5.3%
33	A627(M) (north of Slattocks Interchange)	112	2,907	9.6%	3,294	9.6%	3,695	8.6%
34	A627(M) (north of Slattocks Interchange)	112	5,664	7.6%	6,418	7.6%	6,778	7.2%
35	A627(M) (south of Slattocks Interchange)	112	5,814	4.5%	6,587	4.5%	7,261	4.1%
36	A627(M) (south of Slattocks Interchange)	112	4,848	3.2%	5,494	3.2%	6,098	2.9%
37	A664 Assheton Way	64	16,027	5.6%	18,160	5.6%	19,231	5.3%
38	Oldham Road	48	12,420	5.2%	14,072	5.2%	14,072	5.2%
39	Ashton Lane	48	465	2.6%	527	2.6%	527	2.7%
40	Oldham Road	48	27,074	5.2%	30,677	5.2%	31,747	5.1%
41	A627(M) (north of Chadderton Roundabout)	112	16,929	4.1%	19,182	4.1%	19,787	4.0%
42	A627(M) (north of Chadderton Roundabout)	112	17,274	4.5%	19,573	4.5%	20,247	4.4%
43	Broadway	48	24,558	3.5%	27,826	3.5%	28,078	3.5%
44	A627/Chadderton Way	48	36,685	3.0%	41,567	3.0%	42,162	3.0%
45	A627(M) (south of Chadderton Roundabout)	112	6,342	3.5%	7,186	3.5%	7,200	3.5%
46	A627(M) (south of Chadderton Roundabout)	112	3,682	2.9%	4,172	2.9%	4,367	2.8%
47	Burnley Lane	48	14,419	2.2%	16,338	2.2%	16,347	2.3%
Count Point 46072	A627(M) (between Slattocks Interchange and Chadderton Roundabout)	112	55,234	6.4%	55,689	5.4%	55,689	5.4%
Count Point 56048	M62		120,207	14.8%	124,525	18.0%	124,525	18.0%
Count Point 36074	A627(M) (above Slattocks Interchange)	112	55,749	6.3%	57,974	6.0%	57,974	6.0%

Figure D1: Diurnal Profile Included in the Dispersion Modelling Assessment



ANNEX E - MODELLING OF OPERATIONAL PHASE – VERIFICATION METHODOLOGY

The dispersion model results were verified following the relevant guidance in LAQM.TG.22. Predicted results from a dispersion model may differ from measured concentrations for a variety of reasons, these are identified in LAQM.TG.22 to include:

- Estimates of background concentrations;
- Meteorological data uncertainties;
- Uncertainties in source data for example, traffic flow data, stack emissions and emission factors;
- Model input parameters such as roughness length, minimum Monin-Obukhov and overall model limitations; and,
- Uncertainties associated with monitoring data, including locations.

2019 monitored annual mean NO₂ concentrations from diffusion tube RO24ANO was used for model verification. Table E1 presents details of the location of this tube.

Table E1: Monitoring Location used in Verification Process

Site ID	Receptor Location	Site Type	Grid Reference		Height (m)
			X	Y	
RO24ANO	A664/Manchester Road	Urban Background	388089	410822	2.5

In line with the LAQM.TG.22 guidance, modelled versus measured road NO_x at the diffusion tube site is shown in Table E2 and E3.

Table E2: Modelled versus Monitored NO_x/NO₂

Site	Monitored total NO ₂	Background NO ₂	Monitored Road Contribution NO _x	Modelled road contribution NO _x	Ratio of Modelled and Measured Road NO _x
RO24ANO	30	22.1	15.43	13.52	1.1

An adjustment factor of **1.14** was obtained and applied to the modelled road-NO_x component predicted at all receptors. The verified annual average modelled road contribution NO_x concentrations have then been converted into annual average road NO₂ by using the Defra NO_x to NO₂ spreadsheet. A comparison of monitored and model adjusted NO₂ concentrations is presented in Table E3. This shows that, following adjustment, the modelled NO₂ result is within +/- 25% of the monitored NO₂ concentration. In accordance with the LAQM.TG.22 guidance, it is not considered that further verification is required.

Table E3: Modelled versus Monitored NO₂ Concentrations

Site	Background NO ₂	Monitored total NO ₂	Modelled total NO ₂ after adjustment	% Difference [(modelled – monitored)/monitored]x100
RO24ANO	22.1	30	30	0

Measured annual PM₁₀ and PM_{2.5} concentrations were not available therefore, as per the recommendations in LAQM.TG.22, the same factor was applied to the modelled PM₁₀ and PM_{2.5} concentrations.

Verified model results are shown in Annex F.

ANNEX F - MODEL RESULTS

Table F1: Predicted Pollutant Concentrations at Proposed Receptor Locations (2019 meteorological data, background concentrations included): S1, S2 and S3

Receptor ID	Annual Mean NO ₂ Concentrations (µg/m ³)			Annual Mean PM ₁₀ Concentrations (µg/m ³)			Number of days when 24 Hour PM ₁₀ Concentrations >50µg/m ³ (days)			Annual Mean PM _{2.5} Concentrations (µg/m ³)		
	S1 2019	S2 2033	S3 2033	S1 2019	S2 2033	S3 2033	S1 2019	S2 2033	S3 2033	S1 2019	S2 2033	S3 2033
ER1	31.39	24.66	24.66	13.26	13.12	13.13	0	0	0	8.86	8.73	8.73
ER2	26.21	23.37	23.39	12.66	12.68	12.69	1	1	1	8.49	8.47	8.48
ER3	30.45	24.62	24.64	12.90	13.44	13.45	1	0	0	8.69	8.89	8.90
ER4	24.29	22.80	22.85	12.05	12.07	12.11	1	1	1	7.92	7.92	7.94
ER5	31.94	25.35	25.87	13.47	13.58	13.90	0	0	0	8.75	8.75	8.93
ER6	31.77	25.28	25.89	13.31	13.39	13.74	0	0	0	8.66	8.65	8.84
ER7	23.38	22.48	22.52	11.81	11.81	11.83	1	1	1	7.79	7.78	7.79
ER8	25.99	23.33	23.56	13.56	13.59	13.72	0	0	0	8.79	8.77	8.85
ER9	25.62	23.20	23.42	13.54	13.57	13.71	0	0	0	8.77	8.76	8.84
ER10	28.62	24.14	24.52	13.95	13.99	14.21	0	0	0	9.03	9.00	9.13
ER11	26.47	23.43	23.65	13.57	13.58	13.71	0	0	0	8.80	8.78	8.85
ER12	25.25	22.98	23.05	13.29	13.28	13.32	0	0	0	8.65	8.62	8.64
ER13	25.55	23.07	23.18	13.34	13.33	13.39	0	0	0	8.67	8.64	8.68
ER14	24.77	22.85	22.87	13.19	13.18	13.18	0	0	0	8.49	8.47	8.47
ER15	24.32	22.78	22.83	11.90	11.90	11.92	1	1	1	7.85	7.83	7.85
ER16	31.1	24.86	25.29	13.85	13.90	14.19	0	0	0	9.29	9.27	9.42
ER17	28.2	23.98	24.31	13.38	13.42	13.63	0	0	0	9.00	8.99	9.10
ER18	29.7	24.50	24.69	13.52	13.56	13.68	0	0	0	9.09	9.07	9.13
ER19	31.5	25.11	25.39	13.79	13.85	14.01	0	0	0	9.26	9.23	9.32
ER20	32.1	25.38	25.68	13.98	14.07	14.24	0	0	0	9.36	9.34	9.44
ER21	32.7	25.02	25.03	14.40	14.35	14.35	0	0	0	9.38	9.28	9.28

Receptor ID	Annual Mean NO ₂ Concentrations (µg/m ³)			Annual Mean PM ₁₀ Concentrations (µg/m ³)			Number of days when 24 Hour PM ₁₀ Concentrations >50µg/m ³ (days)			Annual Mean PM _{2.5} Concentrations (µg/m ³)		
	S1 2019	S2 2033	S3 2033	S1 2019	S2 2033	S3 2033	S1 2019	S2 2033	S3 2033	S1 2019	S2 2033	S3 2033
ER22	36.8	26.20	26.22	14.66	14.59	14.60	0	0	0	9.47	9.33	9.34
ER23	25.4	23.05	23.05	13.47	13.45	13.46	0	0	0	8.83	8.80	8.80
ER24	26.4	23.40	23.43	12.94	12.95	12.97	1	1	1	8.75	8.73	8.74
ER25	27.6	23.73	23.73	13.04	13.02	13.02	1	1	1	8.68	8.64	8.64
ER26	26.3	23.39	23.41	12.93	12.95	12.96	1	1	1	8.75	8.73	8.73
PR1	-	-	23.36	-	-	13.66	-	-	0	-	-	8.82
PR2	-	-	22.90	-	-	13.25	-	-	0	-	-	8.60
PR3	-	-	23.13	-	-	13.33	-	-	0	-	-	8.65
PR4	-	-	23.62	-	-	13.47	-	-	0	-	-	8.65
PR5	-	-	22.98	-	-	13.21	-	-	0	-	-	8.49
PR6	-	-	22.49	-	-	11.81	-	-	1	-	-	7.78
AQS	40			40			35 days			20		