

Plot 9a, First Street

Air Quality Assessment

First Street Developments Limited

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X G.Hodgkiss Principal author Signed by: Hodgkiss, Glyn	X J.Carrington Checked by Signed by: Carrington, Jenny	X J.Carrington Verified by Signed by: Carrington, Jenny

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Executive Summary

Cundall has been commissioned to prepare an Air Quality Assessment Report for the Proposed Development at Plot 9a, First Street, Manchester. The Proposed Development will deliver the construction of a 9-storey building with basement comprising office accommodation (Use Class E(c)), car parking, cycle parking and associated facilities, landscaping and associated works. It is part of a wider vision to create a mixed-use neighbourhood in the area, supported by a mixture of leisure, office and residential blocks.

The Proposed Development lies within Greater Manchester's Air Quality Management Area (AQMA), which was declared in 2000 due to exceedances of the annual mean nitrogen dioxide (NO₂) objective threshold and 24-hour particulate matter (PM₁₀) objective. Existing conditions within the study area indicate that there is potential for nitrogen dioxide (NO₂) concentrations in the wider area to exceed the National Air Quality Objective threshold levels.

The methodology for the assessment has been agreed with the Environmental Health team at Manchester City Council. In setting the scope of assessment, consideration has been made of the potential for impacts to occur during both the construction and operation phases of the development, and the exposure of future occupants of the site to air pollution.

A construction dust impact assessment was undertaken in accordance with Institute of Air Quality Management (IAQM) guidance. It was concluded that in the absence of any adequate mitigation, there is a *medium* risk from the construction, earthworks and trackout dust-generating activities associated with the Proposed Development. With appropriate mitigation measures implemented for all dust generating activities, it is anticipated that the dust generation and harmful emissions from construction site activities will not be significant.

There will be 26 accessible car parking spaces located in the basement of the Proposed Development and predicted daily vehicle trips are likely to exceed the IAQM threshold criterion (of 100 vehicles per day) for when a detailed assessment of transport emissions is required. Detailed assessment of transport related emissions indicates negligible air quality impacts at all surrounding receptors, apart from one residential receptor where impacts ranged between negligible and moderate. Mitigation measures include the exclusion of standard car parking places and a Framework Travel Plan has been prepared to encourage future users of the building to use Public Transport modes.

The energy design for the Proposed Development has not yet been finalised. Based on current design, the energy requirements for the development will be provided by electrical sources. There is therefore unlikely to be any large, centralised combustion plant for the building that would result in NO_x emissions above threshold values published by the IAQM. Proposals are for an emergency generator to be located within an external plant area at roof level. At the time of writing, generator requirements / specifications are not available, although design measures will be adopted to see that the compliance with the relevant requirements are achieved. Further screening in accordance with the criteria listed in the guidance published by the IAQM may be required once details are finalised.

The Client will commit to the implementation of the best practice mitigation measures identified in this report during the construction phase of the development. It is anticipated that the generation of dust and harmful pollutants emissions from construction site activities will be reduced with the correct implementation of these measures. It is anticipated that a Construction Management Plan will be required as part of a planning permission condition. This would need to conform to Manchester City Council's planning requirements and be agreed with the Local Planning Authority prior to commencement of works.

Worst-case dispersion modelling has indicated that NO₂ levels range from 31.8 to 51.4 µg/m³ throughout the development, with potential exceedances of the 40µg/m³ annual mean NO₂ objective being predicted on lower levels at all building facades. There are no exceedances of the current annual mean NO₂ objective and lower WHO threshold value at fourth floor levels and higher throughout the Proposed Development.

Worst-case dispersion modelling has indicated that PM₁₀ levels range from 19.3 to 23.5 µg/m³ and there are no exceedances of the annual mean PM₁₀ objective, however, the lower WHO threshold value of 20µg/m³ is exceeded

throughout the Proposed Development.

Worst- case dispersion modelling has indicated that PM_{2.5} levels range from 11.2 to 13.7 µg/m³. Although there are no exceedances of the annual mean PM_{2.5} objective, the lower WHO threshold value of 10µg/m³ is exceeded throughout the Proposed Development.

Since the estimated NO₂ values are predicted to be well below 60µg/m³ compliance with the short-term objectives (applicable to a commercial use) is anticipated. There will therefore not be a requirement for gaseous filtration. However, in order to comply with best practice guidelines, consideration should be made for positioning air inlets on higher floors of the development, or at roof level, and integrating particulate filters into the design where this is practicable. This will assist in striving towards achieving the more stringent WHO guideline values, and meeting Greater Manchester's Breathe-Life Initiative 2030 targets.

Indoor air testing within the building would provide operational data on indoor air quality to inform the acceptability of the ventilation strategy. Indoor air quality monitoring could also be used to confirm the suitability opening windows for purge or natural ventilation purposes as external conditions allow.

Overall, it was concluded that with the provision of appropriate mitigation measures, construction activities and operation impacts will have no significant effects on local air quality. The proposals are therefore compliant with the requirements of the National Planning Policy Framework and Manchester City and Greater Manchester's planning policy.

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1.0

Introduction

1.0 Introduction

Cundall has been commissioned by Ask Real Estate Limited to prepare an Air Quality Assessment Report to support a planning application for the redevelopment of Plot 9a, First Street, Manchester. The site is located within the Greater Manchester Air Quality Management Area (AQMA).

1.1 Study Area

The site covers 0.48 ha and is located at the south eastern edge of Manchester City Centre, within the First Street Strategic Development Framework (SDF) 2018 area. It is part of a wider vision to create a mixed-use neighbourhood in the area, supported by a mixture of leisure, office and residential blocks.

The site is known as Plot 9a and is bound by River Street to the north, a future development site known as Plot 10 to the east, future development Plot 9b to the south, and Medlock Street to the west.

The Site is currently mostly hardstanding, reflecting its recent use as a temporary car parking area ahead of the plot's permanent redevelopment. There is limited vegetation on site, limited to small shrubbery to the edge of Medlock Street.

The location of the development site is illustrated in Figure 1-1. Additional context is provided by the aerial image (Figure 1-2).

Figure 1-1: Location of the Development Site (Courtesy of Google My Maps)



Figure 1-2: Aerial Image (Courtesy of Google Earth)



1.2 Proposed Development

The Proposed Development will deliver 18,977 sqm of commercial office space over 9 storeys with basement, comprising office accommodation (Use Class E(c)), car parking, cycle parking and associated facilities, landscaping and associated works.

Key parameters for the Proposed Development are summarised in Table 1-1.

Parameter	Proposed Development
Proposed Site Area	0.48ha
Proposed Development	Erection of a 9-storey building with basement, comprising office accommodation (Use Class E(c)), car parking, cycle parking and associated facilities, landscaping and associated works"
Proposed Office Space	18,977sqm GIA
Proposed Development Height	9 Storeys c.44m
Parking	26 car parking spaces (all accessible), 130 cycle spaces

Table 1-1: Key Parameters of the Proposed Development

An illustration of the proposed ground floor layout is provided in Figure 1-3, and a typical elevation is provided in Figure 1-4, courtesy of Jon Matthews Architects¹.

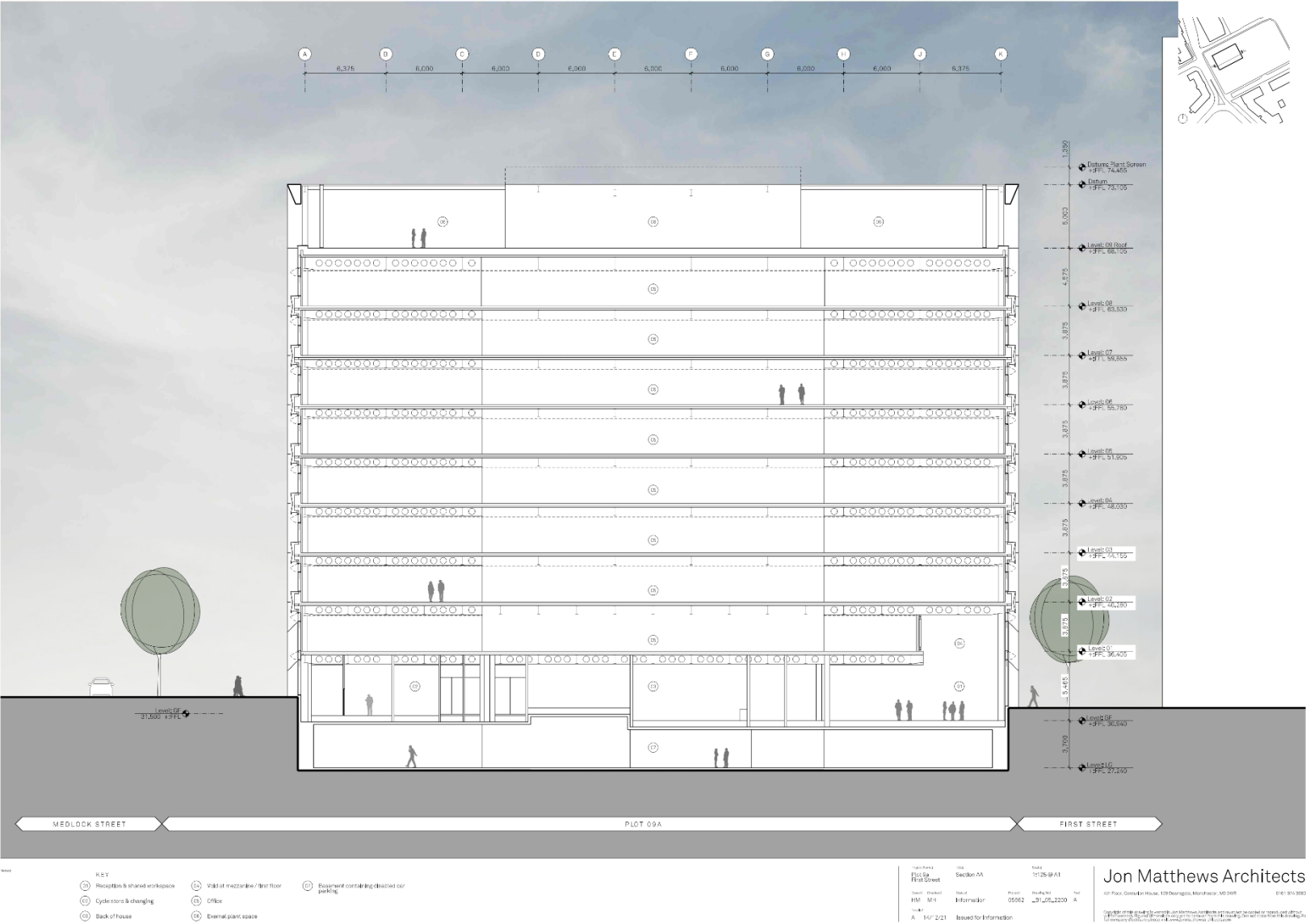
¹ Drawings provided 14th December 2021 courtesy of Jon Matthews Architects

Architectural floor plan of the first floor of the Jon Matthews Architects building. The plan shows a large rectangular building with a central core containing stairs and elevators. The building is divided into various rooms, including offices, meeting rooms, a reception area, and a lounge. The plan includes a grid system with letters A through K and numbers 01 through 08. Dimensions are provided for various sections of the building. The plan is titled "First Floor" and "General Arrangement Plan". The architect's name, "Jon Matthews Architects", is at the bottom right.

First Floor
General Arrangement Plan

Jon Matthews Architects
Architects
100 South Main Street, Suite 200, Worcester, MA 01602
Tel: 508.853.1234
Fax: 508.853.1235
www.jonmatthewsarchitects.com

Figure 1-4: Proposed Medlock Street Elevation (Courtesy of Jon Matthews Architects)



1.3 Scope of Assessment

This assessment has been prepared in support of the planning application and considers the potential for effects to occur during both the construction and operation phases of the development.

This air quality assessment outlines the relevant air quality legislation and policy guidance and presents the assessment methodology. The main pollutants of concern for this assessment are oxides of nitrogen (NO_x), including nitrogen dioxide (NO₂), fine and very fine particulate matter (PM₁₀ and PM_{2.5}). The existing air quality conditions are presented and the likely air quality impacts from construction and operation of the Proposed Development are considered. The effects are assessed in the context of relevant national, regional and local air quality legislation, policies and guidance. Mitigation measures are proposed, as required, to reduce the effect of the Proposed Development to negligible, as far as reasonably practicable.

The scope of the assessment is detailed further in section 3.A

This assessment has been undertaken by Cundall's Air Quality Team, who are all Members/Associates of the Institute of Air Quality Management; senior staff within the team are professionally chartered and full details are provided in Appendix A.

1.4 Consultation with Manchester City Council (MCC)

Following the execution of an initial screening and scoping exercise, consultation with Manchester City Council's Air Quality Team was undertaken between October and December 2021 to discuss and agree the scope of the assessment. Further details are provided in Appendix B.

2.0

Legislation, Policy and Guidance

2.0 Legislation, Policy and Guidance

2.1 Key Legislation and Policy

This assessment considers key air quality legislation, which is summarised in Table 2-1.

Legislation	Description
EU Ambient Air Quality Directive 2008/50/EC²	Establishes the requirements of Member States in terms of improvements required to air quality. Sets standards for a variety of pollutants for human-health and the environment.
The Air Quality Standards Regulations 2010³	Transposes formalised EU Limit Values set out in directive 2008/50/EC to UK law. An Amendment was published in 2016 ⁴
The Clean Air Quality Strategy 2019⁵	Defra published a Clean Air Strategy in January 2019, setting out a wide range of actions for UK Government to reduce pollutant emissions and improve air quality. The actions are grouped into four main emission sources: Transport, Domestic, Farming and Industry The Clean Air Strategy sets out the case for action and demonstrates the government's determination to improve air quality. In some cases, the goals are even more ambitious than EU requirements to reduce people's exposure to toxic pollutants like nitrogen oxides, ammonia, particulate matter, non-methane volatile organic compounds and sulphur dioxide.
Environment Act 1995, Part IV⁶	Defines the requirements for Local Air Quality Management (LAQM).
Environment Protection Act 1990⁷, amended by the Pollution Prevention and Control Act 1999, and the Environment Act 2021.	Part III provides statutory nuisance provisions for nuisance dust. Nuisance complaints about dust would need to be investigated by the Local Authority. In practice, dust deposition is generally managed appropriately by suitable on-site practices and mitigation, avoiding the determination of statutory nuisance and/or prosecution or enforcement notices.
The Non-Road Mobile Machinery (Type-Approval and Emission of Gaseous and Particulate Pollutants) Regulations 2018⁸	Developers and contractors are required to meet compliance with the emission standards for Non-Road Mobile Machinery (NRMM). The Regulations exercise of the powers conferred by section 2(2) of, and paragraph 1A of Schedule 2 to, the European Communities Act 1972 in relation to the type, description, construction or equipment of vehicles.
Environment Act, 2021.	The Act makes provision about targets, plans and policies with the focus of improving the natural environment. This includes air quality, as well as water, nature and biodiversity, regulation of chemicals, waste and resource efficiency and recall of products failing to meet environmental standards. The Act introduces a duty on government to bring forward at least two air quality targets by October 2022 for consultation. These are to be to reduce the annual average level of fine particulate matter (PM ^{2.5}) and to set a long-term (minimum of 15 year) target for its reduction. The 2021 Act amends the Environment Act 1995 Part IV by seeking to strength local air quality a management (LAQM) through greater cooperation at local level and broadening the range of organisations that

² Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

³ HMSO (2010). Statutory Instrument 2010 No. 1001, The Air Quality Standards Regulations 2010, London: HMSO

⁴ HMSO (2016). Statutory Instrument 2016 No. 1184, Environmental Protection, England, The Air Quality Standards (Amendment) Regulations 2016, London: HMSO, <https://www.legislation.gov.uk/uksi/2016/1184/contents/made>

⁵ Department for Environment Food and Rural Affairs (Defra) (2019) Clean Air Strategy 2019, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770715/clean-air-strategy-2019.pdf

⁶ Environment Act 1995, Chapter 25, Part IV Air Quality

⁷ Environmental Protection Act 1990, Chapter 43, Part III Statutory Nuisances and Clean Air <https://www.legislation.gov.uk/ukpga/1990/43/part/III>

⁸ HMSO (2018) The Non-Road Mobile Machinery Type-Approval and Emission of Gaseous and Particulate Pollutants) Regulations 2018, UK Statutory Instruments, 2018 No. 764, <https://www.legislation.gov.uk/uksi/2018/764/made>

Legislation	Description
	play a role in improving air quality. Responsibility for tackling air pollution is to be shared between designated local authorities, all tiers of local government and neighbouring authorities. The environment secretary will be required to review the Air Quality Strategy at least every five years and publish annual progress reports to parliament. The 2021 Act amends the Clean Air Act 1993 to give local authorities more power to reduce pollution in smoke control areas by replacing the criminal offence of emitting smoke from a chimney in a smoke control area with a civil penalty regime, seeking to enable simpler, quicker and more proportionate enforcement at local level. It also amends the Environmental Protection Act 1990 by extending the system of statutory nuisance to private dwellings in smoke control areas, which could result in abatement notice and issuing fines for criminal offence of breaches. The 2021 Act introduces new powers for the government to compel vehicle manufacturers to recall vehicles and non-road machinery that fails to meet legal binding standards.

Table 2-1: Key Legislation

The air quality EU limit values and UK Air Quality Objectives (AQOs) which apply to this assessment are shown in Table 2-2⁹. Some pollutants have long-term (annual mean) objectives due to the chronic way they affect human-health or the natural environment and others have short-term (1-hour, 24-hour mean) objectives due to the acute way they affect human health or the natural environment.

Pollutant	Averaging Period	Objective Threshold / EU Limit Value ($\mu\text{g}/\text{m}^3$)
Nitrogen Dioxide (NO₂)	Annual mean	40
	1-hour mean	200 Not to be exceeded more than 18 times per year (equivalent to the 99.79 th percentile of 1-hour mean values)
Particulate Matter (PM₁₀)	Annual mean	40
	24-hour mean	50 Not to be exceeded more than 35 times per year (equivalent to the 90.4 th percentile of 24-hour mean values)
Fine Particulate Matter (PM_{2.5})	Annual mean	25

Table 2-2: AQO and EU Limit Values

Previous research carried out on behalf of Defra identified that exceedances of the NO₂ 1-hour mean are unlikely to occur where the annual mean is below 60 $\mu\text{g}/\text{m}^3$. This assumption is still considered valid; therefore, Defra's Technical Guidance document, LAQM.TG (16)¹⁰ confirms that this figure can be referenced where 1-hour mean monitoring data are not available (typically if monitoring NO₂ using passive diffusion tubes).

Good practice design (as Building Regulations often consider WHO guidelines which are usually more stringent), see Table 2-3 below. Compliance with WHO recommended guidelines for residential and non-residential elements is considered 'best practice' but is non-mandatory at present, i.e., suitable control can be adopted on an 'as-required' basis. The WHO recommended guidelines were recently updated in September 2021¹¹. The update includes Air Quality Guideline (AQG) levels for the pollutants of relevance to this assessment (NO₂, PM₁₀ and PM_{2.5}) which are significantly lower than the previous WHO guidelines, which correspond to the lower range of the interim targets for PM₁₀ and PM_{2.5} and the higher range for NO₂.

⁹ Other pollutants have been screened out of this assessment as exceedance of their respective objectives is not anticipated to be associated with the pollutant sources of relevance to this assessment.

¹⁰ Defra (2021) Local Air Quality Management Technical Guidance TG (16) April 2021 <https://laqm.defra.gov.uk/documents/LAQM-TG16-April-21-v1.pdf>

¹¹ World Health Organisation (WHO) (2021) WHO global air quality guidelines, Particulate matter (PM_{2.5} and PM₁₀), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide, <https://apps.who.int/iris/handle/10665/345329>.

Pollutant	Averaging Period	Air Quality Objective (AQO) ($\mu\text{g}/\text{m}^3$)	WHO Guidelines ($\mu\text{g}/\text{m}^3$)	
			Interim Target	AQG Level
NO ₂	Annual mean	40	40 to 20	10
PM ₁₀	Annual mean	40	70 to 20	15
PM _{2.5}	Annual mean	25	35 to 10	5

Table 2-3: Comparison of WHO Guidelines with National Air Quality Objectives

2.2 Planning Policy and Guidance

Consideration of the strategic location and design of new developments is of key importance in the land-use planning process and can provide a means of improving air quality. Air quality considerations as part of development applications may become material in determining planning applications. Relevant planning policy and guidance at the National, Regional, and Local levels as summarised in Table 2-4.

Policy / Guidance	Description
National Policy and Guidance	
Ministry of Housing, Communities & Local Government – National Planning Policy Framework (NPPF) (2021)¹²	The National Planning Policy (NPPF) published March 2012 and last updated in July 2021 with the purpose of planning achieving sustainable development. Paragraph 186 of 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 AQMAs 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 AQMAs and Clean Air Zones is consistent with the local air quality action plan”. In addition, paragraph 105 states that: <i>“The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making.”</i> Paragraph 174 discusses how planning policies and decisions should contribute to and enhance the natural and local environment. Of relevance to air quality, NPPF notes that this can be achieved by: <i>“e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans”</i>
Planning Policy Guidance (updated 2019)¹³	Planning Practice Guidance (PPG) documents have been published as part of the NPPF. PPG relating to air quality was last updated in November 2019. It provides guidance on the significance of air quality in determining the local impact of proposed developments and highlights the importance of local and neighbourhood plans with regard to air quality. A flowchart is provided to assist local authorities in determining how air quality considerations might fit into development management processes.

¹² Ministry of Housing, Communities & Local Government, National Planning Policy Framework, July 2021
<https://www.gov.uk/government/publications/national-planning-policy-framework--2>

¹³ Ministry of Housing, Communities and Local Government (2019) Planning Practice Guidance: Air Quality, updated 1 November 2019
<https://www.gov.uk/guidance/air-quality--3>

Policy / Guidance	Description
National Policy and Guidance	
UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations. Detailed Plan. Defra / Department of Transport (DfT) (2017)¹⁴	This plan was produced in response to a UK Supreme Court Ruling and sets out how the UK will achieve compliance with EU Limit Values for nitrogen dioxide (NO ₂) in the shortest possible time. The plan outlined infrastructure initiatives and grants and the requirements for Local Authorities to produce local action plans, with the aim of reducing NO ₂ concentrations below the objective as soon as practically possible.
Regional Planning Policies	
Greater Manchester's Clean Air Plan¹⁵	Eight Greater Manchester authorities were identified by the Government as having roads which are expected to continue to exceed the maximum legal limits of NO₂ in 2021. They were directed by Government to undertake feasibility studies to identify measures for reducing NO₂ concentrations to compliant levels in the 'shortest possible time'. These studies must produce a series of business cases for assessing and implementing the relevant measures to address the problem. The 10 Greater Manchester local authorities, Greater Manchester Combined Authority (GMCA) and Transport for Greater Manchester (TfGM) have worked together to develop a Clean Air Plan to tackle nitrogen dioxide (NO₂) exceedances at the roadside, known as GM CAP. The latest GMCA report from 29th January 2021 outlines the progress and next steps for the development of the GM CAP. The key developments can be summarised as follows: - Government ministers have agreed to consider extending Greater Manchester's Clean Air Zone (CAZ) charges to the sections of the A628/A57 in Tameside. This will be subject to full assessment of the potential impacts, to be led by Highways England. - GM was awarded £14.7m of funding for retrofitting of buses - No confirmation or offer of government funding has been received regarding taxi and private hire electric charge points. Due to the dynamic context of COVID-19 and national and regional/local lockdowns, progress on the development of the final plan will be provided by the Green City Region Lead, as required at GMCA meetings
Greater Manchester Air Quality Action Plan 2016-2021 (AQAP)¹⁶	The AQAP identifies a range of actions to reduce emissions and mitigate the impacts on air quality. Some Key actions regards development and transportation are: - Actions for managing new development: - Construction Management Guidance – where a key priority area is affected by a proposed scheme, a high level of mitigation control will be requested. - Development Planning Guidance - to ensure that potential local air quality effects are not overlooked and is not intended to introduce a burden on developers or local authorities to undertake unnecessary work. - Cumulative Development Database - A centralised database of significant planning applications and air quality assessments will be managed by Transport for Greater Manchester (TfGM), as a record of the cumulative effects of multiple developments and thereby facilitate combined approaches to minimising emissions. - Clean Air Zone – TfGM will undertake an appraisal of the effects of charging Clean Air Zones (CAZ) 20mph Zones - The implementation of 20mph zones in urban areas has been cited as having the potential to benefit local air quality through smoother vehicle flow through junctions and reduced acceleration and braking, as well as having potential for additional benefits from encouraging modal shift from driving to walking or cycling - Encouraging Travel Planning - Individuals and companies are encouraged to look at travel planning measures, and to investigate the potential of additional demand

¹⁴ Department for Environment, Food and Rural Affairs / Department for Transport (2017) UK plan for tackling roadside nitrogen dioxide concentrations, July 2017 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/633269/air-quality-plan-overview.pdf

¹⁵ Clean Air Greater Manchester, Greater Manchester Combined Authority (GMCA) reports, <https://cleanairgm.com/gmca-reports/>

¹⁶ Greater Manchester Combined Authority/ Transport for Greater Manchester, Greater Manchester Air Quality Action Plan 2016-2021, https://www.manchester.gov.uk/downloads/download/4166/air_quality_reports

Policy / Guidance	Description
National Policy and Guidance	
	management measures to effect a significant mode shift and to stimulate the uptake of low-emission vehicles Taxi and Private Hire Quality Controls to Priorities Low-Emission Vehicles Green Infrastructure - The provision of green infrastructure in and around urban areas is now widely recognised as contributing towards creating places where people want to live and work.
Greater Manchester Low-Emission Strategy (2016)¹⁷	The Low-Emission Strategy sets out a framework for policies and measures to: - Reduce air pollution as a contributor to ill-health in Greater Manchester - Support the UK government in meeting EU air quality thresholds Contribute to a reduction in Greater Manchester's carbon footprint; and encourage low-emission behaviours in the culture and lifestyles of the city region.
Greater Manchester Planning Guidance on Air Quality¹⁸	Greater Manchester Combined Authority (GMCA) have adopted the most recent IAQM guidance on the assessment and control of dust from demolition and construction sites, and also for air quality considerations in land-use planning and development control. Applicants, developers and consultants are advised to read the IAQM guidance prior to submitting a planning application.
Greater Manchester's Plan for Homes, Jobs and the Environment, - Draft for Approval (2020)¹⁹	The plan was prepared on behalf of the 10 Greater Manchester local authorities and looks ahead to the period 2020 to 2037. The plan - sets out how Greater Manchester should develop up until 2037 - identifies the amount of new development that will come forward across the 10 districts, in terms of housing, offices, and industry and warehousing, and the main areas in which this will be focused; - supports the delivery of key infrastructure, such as transport and utilities; - protects the important environmental assets across the city region; - allocates sites for employment and housing outside of the existing urban area; and defines a new green belt boundary for Greater Manchester
Greater Manchester Places for Everyone Joint Plan²⁰	Following an announcement in December 2020, nine Greater Manchester councils (Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford and Wigan) will discuss proposals to work together on a joint development plan. The Places for Everyone would underpin Greater Manchester's ambitious plans for sustainable and inclusive growth, building on evidence already collected. The nine councils will continue to work closely with Stockport Council, who decided in 2020 to withdraw from the Greater Manchester Spatial Framework.
Local Planning Policies	
The Manchester Core Strategy 2012-2027²¹	The strategy aims to improve air quality and detailed in Policy EN 16: <i>"The Council will seek to improve the air quality within Manchester, and particularly within AQMAs, located along Manchester's principal traffic routes and at Manchester Airport. Developers will be expected to take measures to minimise and mitigate the local impact of emissions from traffic generated by the development, as well as emissions created by the use of the development itself, including from CHP, and biomass plant.</i> <i>When assessing the appropriateness of locations for new development the Council will consider the impacts on air quality, alongside other plan objectives. These includes cumulative impacts, particularly in AQMAs."</i>

¹⁷ Greater Manchester Combined Authority/ Transport for Greater Manchester, (2016) Greater Manchester Low-Emission Strategy, December 2016
<https://www.greatermanchester-ca.gov.uk/media/1276/low-emission-strategy-dec-2016.pdf>

¹⁸ Manchester City Council, Additional Planning Guidance, Environmental information for developers,
https://www.manchester.gov.uk/info/500207/planning_and_regeneration/1962/additional_planning_guidance/3

¹⁹ Greater Manchester Combined Authority, (2020) Greater Manchester's Plan for Homes, Jobs and the Environment: Greater Manchester Spatial Framework Publication Plan 2020, Draft for Approval October 2020, <https://www.greatermanchester-ca.gov.uk/media/3663/221020-agma-issue-opt.pdf>

²⁰ Greater Manchester Combined Authority, (2021) Greater Manchester councils to set out next steps with Places for Everyone joint plan, 05/02/2021,
<https://www.greatermanchester-ca.gov.uk/news/greater-manchester-councils-to-set-out-next-steps-with-places-for-everyone-joint-plan/>

²¹ Manchester City Council (2012), Manchester's Local Development Framework, Core Strategy Development Plan Document, Adopted 11th July 2012
https://www.manchester.gov.uk/info/200074/planning/6573/core_strategy_2012-2027

Policy / Guidance	Description
National Policy and Guidance	
Other Relevant Policy and Guidance	
Defra Local Air Quality Management (LAQM) Policy Guidance (2016)²² and Technical Guidance (2021)²²	The guidance issued under Part IV of the Environment Act 1995 is designed to help local authorities with their LAQM duties. The guidance sets out the general approach to use and detailed technical guidance to guide local authorities through the Review and Assessment process.
EPUK/IAQM Land Use Planning & Development Control (2017)²³	This guidance has been produced to ensure that air quality is adequately considered in the land use planning and development control processes by relevant officers within local authorities, developers, and consultants involved in the preparation of development proposals and planning applications. This document is best practice guidance and has no formal or legal status.
IAQM Assessment of Dust from Demolition and Construction (2016)²⁴	The document provides guidance for developers, their consultants and environmental health practitioners on how to undertake a construction impact assessment (including demolition and earthworks). The guidance provides a method for assigning a magnitude of risk (high, medium or low) and identifies appropriate mitigation measures.
Covid-19: Supplementary Guidance, Local Air Quality Management Reporting in 2021²⁵	The guidance had been informed by responses from an impact survey received following the release of the interim statement on Covid-19 impacts to the LAQM regime. The guidance is to be read in conjunction with LAQM.TG16
IAQM assessment of air quality impacts on designated nature conservation sites²⁶	This guidance signposts the appropriate thresholds used by local authorities, the Environment Agency and other regulators to determine the potential for air quality damage on sensitive ecological sites. Should threshold be likely to be exceeded, a suitably qualified and experienced ecologist is required to determine whether there is likely to be a significant impact on the habitat.

Table 2-4: Key Policy and Guidance

²² Defra (2016) Local Air Quality Management Policy Guidance PG(16) <https://iaqm.defra.gov.uk/documents/LAQM-PG16-April-16-v1.pdf>

²³ EPUK/IAQM, (2017) Land-Use Planning & Development Control: Planning for Air Quality <https://iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf>

²⁴ Institute of Air Quality Management (IAQM) (2016) Guidance on the Assessment of Dust from Demolition and Construction (Version 1.1) <https://iaqm.co.uk/text/guidance/construction-dust-2014.pdf>

²⁵ Department for Environment, Food and Rural Affairs (Defra) / Greater London Authority (2021). Covid-19: Supplementary Guidance, Local Air Quality Management Reporting in 2021, April 2021, Version 1.0, <https://iaqm.defra.gov.uk/supporting-guidance.html>

²⁶ Institute of Air Quality Management (IAQM) (2020) A guide to the assessment of air quality impacts on designated nature conservation sites, version 1.1, May 2020, <https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2020.pdf>

3.0

Approach and Methodology

3.0 Approach and Methodology

3.1 Overall Approach

The overall approach of this air quality assessment comprises the following:

- A review of existing conditions within the study area, defined as 2km from the boundary of the Proposed Development
- An assessment of the potential to change in air quality conditions as a result of the construction and operation of the Proposed Development; and
- The formulation of appropriate mitigation measures, where required, to mitigate any adverse impacts on air quality as a result of the construction and/or operation of the Proposed Development and/or to protect the health of future residents of the Proposed Development.

The environmental health officer at Manchester City Council has been contacted to agree the scope and methodology of this assessment. The email correspondence is included as Appendix B.

3.2 Existing Conditions

Existing ambient air quality conditions relates to relevant pollution that is already present in the environment from various sources such as industrial processes, commercial and domestic activities, road traffic emissions and natural resources.

Existing sources of emissions within the study area (2km) have been defined using several approaches, as follows:

- Industrial and waste management sources that may affect the area have been identified using the Environment Agency's Pollution Inventory Data²⁸.
- Local sources have also been reviewed through examination of the latest Annual Status Report (ASR) for Greater Manchester Combined Authority²⁹
- Background concentrations have been defined using the national pollution maps published by Defra³⁰. These cover the whole country on a 1x1 km grid.

3.3 Construction Phase

The development proposals comprise the following activities:

- Construction of new building (9-storey building)

At this stage it is anticipated that construction will commence in 2022 at the earliest. This will include construction, earthworks and trackout activities. The potential for air quality effects during the construction phase has been assessed, and the extent of mitigation required for dust/ Particulate Matter (PM₁₀) generated by construction activities has been considered.

Machinery used during construction can generate new sources of emissions, as well as traffic movements to/from the site and the works themselves. When assessing the effect of dust emissions generated during construction works, receptors include those nearest to the construction boundary of the site in each direction. These receptors have the potential to experience effects of greater magnitude due to emissions of dust generated by the works, when compared with more distant receptors.

Without appropriate mitigation controls in place, there is the potential for adverse effects to occur during to the construction of the Proposed Development. The implementation of best practice mitigation controls can ensure any potential adverse effects would be not significant.

²⁸ Environment Agency, Pollution Inventory <https://data.gov.uk/dataset/cfd94301-a2f2-48a2-9915-e477ca6d8b7e/pollution-inventory>

²⁹ Greater Manchester Combined Authority (2019) Greater Manchester Combined Authority 2019 Air Quality Annual Status Report (ASR), June 2020, https://www.manchester.gov.uk/downloads/download/4166/air_quality_reports

³⁰ Department for Environment, Food and Rural Affairs (Defra) (2019). Background Mapping data for local authorities, <http://uk-air.defra.gov.uk/data/laqm-background-home>

The impact of anticipated construction activities has been assessed in accordance with IAQM Guidance on the Assessment of Dust from Demolition and Construction v1.1 (2016). The construction phase assessment considers the anticipated physical activities occurring on-site that are likely to result in the generation of dust which gives rise to impacts on dust soiling and human health, especially through the generation of PM₁₀ and PM_{2.5}.

The assessment involves the identification of whether each phase of on-site activity (earthworks, construction, and trackout) represents a low, medium, or high risk of causing a significant effect and then identifies suitable mitigation measures for the relevant level of risk assigned. Details of the IAQM construction impact assessment procedure are presented in Appendix C.

Best practice mitigation controls have been identified in accordance with IAQM guidance.

3.4 Operation Phase.

IAQM's guidance note 'Land-Use Planning & Development Control: Planning for Air Quality' (updated in January 2017) was issued to ensure that air quality is adequately considered in the land-use planning and developmental control process. Full details are provided in Appendix D. To determine the need for operational assessment, a screening assessment has been undertaken using the criteria outlined in the IAQM guidance note (Appendix E).

3.4.1 Combustion Plant Impact

Any on-site combustion plant such as boilers and combined heat and power (CHP) has the potential to impact air quality receptors both on and off-site. Emissions from combustion plant would include NO₂ and possibly also PM₁₀ and PM_{2.5} if diesel is used as a source.

The energy design for the Proposed Development has not yet been finalised. Based on the current design proposals, there is unlikely to be any large, centralised combustion plant for the building that would result in NO_x emission >5mg/s.

Proposals are for an emergency generator to be located within an external plant area at roof level. At the time of writing, generator requirements / specifications are not available, although design measures will be adopted to see that the compliance with the relevant requirements are achieved. Further screening in accordance with the criteria listed in the IAQM guidance will be required once details are finalised.

3.4.2 Road Traffic Impacts

The Proposed Development has the potential to impact existing air quality as a result of pollutants from road traffic exhaust emissions, such as NO₂, PM₁₀ and PM_{2.5}, associated with traffic travelling to and from the development during the operation phase.

The guidance includes a method for screening the requirement for an air quality assessment, the undertaking of an air quality assessment, the determination of the air quality impact associated with a development proposal and whether this impact is significant. Interpretation of this guidance was used to develop a methodology for the assessment of road impact emissions. As the site is located within an AQMA, the EPUK/IAQM guidance states the following criteria to establish where an air quality assessment is likely to be considered necessary:

- A change of Light Duty Vehicle (LDV) flows of more than 100 Annual Average Daily Traffic (AADT) movements; and
- A change of Heavy-Duty Vehicle (HDV) flows of more than 25 AADT movements.

The Transport Statement (TS)³¹ provides the following summary regarding provision of parking spaces and generation of development trips:

- There will be 26 accessible car parking spaces located in the basement of the Proposed Development.
- The peak hour car trips generated by the development will be modest with around 89 two-way trips in the morning peak hour and 84 two-way trips in the evening peak hour. This equates to 337 daily incoming vehicle trips and 330 daily vehicle departures.

³¹ First Street Plot 9A Transport Statement VN81029 Issue 8. Prepared by Vectos. 16 December 2021.

- The site will generate approximately 20 LGV deliveries per day and 3 HGV deliveries. In the busiest hour, we might expect 1 HGV and 3 LGVs in the hour. All deliveries at the development will be undertaken between the hours of 07:00 and 20:00.

A conservative estimate of vehicle trips associated with the Proposed Development provided within the TS therefore suggests that annual average daily traffic flows on nearby roads could increase by greater than 100 vehicles per day.

The information relevant to the Proposed Development has been compared against IAQM's indicative criteria and the results are summarised in Appendix E. As a result of this screening exercise, an assessment of additional average annual daily traffic (AADT) increases has therefore been included within the assessment.

Traffic data for the air quality assessment were obtained from historic surveys compiled by the Department of Transport (DfT). Raw transport data and future traffic growth factors provided by the Transport Consultant are summarised in Appendix F.

The distribution of these potential traffic increases has been evaluated by the TC and a breakdown is provided within Appendix F. The do-something scenario has considered the conservative effects of adding the calculated development trips to key links surrounding the Proposed Development that were considered within the assessment. Calculated traffic inputs for subsequent modelling calculations are provided within Appendix F.

3.4.3 Human Exposure

Potential exposure of future occupants of the site was considered in accordance with Defra Technical Guidance and IAQM Planning Guidance. This assessment evaluated the exposure that future occupants or visitors might experience associated with existing baseline conditions, considering the following:

- The background and future baseline air quality, and whether this will be likely to approach, or exceed, the threshold values set by the air quality objectives
- The presence of any heavily trafficked roads, with emissions that could give rise to significantly higher concentrations of pollutants (e.g., NO₂), that would cause unacceptably high exposure for users of the new development; and
- The presence of non-road transport sources that may be significant, such as nearby airports, railway lines with high traffic usage of diesel locomotives³² or coal-fired steam locomotive railway lines.

The current/baseline conditions were established qualitatively by reviewing relevant air quality information that is readily available from the Local Authority, including Review and Assessment Reports and historic monitoring data. These data were used to understand current/baseline pollutant concentrations at receptors within the study area, and the risk that any changes in air quality may cause exceedance of AQOs at these locations.

The exposure that future residents or users might experience was considered in accordance with IAQM Planning Guidance and Defra technical guidance Local Air Quality Management Technical Guidance (LAQM.TG16)³³.

Detailed dispersion modelling has been used to undertake an assessment of human exposure at the development site.

³² Defra (2021), Local Air Quality Management Technical Guidance (TG21) - which lists rail lines with a heavy traffic of diesel passenger trains

³³ Department for Environment, Food and Rural Affairs (Defra) (2021). Local Air Quality Management Technical Guidance (TG16), April 2021. <https://laqm.defra.gov.uk/documents/LAQM-TG16-April-21-v1.pdf>

3.4.3.1 Dispersion Model

Detailed dispersion modelling of traffic emissions has been carried out using the latest version of ADMS-Roads Extra (version 5.0.0.1), which is an internationally recognised new generation dispersion model developed by CERC. ADMS uses advanced algorithms to describe the boundary layer structure, turbulence and stability.

NO₂ concentrations were estimated from the modelled NO_x concentrations. For roads, Defra's NO_x to NO₂ calculator³⁴ was used with the 'All Other UK Traffic' mix assumed.

The annual mean background and modelled roads contribution from ADMS-Roads were added together to give total concentrations and enable a comparison to be made with the air quality criteria for annual mean concentrations.

3.4.3.2 Meteorological Data

Hourly sequential meteorological data is required as an input to the model. Data from Manchester Airport meteorological station for 2019 has been obtained used for this assessment. Manchester Airport is located approximately 14km to the south-west of the Proposed Development. Due to its location and elevation, Manchester Airport is considered to be the most representative meteorological station for the Proposed Development. Both the location of the Proposed Development and Manchester Airport are inland sites, without significant terrain influence.

Defra's LAQM.TG16 guidance recommends that meteorological data should only be used if the percentage of usable hours is greater than 75% and preferably greater than 90%. Unusable hours include missing hours and calm hours³⁵. The 2019 dataset has been checked for usability. There are 8,469 lines of usable hourly data for 2019, which equates to 96.7% of the hourly in a year. As this is well above the 75% threshold, the data is considered to be adequate for dispersion modelling, in accordance with LAQM TG16 guidance.

The 2019 wind rose for Manchester Airport is presented in Appendix G. It can be seen that the predominant wind direction is south/south-westerly.

Surface roughness is a component of surface texture. Air travelling over the surface is affected by the surface roughness, rough surface would result in higher roughness to smoother surfaces. Typical surface roughness values range from 1.5m (for cities, forests and industrial areas) to 0.0001m (for water or sandy deserts). The future setting of the Proposed Development has been considered in the modelling by setting the surface roughness length to 1.0m. This is the value recommended by the model developers for cities and woodlands. A surface roughness length 0.2m was used for the meteorological station, which is stated within ADMS-Roads as being suitable for 'agricultural' areas.

The Monin-Obukhov length is used to describe the effects of buoyancy on turbulence kinetic energy, particular in the lowest atmospheric boundary layer. This relates to the urban heat island effect, and its effects on turbulence due to surface topology and the effects from heated and shaded building surfaces. Monin-Obukhov values typically range from 2m to 10m in rural settings but can be higher in urban area where buildings and traffic results in more heat generation. In this assessment, the minimum Monin-Obukhov Length Scale was set to 30 m (the recommended model setting for cities and large towns). A value of 30m was similarly used for the land around Manchester Airport meteorological station.

3.4.3.3 Traffic Data

Local air quality at the Proposed Development is likely to be affected during operation by local traffic flows. For each road link for each scenario, the following data has been included in the model:

- Total Traffic Flows- these are based on historic data from DfT factored from 2019 to the development opening year (2024) using the appropriate growth factor derived from the government's Trip End Model Presentation Program (TEMPO V7.2)
- % Heavy Goods Vehicles (HGVs)

³⁴ <https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc>.

³⁵ Wind speeds <0.75m/s would be classed as calm. ADMS Roads sets the speed to 0.75m/s for speeds <0.75m/s and uses the wind direction from the previous hour.

- Estimated vehicle speeds. These were based on posted speed limits, local knowledge, evaluation of Google Traffic data and professional judgement.
- Elevated road heights were included for sections of the A57. Heights were calculated using data provided by Defra LIDAR survey data download³⁶

The assessment scenarios modelled are as follows:

- 2019 baseline scenario obtained from 2019 DfT traffic counts³⁷;
- 2024 opening year without the Proposed Development (Factored from 2019 baseline data) (Do-Minimum (DM) scenario); and,
- 2024 opening year with the Proposed Development (2024 DM with calculated vehicle trips on key links added on) (Do-Something (DS) scenario).

The latest full year of ratified monitoring data available at the time of writing was 2020. However, during 2020, Covid-19 lockdown travel restrictions are likely to have suppressed air quality pollutant levels, i.e., conditions were atypical. To enable verification with local monitoring data, 2019 was therefore selected as a more conservative and representative dataset and modelled as the baseline year.

A summary of the road links used within the model inputs is provided in Appendix F.

3.4.3.4 Background Pollutant Concentrations

Adjusted Defra background concentrations were used in the NO₂ PM₁₀ and PM_{2.5}. Justification of background concentrations used is discussed further in section 0.

The modelling has assumed that there will be no reduction in background NO₂ concentrations with the background value for the base year used in all years of modelling to match that used in the model verification.

3.4.3.5 Vehicle Emission Rates

Vehicle emission rates for NO_x, PM₁₀ and PM_{2.5} were obtained from the latest version of Defra's Emission Factor Toolkit (EFT11.0)³⁸, for the 'England (Not London)' area, with a 'Basic Split' traffic split format. Vehicle emission rates are expected to decrease in the future due to increasingly stringent Euro emission standards, but there is uncertainty as to the rate of improvement for NO_x emissions from diesel vehicles, considering recent measurements of exhaust emissions and ambient air quality.

Sensitivity calculations have been undertaken assuming:

- (a) No reduction in emission factors.
- (b) Reduction of emission factors in line with the values presented in the Defra Emission Factor Toolkit (EFT) calculations, as described in 3.4.3.5.

3.4.3.6 Receptors

Detailed dispersion modelling of NO_x, PM₁₀ and PM_{2.5} emissions from operational traffic was used to undertake assessment of human exposure at the development site and existing receptors close to the modelled road network.

Worst-case existing sensitive receptor locations were selected, such as those close to junctions and closest to the roads impacted by the Proposed Development, see Figure 3-1 and Table 3-1. A height of 1.5m corresponds to a ground floor property, a height of 4.5m corresponds to a first-floor property.

Future proposed on-site receptors have also been modelled and also include worst case locations, such as those closest to roads and junctions. The modelled receptors are shown in figure 3-2 and listed in Table 3-2. The proposed receptor locations include various facades of the Proposed Development at various heights within the development.

³⁶ LIDAR Defra Surveys Data Download. See: <https://environment.data.gov.uk/DefraDataDownload/?Mode=survey>. Accessed December 2021.

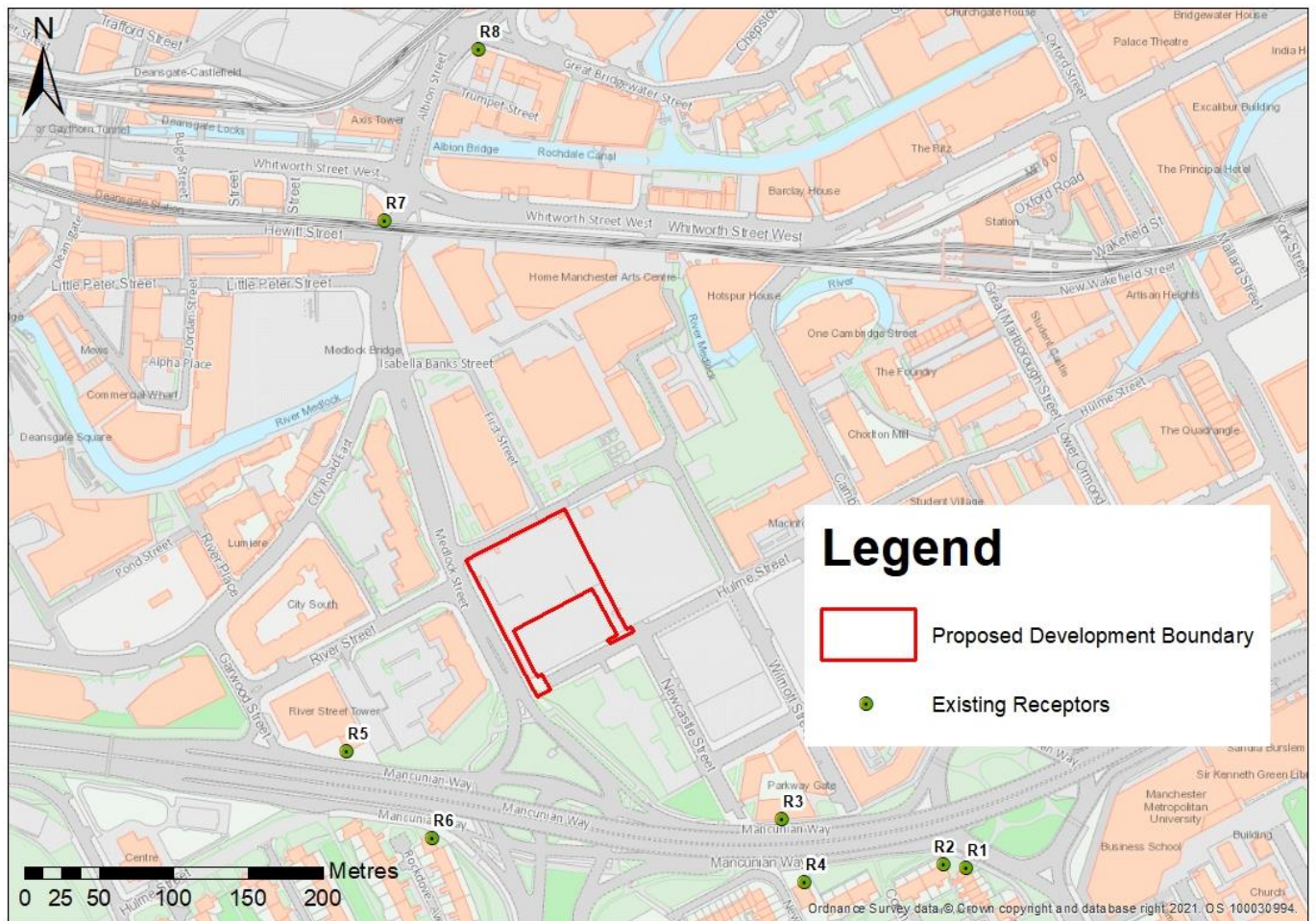
³⁷ Department of Transport (DfT) Traffic Count Data. See: <https://roadtraffic.dft.gov.uk/local-authorities/85>. Accessed December 2021

³⁸ <https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/>. Accessed December 2021.

Receptor ID	Location		Floors	Heights (m)
	Easting	Northing		
R1	384005.8	397069.7	Residential, Conmere Square	1.5
R2	383990.3	397071.7	Residential, Conmere Square	1.5
R3	383882.5	397102.4	Student Residential, Parkway Gate	5.4
R4	383897.4	397060.1	Residential, Newcastle Street	1.5
R5	383590.8	397147.3	Student Residential, River Street Tower	22.5
R6	383648.4	397089.6	Residential, Rockdove Avenue	1.5
R7	383616.5	397502.4	Flat Above City Road Inn	4.5
R8	383679.7	397617.1	Albion Street Flat Above Britons Protection Public House	4.5

Table 3-1 Modelled Existing Receptors

Figure 3-1: Existing Receptors



Recept or ID	Location		Floors	Heights (m)
	Easting	Northing		
P1	383684.1	397266.1	Ground and 1-9	1.5, 7.0, 10.8, 14.7, 18.6, 22.5, 26.3, 30.2, 34.1, 38.7
P2	383733.1	397291.9	Ground and 1-9	1.5, 7.0, 10.8, 14.7, 18.6, 22.5, 26.3, 30.2, 34.1, 38.7
P3	383748.8	397261.6	Ground and 1-9	1.5, 7.0, 10.8, 14.7, 18.6, 22.5, 26.3, 30.2, 34.1, 38.7
P4	383700.8	397235.8	Ground and 1-9	1.5, 7.0, 10.8, 14.7, 18.6, 22.5, 26.3, 30.2, 34.1, 38.7

Table 3-2 Modelled Future Receptors

Figure 3-2: Future Receptors



3.4.3.7 Model Verification

Using the guidance provided in Chapter 7 of LAQM.TG (16), the modelled output has been verified against local monitoring data obtained from diffusion tube surveys operated by Manchester City Council. Full details are provided in Appendix H.

The performance of the dispersion model was assessed by comparing the modelled concentrations with measured concentrations. Meteorological data, monitored concentrations, vehicle emission rates and traffic data for 2019 were all used in the model verification process.

The model adjustment was undertaken using methodology which requires the determination of the ratio between the measured and modelled road contributed NO_x at each comparison site. The ratio between them, referred to as the

adjustment factor, is applied to the modelled road contributed NO_x. The modelled NO₂ is then determined using the Defra NO_x/NO₂ calculator³⁹.

The modelled road contributed NO_x was adjusted by the factor 3.146 and then converted to total NO₂ using the Defra NO_x/NO₂ calculator. The results, in comparison with the measured total NO₂ concentrations, are shown in Appendix H.

The final adjusted total NO₂ concentration predicted at the two diffusion tubes is within $\pm 25\%$ of the measured values and is therefore considered satisfactory.

In accordance with Defra guidance, the road contributed NO_x adjustment factor was also applied to the road contributed PM concentration. The total PM₁₀ and PM_{2.5} concentrations are derived by adding the adjusted road contribution value to the Defra background concentrations.

³⁹ <https://lagm.defra.gov.uk/review-and-assessment/tools/background-maps.html>.

4.0

Site Description and Baseline Conditions

4.0 Site Description and Baseline Conditions

To assess the significance of any new development proposal (in terms of air quality), it is necessary to identify and understand the baseline air quality conditions in and around the study area. This provides a reference against which any potential changes in air quality can be assessed. Since air quality is predicted to change in the future (mainly because of changes to vehicle emissions), the baseline situation is extrapolated forward to the opening year. The future baseline scenario is the predicted baseline for the opening year.

To identify the existing air quality conditions, a review of publicly available information has been undertaken, including the latest local authority air quality reports, monitoring data, and background concentration maps. This section presents the results of the review.

4.1 Local Sources of Pollution

Industrial air pollution sources are regulated through operating permits or authorisations, which list stringent emission requirements. Regulated industrial processes are classified as either Part A or Part B processes and are regulated through the Pollution Prevention and Control (PPC) system⁴⁰ which has been transposed into National legislation⁴¹. The larger, more polluting, Part A processes are regulated by the Environment Agency for emissions to air, water and land. The smaller, less polluting processes are regulated by the local authority for emission to air.

The Environment Agency Pollutant Inventory for 2018⁴² indicated that there is one Part A permit site, operated by Heineken UK Ltd, located within 2km of the Proposed Development (Figure 4-1).

A review of environmental permit data held by Manchester Council⁴³ was carried out. There are seven Part B processes within 2km of the Proposed Development. These relate to 3 dry cleaners to the north of the site, Presbar Diecastings Ltd to the north-east, and 3 petrol stations to the south and south-east (Figure 4-2).

The most recent ASR (2019) did not list any new industrial sources.

The emissions from any industrial installations are assumed to be represented in the background concentrations used and have therefore not been considered further within the current assessment.

⁴⁰ Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)

⁴¹ The Environmental Permitting (England and Wales) (Amendment) Regulations 2013, SI 2013/390

⁴² <https://data.gov.uk/dataset/cfd94301-a2f2-48a2-9915-e477ca6d8b7e/pollution-inventory>.

⁴³ Manchester City Council, Environmental Permits Part B, https://www.manchester.gov.uk/directory/68/environmental_permits_part_b

Figure 4-1: Part A Industrial Permit Sites within 2km.

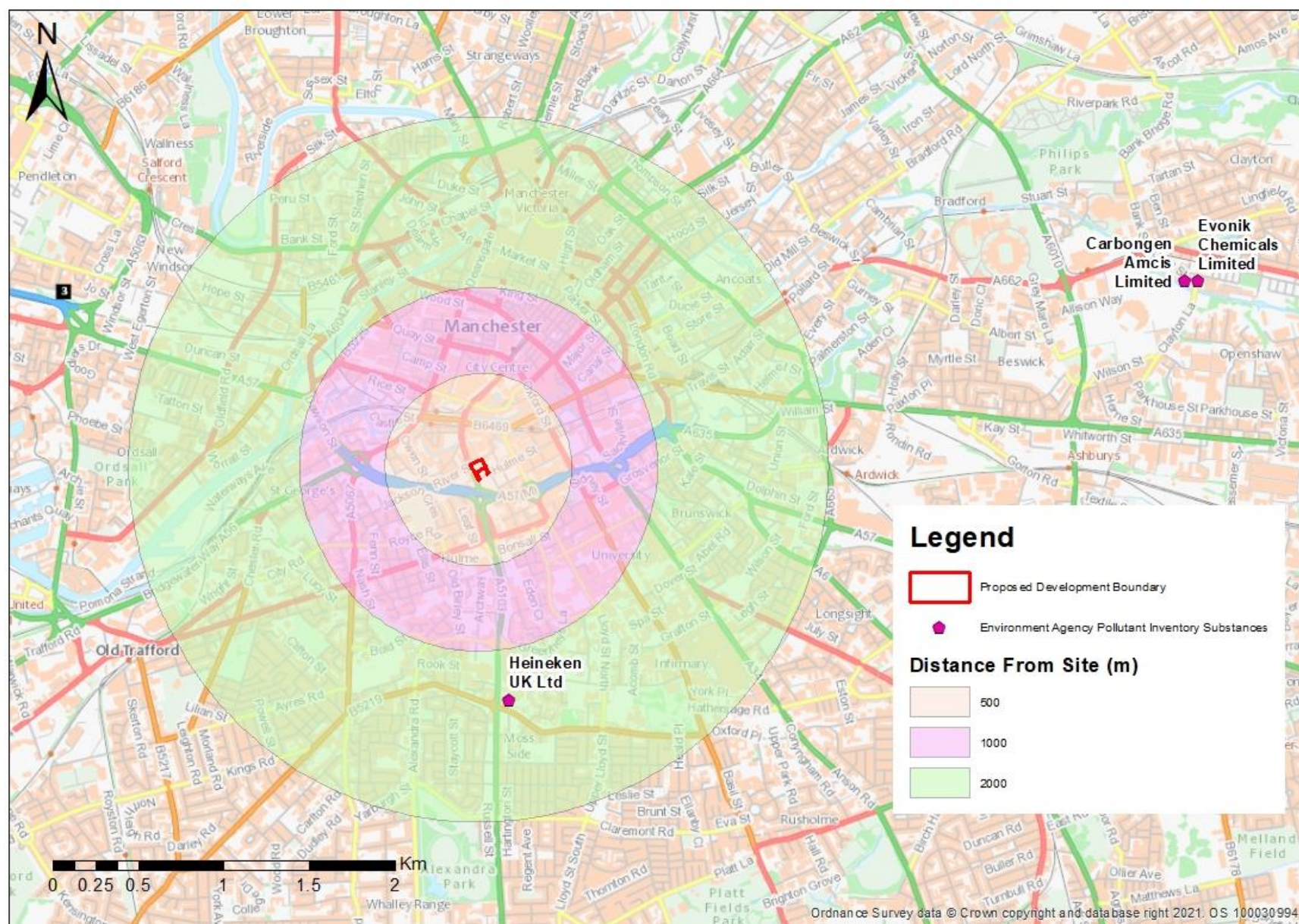
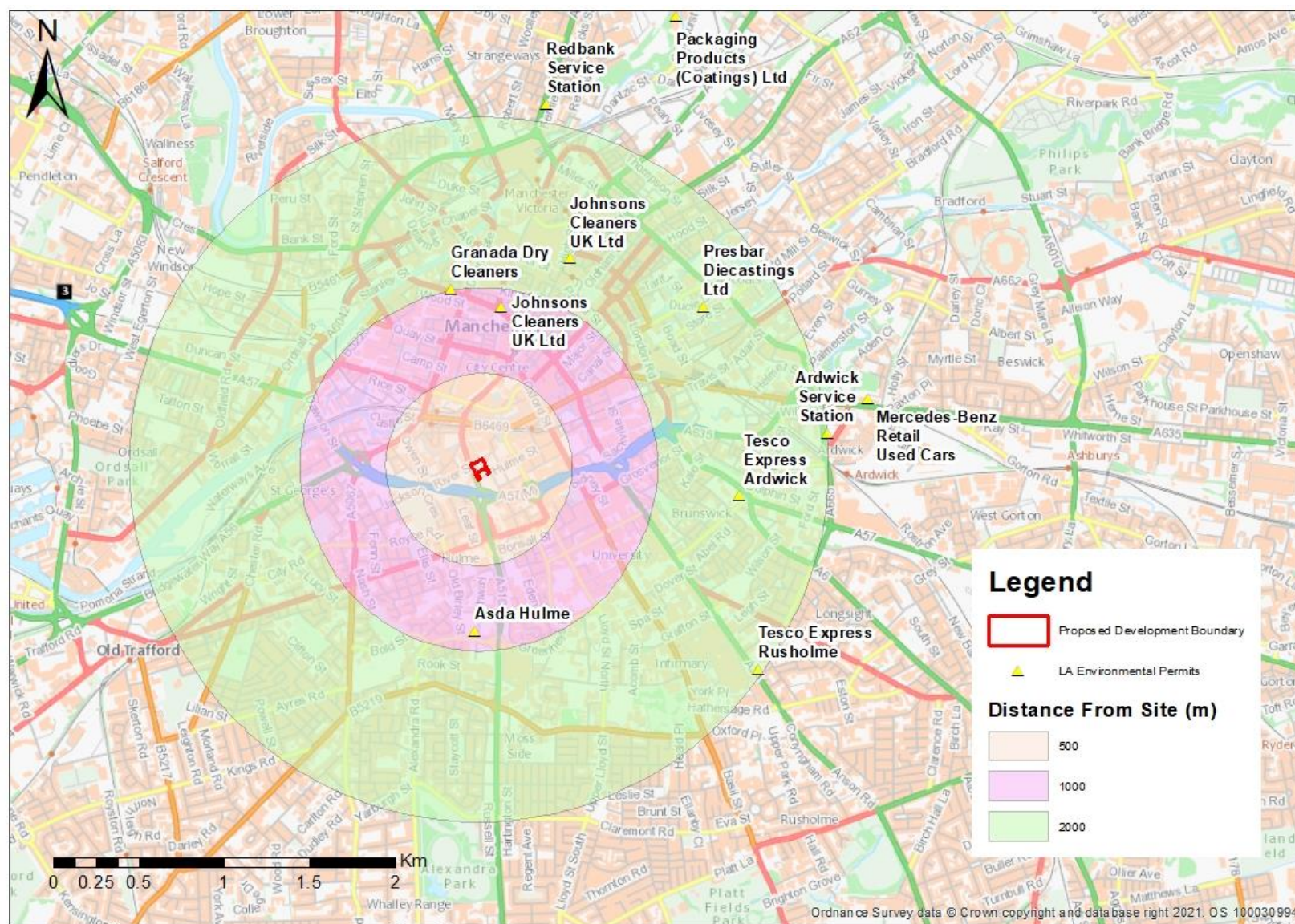


Figure 4-2: Part B Industrial Permit Sites within 2km.



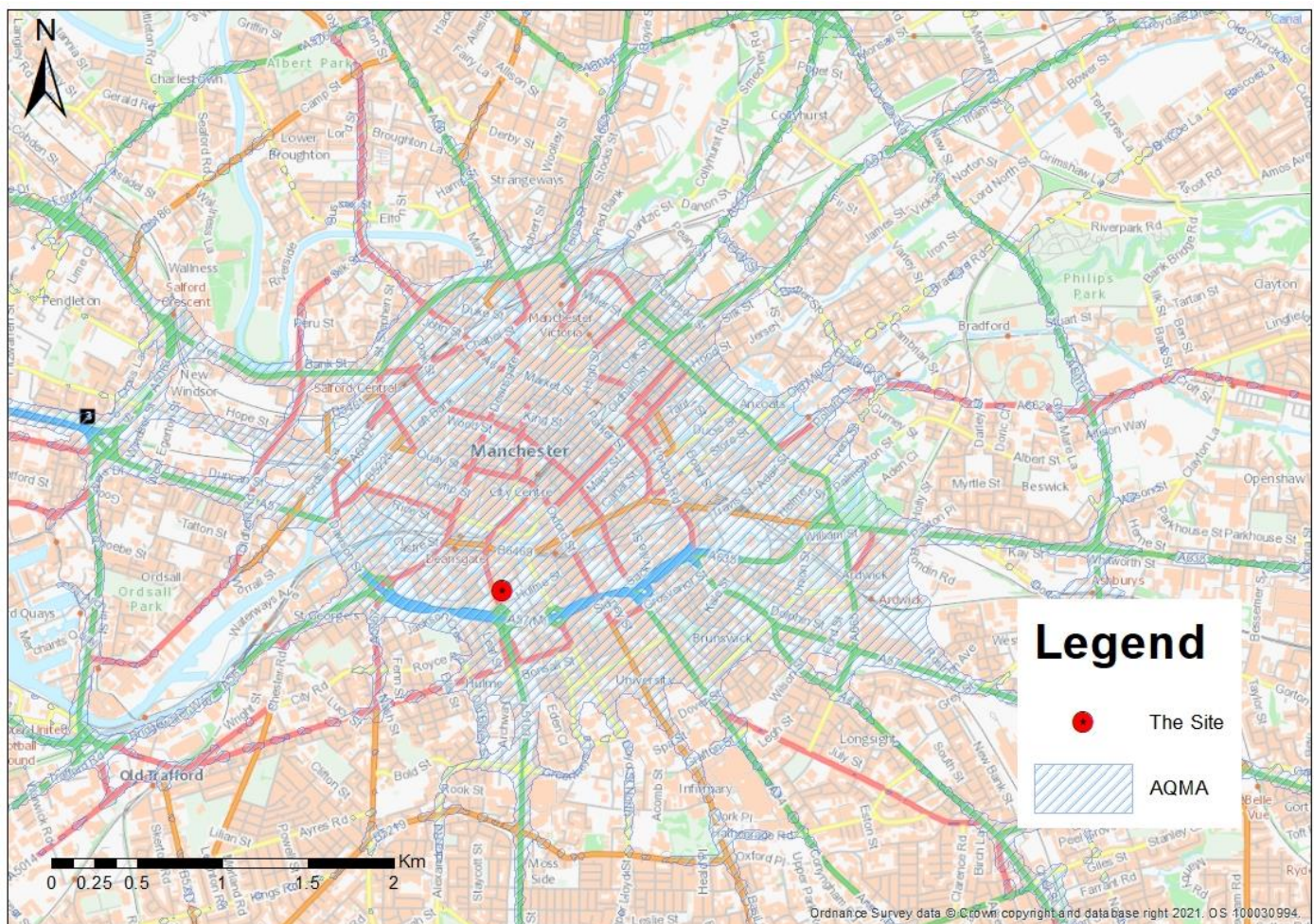
4.2 Local Air Quality Management

The Environment Act 1995 requires local authorities to review and assess air quality with respect to the objectives for seven pollutants specified in the National Air Quality Strategy. Local authorities are required to carry out an assessment and provide an Annual Status Report (ASR) of their area every year. If the ASR identifies any potential hotspot areas likely to exceed air quality objectives, a detailed assessment of those areas is required. If objectives are not predicted to be met, the local authority must declare the area as an AQMA. If an AQMA has been declared, the Local Authority will also need to produce an Air Quality Action Plan (AQAP), to include measures to improve air quality in the AQMA.

The Proposed Development is located in Manchester city centre. The baseline assessment includes a brief review and summary of the Greater Manchester Combined Authority's latest available Annual Status Report for 2019 (ASR) and the data available from Clean Air Greater Manchester⁴⁴.

A single AQMA was designated on the 1st May 2016 for the whole of Greater Manchester and reflects the location of the motorways, major roads and urban areas, for exceedances of the annual mean NO₂ objective threshold. The AQAP was published in 2016⁴⁵ and sets out measures to improve air quality in the AQMA. The latest ASR reports that Defra have responded positively to Greater Manchester's suggestion that update of the AQAP should be postponed until the impact of the proposed Greater Manchester wide Clean Air Zone (CAZ) is understood. There is currently no AQMA declared for PM₁₀ exceedances in Manchester.

Figure 4-3: Air Quality Management Area



⁴⁴ Clean Air Greater Manchester, <https://cleanairgm.com/>

⁴⁵ Greater Manchester Combined Authority / Transport for Greater Manchester (2016) Greater Manchester Air Quality Action Plan 2016-2021, https://www.manchester.gov.uk/downloads/download/4166/air_quality_reports

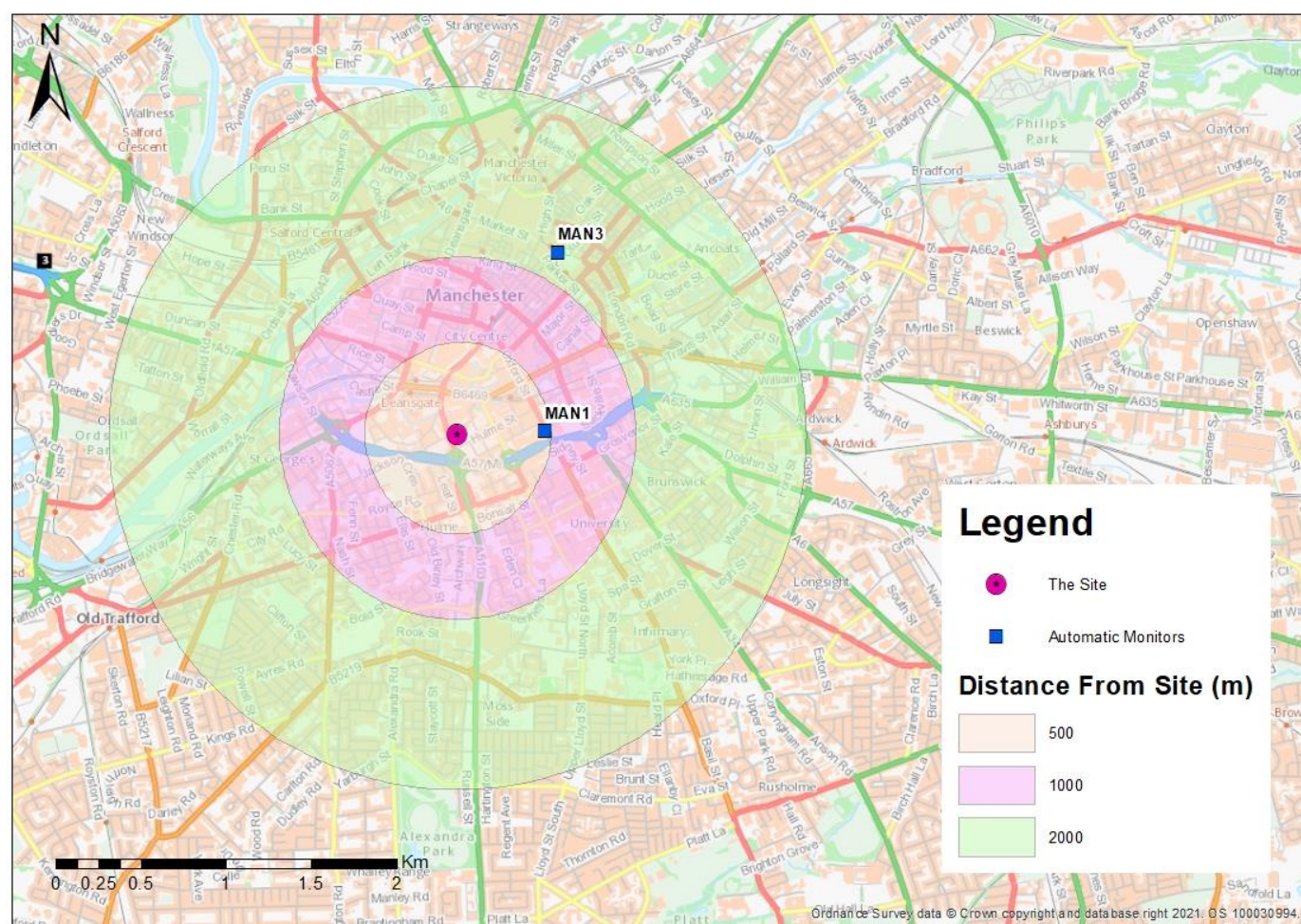
4.2.1 Local Air Quality Monitoring

A review of existing local air quality conditions in the vicinity of the Proposed Development has been undertaken. Automatic and diffusion tube monitors within 2km of the Proposed Development have been evaluated as part of this assessment.

4.2.1.1 Automatic Monitoring

Automatic or continuous monitoring involves drawing air through an analyser continuously to obtain near real-time pollutant concentration data. A review of the most recent ASR from Greater Manchester Combined Authority showed that MCC operates two automatic monitoring stations with 2km of the Proposed Development. The location of the automatic monitors is shown in Figure 4-4 and details about the sites are provided in Table 4-1.

Figure 4-4: Local Automatic Monitoring Sites



Site ID	Site Location	OS Grid Reference		Site Type	Pollutants Monitored	Distance to kerb of nearest road (m)
		x	y			
MAN1	Manchester Oxford Road	384233	397287	Urban Traffic	NO ₂ , PM ₁₀	1
MAN3	Manchester Piccadilly	384310	398337	Urban Centre	NO ₂ , O ₃ , PM ₁₀ , PM _{2.5} , SO ₂	30

Table 4-1: Details of Automatic Monitoring Sites within 2km

Recent NO₂ monitoring results from 2015 to 2021 are shown in Table 4-2, with numbers of hourly exceedances of 200µg/m³ indicated in brackets. An exceedance is defined as an annual mean greater than 40µg/m³ for NO₂, or when the daily value exceeds 200µg/m³ more than 18 days within a calendar year.

Site ID	Site Type	Distance from Site (km)	Annual Mean NO ₂ Concentration (µg/m ³)						
			2015	2016	2017	2018	2019	2020 ⁴⁶	2021 ⁴⁷
MAN1	Urban Traffic	0.5 km E	66 (60)	66 (90)	65 (6)	62 (2)	59 (1)	n.d.	n.d.
MAN3	Urban Centre	1.2 km NE	39 (1)	40 (0)	36 (1)	35 (0)	36 (0)	27 (0)	27(0)

Table 4-2: Results of Local Air Quality Monitoring at Automatic Sites – Nitrogen Dioxide

These results show that the NO₂ annual mean air quality objective was exceeded all years in the period 2015 to 2019 at the urban traffic site (MAN1) and were recorded at the objective at the urban centre site (MAN3) in 2016. The number of hourly exceedances of 200µg/m³ have been well below the permissible 18 days at both sites since 2017. The latest provisional data from 2020 to 2021 supports the general decreasing trend in urban background concentrations, this is most likely due to a combination of national decreases in vehicle emissions due to technology improvements, and the impacts of COVID-19 lockdown measures.

Concentrations of NO₂ at all sites remained above the new WHO Air Quality interim target range (20µg/m³ to 40µg/m³) and well above the new WHO guidance level of 10µg/m³ between 2015 and 2021.

Annual mean concentrations of PM₁₀ recorded at the monitoring sites within 2km are shown in Table 4-3, with number of days exceedance shown in brackets. An exceedance is defined as an annual mean greater than 40µg/m³ for PM₁₀, or when the daily value exceeds 50µg/m³ more than 35 days within a calendar year.

Site ID	Site Type	Distance from Site (km)	Annual Mean PM ₁₀ Concentration (µg/m ³)						
			2015	2016	2017	2018	2019	2020	2021
MAN1	Urban Traffic	0.5 km E	28 (25)	27 (16)	27 (15)	30 (15)	26 (18)	<u>n.d.</u>	<u>n.d.</u>
MAN3	Urban Centre	1.2 km NE	20 (3)	20 (3)	20 (3)	21 (2)	20 (7)	15 (n.d.)	15 (n.d.)

Table 4-3: Results of Local Air Quality Monitoring at Automatic Sites – PM₁₀

Annual mean concentrations of PM₁₀ met the air quality objective at sites in all years. Concentrations at the urban traffic site on Oxford Road showed a maximum of 30µg/m³ recorded in 2018. The number of times daily averages have been recorded above 50µg/m³ have been below the permissible 35 days at all sites since 2017. Trends have remained broadly static at all sites since 2015.

Concentrations at all sites remained at or above the new WHO Air Quality guidance level of 15µg/m³ between 2015 and 2021. Lower figures in 2020 and 2021 are most likely due to a combination of national decreases in vehicle emissions due to technology improvements, and the impacts of COVID-19 lockdown measures.

Annual mean concentrations of PM_{2.5} for the monitoring sites are shown in Table 4-4. An exceedance is defined as an annual mean greater than 25µg/m³ for PM_{2.5}. Annual mean concentrations of PM_{2.5} have been below the air quality objective at the site between 2015 and 2019.

Concentrations remain above the new WHO guidance level of 5µg/m³ in all years.

⁴⁶ Data were downloaded directly from Defra's AURN website. See <https://uk-air.defra.gov.uk/interactive-map?network=aurn>. Accessed October 2021

⁴⁷ Data contains some unratiated (provisional) values and covers the period January-October 2021.

Site ID	Site Type	Distance from Site (km)	Annual Mean PM _{2.5} Concentration (µg/m ³)						
			2015	2016	2017	2018	2019	2020	2021
MAN3	Urban Centre	1.2 km NE	10	10	8	11	12	8	9

Table 4-4: Results of Local Air Quality Monitoring at Automatic Sites – PM_{2.5}

4.2.1.2 Non-Automatic Monitoring

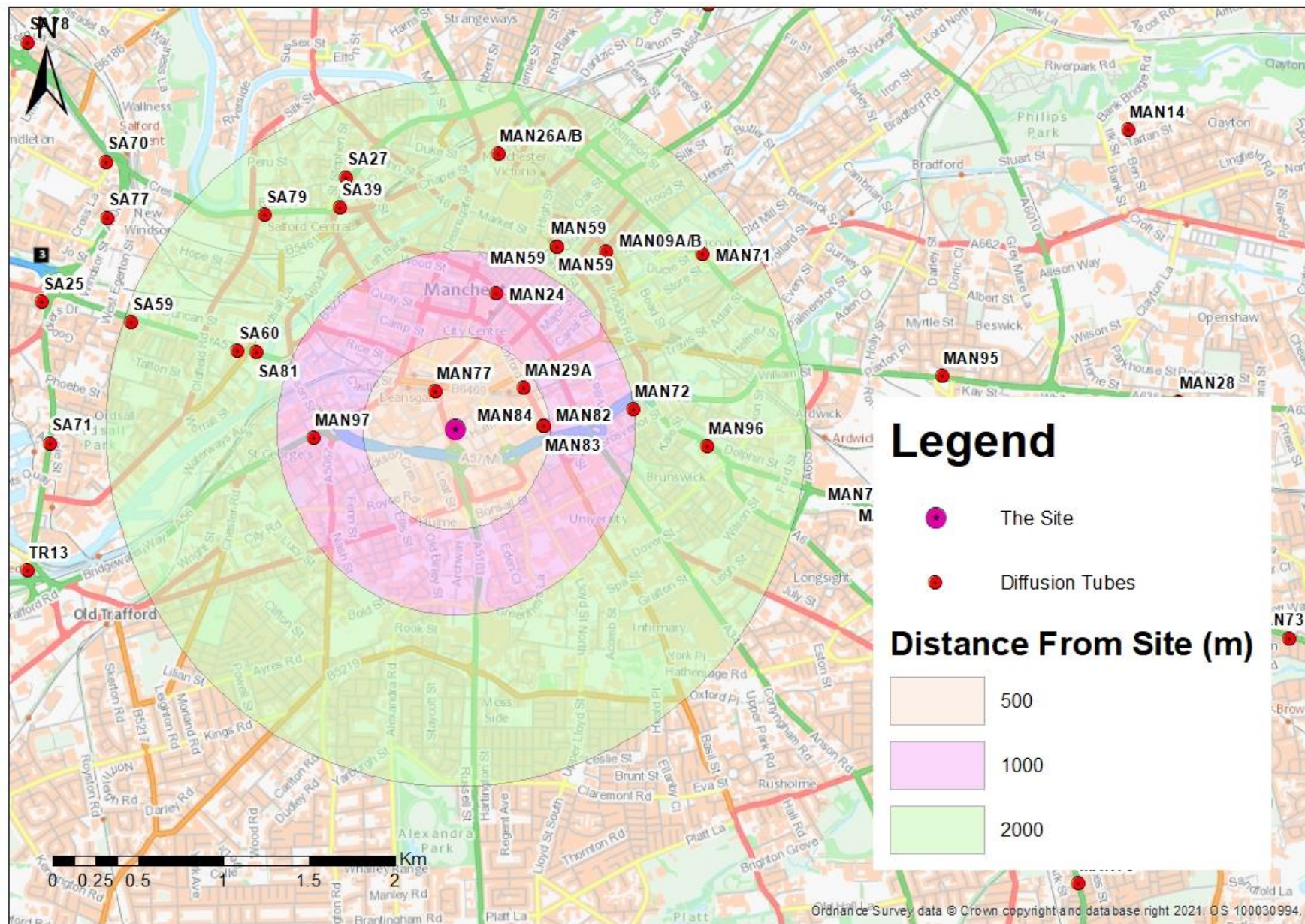
The Clean Air Greater Manchester Website⁴⁸ shows that GMCA has over 400 diffusion tubes monitoring NO₂ in Greater Manchester, 17 of which are within 2km of the Proposed Development. Of the locations in the vicinity of the Proposed Development, eleven of these are “Roadside” sites, two are “Kerbside” and the remainder four are “Urban background”. The locations of the sites within 2km are shown in Figure 4-5. Details of the diffusion tubes are listed in Table 4-5 and the latest monitoring results are provided in Table 4-6.

Site ID	Site Location	OS Grid Reference		Site type	Distance to kerb of nearest road (m)
		x	y		
MAN09AB	Newton Street	384601	398303	Kerbside	0.5
MAN24	Princess Street /Cooper Street	383954	398060	Kerbside	0.5
MAN26AB	Long Millgate	383971	398876	Urban background	59
MAN29A	Oxford Street	384117	397505	Roadside	2.0
MAN59/ 60/61	Piccadilly Gardens	384310	398337	Urban background	56
MAN71	Great Ancoats Street	385161	398290	Roadside	2.0
MAN72	Lockton Close	384761	397384	Urban background	46
MAN77	Hewitt Street	383602	397488	Urban background	2.0
MAN82/83/84	Oxford Road	384233	397287	Roadside	0.5
MAN 96	Ardwick Green	385189	397167	Roadside	2.0
MAN 97	Chester Road	382886	397215	Roadside	11.0
SA27	Frederick Street	383076	398738	Roadside	1.5
SA39	Trinity Way	383040	398563	Roadside	8.0
SA59	West Crown Avenue	381822	397895	Roadside	11.0
SA60	Regent Road	382445	397724	Roadside	4.0
SA79	Chapel Street	382602	398519	Roadside	10.0
SA81	Regent Road 2	382561	397722	Roadside	1.5

Table 4-5: Details of Diffusion Tube Monitoring Sites within 2km

⁴⁸ <https://cleanairgm.com/air-quality-data/diffusion-tubes>.

Figure 4-5: Local Diffusion Tube Sites



Site ID	Distance to Site	Site Type	Annual Mean NO ₂ Concentration (µg/m ³)				
			2016	2017	2018	2019	2020
MAN09AB	1.3 km NE	Kerbside	51.9	51.1	45.8	44.9	32.5
MAN24	0.8 km NE	Kerbside	45.3	44.7	40.3	40.8	26.8
MAN26AB	1.6 km NE	Urban background	37.1	35.5	33.4	33.0	22.9
MAN29A	0.4 km NE	Roadside	66.2	57.7	58.8	55.4	39.0
MAN59/ 60/61	1.2 km NE	Urban background	40.8	35.7	31.6	33.1	22.3
MAN71	1.7 km NE	Roadside	51.2	50.4	46.1	45.3	31.4
MAN72	1.0 km E	Urban background	40.0	34.6	33.4	32.8	24.5
MAN77	0.2 km NW	Urban background	44.2	38.8	41.0	43.7	26.9
MAN82/83/84	0.5 km E	Roadside	<u>60.2</u>	56.2	54.0	52.0	33.9
MAN 96	1.4 km E	Roadside	-	-	-	46.0	36.4
MAN 97	0.8 km W	Roadside	-	-	-	32.3	23.4
SA27	1.6 km NW	Roadside	39.8	36.8	34.1	37.2	26.7
SA39	1.4 km NW	Roadside	46.8	41.6	39.1	41.7	30.4
SA59	1.9 km NW	Roadside	-	36.7	33.3	32.4	23.0
SA60	1.3 km NW	Roadside	-	40.7	40.2	36.7	27.0
SA79	1.6 km NW	Roadside	-	-	-	41.1	27.3
SA81	1.2 km NW	Roadside	-	-	-	46.4	34.8
Notes: Exceedances of the annual mean air quality objective are indicated in bold . Values greater than 60µg/m ³ are underlined. - no data available							

Table 4-6: Diffusion Tube Monitoring Results 2015 to 2020

Data from 2016 to 2020 is provided in the Table 4-6. 2020 data has not been specifically interpreted due to atypical conditions created by COVID-19 lockdown.

Of the 17 diffusion tube monitoring locations, all but 3 of the roadside/kerbside sites exceeded the NO₂ objective (40µg/m³) at some point during the period between 2016 and 2019. The maximum concentration recorded at a roadside/kerbside site in 2019 was 55.4µg/m³, recorded at MAN29A.

MAN77 is located near to Medlock Street and recorded concentrations of 43.7µg/m³ in 2019. It is anticipated that roadside concentrations at the Proposed Development site are likely to be similar on frontages facing Medlock Street.

The annual mean NO₂ concentrations recorded at all of the sites within 2km between 2017 and 2019 are below 60µg/m³. Exceedances of the short-term objective are therefore considered to be unlikely.

4.3 Defra's Background Pollutant Concentration Mapping

Background concentrations refer to existing levels of pollution in the atmosphere, as a result of emission from a variety of sources, such as traffic, industrial and agricultural processes. Defra publishes background pollutant mapping for every 1km x 1km OS grid square across the UK for NO_x, NO₂, PM₁₀ and PM_{2.5}. Background pollutant mapping has been reviewed for the grid square in which the Proposed Development lies and surrounding grid squares. The background concentrations (which are based on 2018 monitoring data) are presented in Table 4-7.

OS Grid Square		Annual Mean Concentration (µg/m ³)			
X	Y	NO _x	NO ₂	PM ₁₀	PM _{2.5}
383500	397500	39.9	26.1	13.5	8.7
383500	398500	44.6	28.2	13.1	8.5
384500	397500	44.5	28.2	14.4	9.1
384500	398500	47.0	29.3	13.6	8.8
384500	399500	32.8	22.2	12.5	8.2
385500	398500	35.2	23.4	12.6	8.3
Average		40.7	26.2	13.3	8.6

Table 4-7: Defra's 2019 background concentrations of NO_x, NO₂, PM₁₀ and PM_{2.5}

Defra background concentrations are below the air quality objectives for annual mean NO₂ and PM₁₀ and PM_{2.5}.

Table 4-8 shows the comparison between the measured concentrations at the nearest urban background continuous monitor (MAN3) to the Proposed Development and the estimated Defra background concentrations for the same OS grid square (384500, 398500) for NO₂, PM₁₀ and PM_{2.5} in 2019.

There are significant differences of 17.9, 15.2, 34.0 and 25.2% in NO_x, NO₂, PM₁₀ and PM_{2.5} concentrations, respectively.

Pollutant	Estimated Defra background concentration (µg/m ³)	Measured concentration at MAN3 (µg/m ³)	Difference	Difference (%)
NO _x	51.8	63.1	-11.3	-17.9
NO ₂	30.8	36.3	-5.5	-15.2
PM ₁₀	13.2	20	-6.8	-34.0
PM _{2.5}	8.6	11.5	-2.9	-25.2

Table 4-8: Comparison between monitored and Defra background concentrations

A further investigation has been carried out to compare the other urban background monitoring sites with the estimated Defra background concentration at other locations within the wider Greater Manchester Area.

Table 4-9 shows this further comparison. It shows that there is a difference in annual mean NO₂ of between 10.5% and 29.6% at the other urban background sites, however it should be noted that values are much lower, and less typical of the study area.

Site	Estimated Defra background concentration (µg/m ³)	Measured NO ₂ concentration (µg/m ³)	Difference	Difference (%)
TRAFF	17.0	19	-2.0	-10.5
WIG5	13.4	19	-5.6	-29.5

Table 4-9: Comparison between monitored NO₂ and Defra background NO₂ concentrations

Accordingly, it was decided to adjust the predicted Defra background concentrations using the most conservative ratios derived from the MAN 3 automatic monitor. These are described below:

- The adjustment factor for background NO_x is 1.22
- The adjustment factor for background NO₂ is 1.18
- The adjustment factor for background PM₁₀ is 1.51
- The adjustment factor for background PM_{2.5} is 1.33

The worst-case adjusted background concentrations for 2019 have been applied to the future scenarios in 2024. This is considered to be a conservative approach as the background concentration is likely to decrease in future years.

4.4 Local Traffic Data

The presence of any heavily trafficked roads, with emissions that could give rise to significantly higher concentrations of pollutants (e.g., NO₂), may cause unacceptably high exposure for users of the new development. Traffic count data for the area is reported in Appendix F.

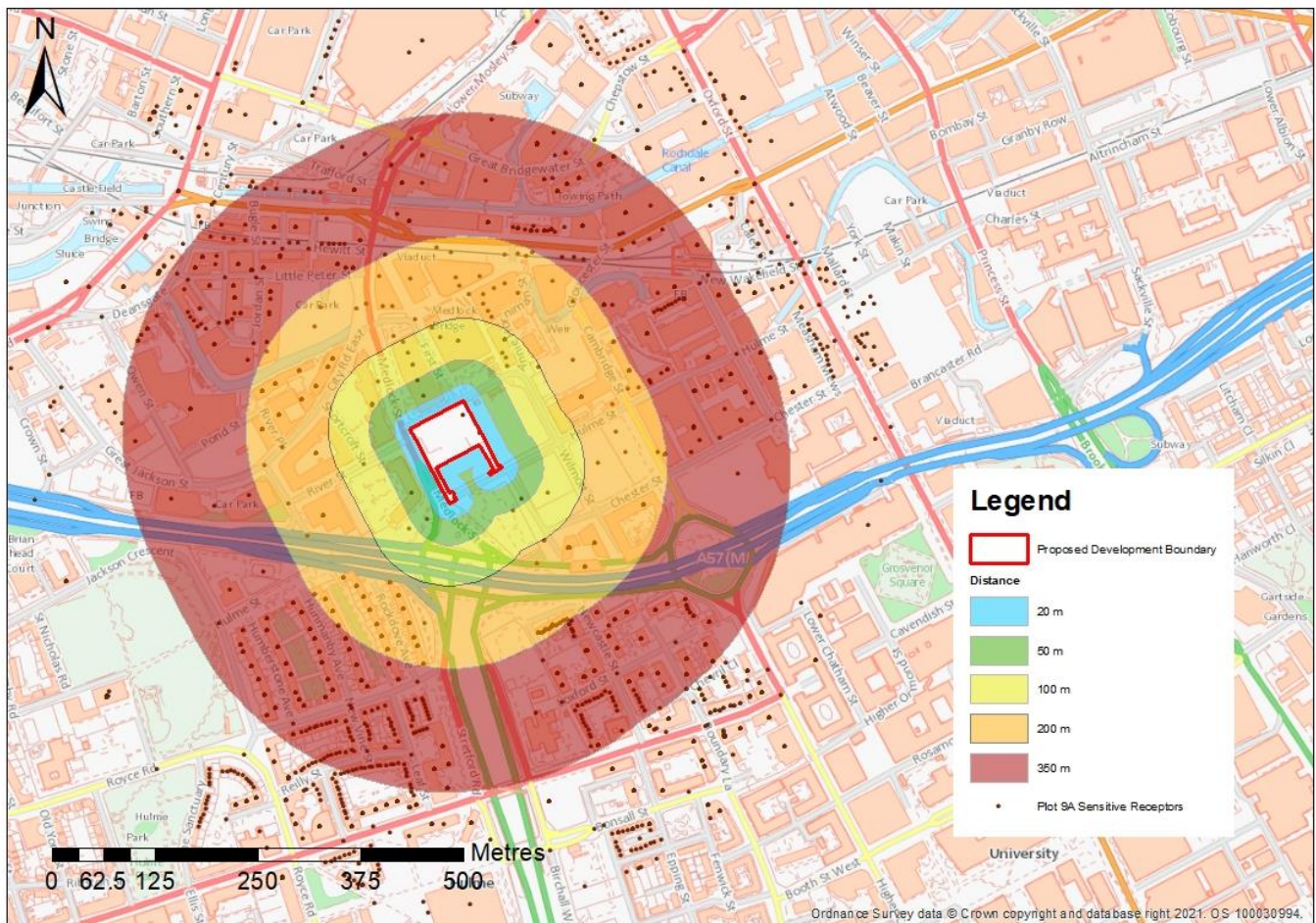
The emissions from roads in the area not included in the modelled are assumed to be represented in the background concentration listed in section 0.

4.5 Sensitive Receptors

4.5.1 Sensitive Residential Receptors

The Site is located within a densely urbanised area. There are several properties surrounding the Site, identified in the Address Base Plus geographical data set. These include several receptors considered to be of high sensitivity, such as residential properties and hotels. High sensitivity receptors within 350m of the Proposed Site are shown in Figure 4-6.

Figure 4-6: Sensitive Receptor Locations



4.5.2 Sensitive Ecological Receptors

Defra MAGIC mapping⁴⁹ has been reviewed to determine the presence of any sensitive ecological sites⁵⁰. There are no designated ecological receptors sensitive to dust within 1km of the Site boundary.

4.6 Future Baseline

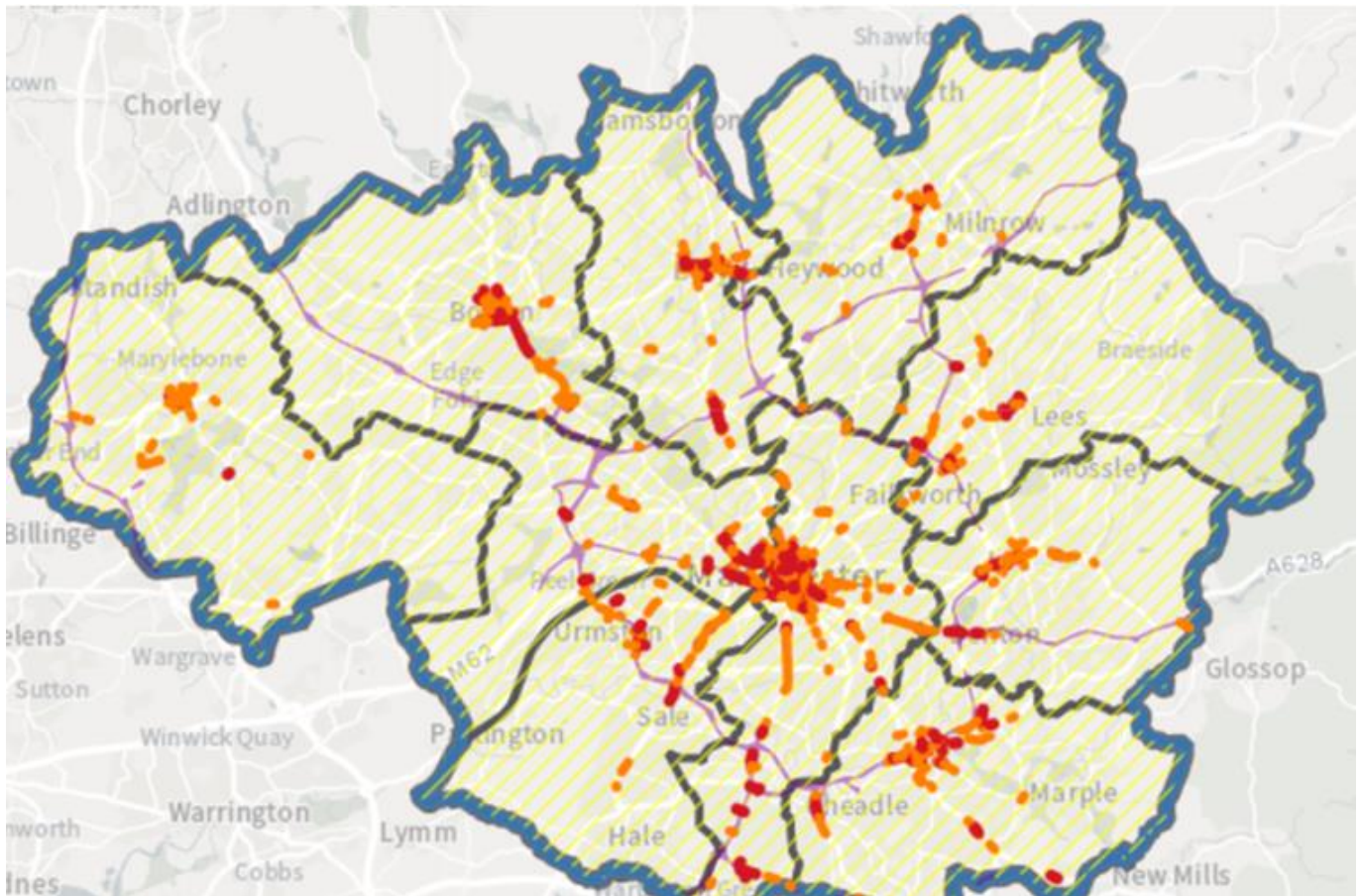
The UK Government has directed Greater Manchester to introduce a Category C Clean Air Zone (CAZ), with an aim of achieving statutory NO₂ Limit Values. In response, Greater Manchester has developed a Clean Air Plan to tackle harmful and illegally high levels of roadside air pollution across the city-region.

Review of the Clean Air Greater Manchester website⁵¹ in December 2021 indicated that the CAZ will be introduced in May 2022.

Figure 4-7 is provided courtesy of Clean Air Greater Manchester website⁵², shows the extent of the CAZ (blue boundary). All roads within Greater Manchester will be included in the Clean Air Zone, with the exception of those roads managed by Highways England, such as motorways and trunk roads (shown in purple in Figure 4-7). Roads shown in red are expected to breach NO₂ legal limits beyond 2020 if no action is taken.

Given the location of the Proposed Development within the centre of the CAZ, it is anticipated that traffic emissions will reduce in the future due to the introduction of the CAZ.

Figure 4-7 :Proposed Greater Manchester Clean Air Zone (CAZ)



⁴⁹ Department for Environment, Food and Rural Affairs (Defra) (2019). MAGIC <https://magic.defra.gov.uk/MagicMap.aspx>

⁵⁰ Typical ecological receptors of significance include Special Conservation Areas (SCAs), Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSIs), RAMSAR sites, Local Nature Reserves with dust sensitive features.

⁵¹ Clean Air Greater Manchester, Clean Air Plans <https://cleanairgm.com/clean-air-plans>

⁵² Clean Air Greater Manchester, Clean Air Zone Map <https://cleanairgm.com/clean-air-zone-map/>

5.0

Impact Evaluation

5.0 Impact Evaluation

5.1 Construction Phase Impacts

5.1.1 Need for a Detailed Assessment

An assessment was undertaken as there are 'human receptors' within 350m of the boundary of the site; and 50m of the route used by construction vehicles on the public highway, up to 500m from the site entrance.

5.1.2 Risk of Dust Impacts Assessment

Dust Emission Magnitude Analysis

The dust emission magnitude is based on the scale of the anticipated work and classified as Table 5-1 below. Assumptions listed are based on indicative design information provided by Jon Mathews Architects.

Stage	Relevant Definition	Highest Potential Dust Emission Magnitude
Demolition	No demolition within the Proposed Development	N/A
Earthworks	- Estimated site area is between 2,500m² – 10,000m² - Sandy loamy soils - Unlikely formation of stockpile enclosures <4 m in height 5 – 10 heavy earth moving vehicles active at any one-time	Medium
Construction	- Total building volume >100,000 m³ - Potentially dusty construction material (e.g., concrete)	Large
Track out	10 – 50 HDV (>3.5 tonnes) outward movements in any one day - Potentially dusty surface material (e.g., high clay content) - Unpaved road length 50 - 100 m	Medium

Table 5-1: Determination of the potential dust emission magnitude

The highest dust emission magnitude is likely to be Large.

5.1.3 Sensitivity of the Area

The surrounding area has a significant density of sensitive receptors, which have wide range of sensitivities to dust soiling and health effects. The numbers of these receptors likely to be affected by earthworks and construction activities during the construction phase has been assessed. The analysis involved counting receptors, identified via the current Address Base Plus geographical data set, within each of the distance bands from the Application Site boundary. Buffers illustrating the assessment distances of 20, 50, 100, 200 and 350 metres from the Application Site boundary are illustrated in Figure 5-1. The analysis of sensitive receptors within each distance band is presented in Table 5-2.

Defra MAGIC mapping⁵³ has been reviewed to determine the presence of any sensitive ecological sites⁵⁴. There are no designated ecological receptors sensitive to dust within 500m of the site boundary and therefore the sensitivity of the area to ecological receptors is negligible.

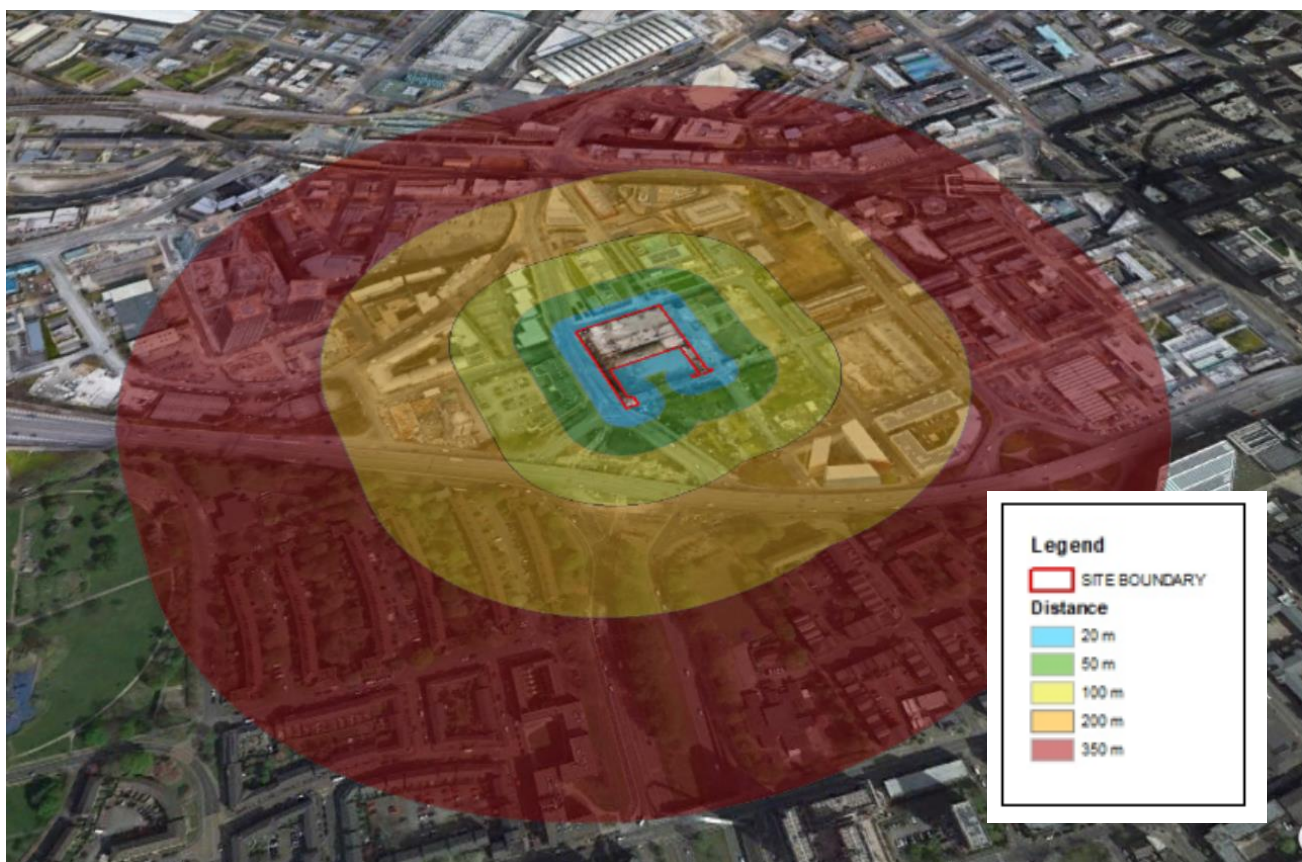
⁵³ Department for Environment, Food and Rural Affairs (Defra) (2019). MAGIC <https://magic.defra.gov.uk/MagicMap.aspx>

⁵⁴ Typical ecological receptors of significance include Special Conservation Areas (SACs), Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSIs), RAMSAR sites, Local Nature Reserves with dust sensitive features.

Distance (metres)	Receptor Type					Totals
	Residential / Development (High)	Non-Residential Development (High)	Commercial / Retail / Office (Medium)	Commercial / Leisure / Transport (Low)	Ecological	
20	0	1	0	2	0	3
50	0	4	0	3	0	7
100	279	11	11	10	0	311
200	2188	43	23	26	0	2280
350	6648	167	143	64	0	7022

Table 5-2: Number of Receptors in Each Distance Band

Figure 5-1: Construction Dust Buffer Zones (courtesy of Google Earth)



In summary, the evaluation shows that:

- <100 high risk receptors are located within 50m of the Proposed Development boundary
- >100 high risk receptors are located within 100m of the Proposed Development boundary

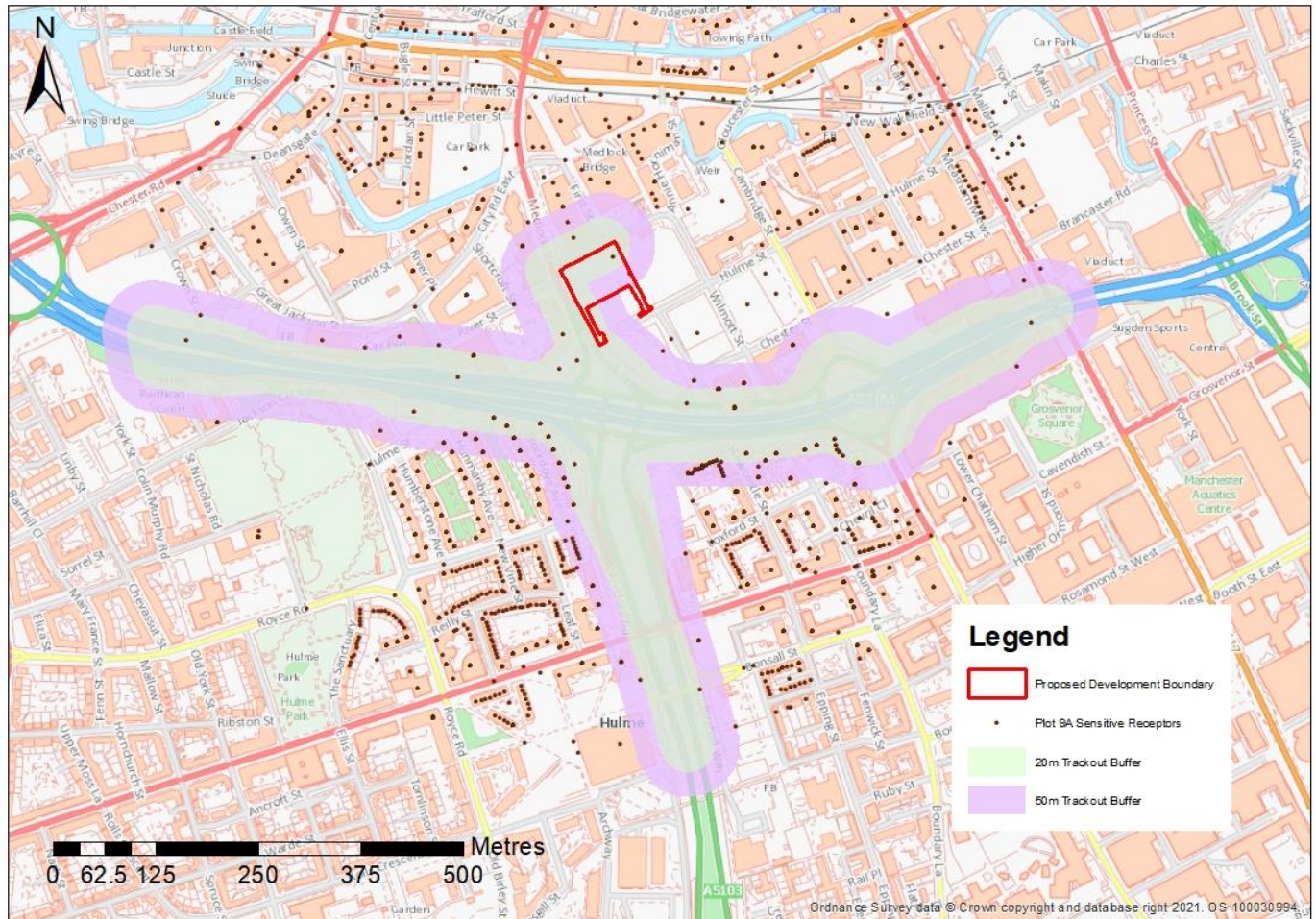
The sensitivity of the area to dust soiling effects on people and property from earthworks and construction activities is therefore **Medium**.

The Defra PM₁₀ background concentrations in the area of the Proposed Development are <15µg/m³. There are >100 high sensitivity receptors within 100 m of the Proposed Development boundary. The sensitivity of the area to human health impacts for earthworks and construction activities is therefore **Low**.

Sensitive receptors are also susceptible to dust soiling and health effects resulting from construction vehicle trackout. The IAQM guidance states that trackout may occur from roads up to 500 m from large sites and 200m from medium sites. As the highest dust emission magnitude is large, a 500m distance band has been applied

accounting for sensitive receptors 50m from the construction route. It is assumed that construction traffic will likely travel south towards the A57M and A5103. 20m and 50m trackout buffers have been applied to this road (Figure 5-2).

Figure 5-2: Trackout 500m Distance Band around potential trackout routes



An evaluation of numbers of sensitive receptors lying within 20m and 50m of the edge of the carriageway of those links identified in Step 2A has been carried out and the number of these receptors likely to be affected by trackout on roads used by construction vehicles is summarised in Table 5-3.

Distance (metres)	Receptor Type					Totals
	Residential / Development (High)	Non-Residential Development (High)	Commercial / Retail / Office (Medium)	Commercial / Leisure / Transport (Low)	Ecological	
20	1082	3	0	10	0	1095
50	2112	20	5	20	0	2157

Table 5-3: Number of Receptors Identified in Distance Bands from the Edge of Carriageways Potentially Included in Construction Traffic Routes

In summary, the evaluation shows that:

- >100 high risk receptors are located within 20m of the potential construction traffic routes

The sensitivity of the area to dust soiling effects on people and property from trackout activities is therefore **High**.

The Defra PM₁₀ background concentrations in the area of the Proposed Development are <15µg/m³. There are >100 high sensitivity receptors within 20 m of the construction phase boundary of roads used by construction traffic within 500

m of the Site exits. The sensitivity of the area to human health impacts for earthworks, construction and trackout activities is **Medium**.

Using the IAQM guidance, the sensitivity of the surrounding area has been determined for dust soiling effects and human health effects, based on the receptor type and density, as well as low annual mean PM₁₀ concentrations. The determined sensitivities for each phase of construction are summarised in Table C4 in Appendix C.

There are no ecological sensitive receptors within 50 m of the boundary of the site; and within 50 m of the route used by construction vehicles on the public highway, up to 500 m from the site entrance. Therefore, no further consideration of dust impact on ecological receptors has been undertaken.

Sensitivity of Areas Analysis

The sensitivity of the receptors and area has been defined for both dust soiling and human-health impact as shown in Table 5-4.

Receptor Sensitivity	Relevant Definition	Sensitivity of the Receptors	Relevant Definition	Sensitivity of the Area
Dust Soiling for Earthworks, Construction	Dwellings	High	>100 receptors within 100m of site but <100 within 50m	Medium
Dust Soiling for Trackout	Dwellings	High	>100 receptors within 20m of route used by construction traffic.	High
Human-Health Effects of PM ₁₀ for Earthworks, Construction	Dwellings	High	<24 µg/m ³ annual mean PM ₁₀ concentration. >100 receptors within 100m of site.	Low
Human-Health Effects of PM ₁₀ for Trackout	Dwellings	High	<24 µg/m ³ (<15µg/m ³) annual mean PM ₁₀ concentration. >100 receptors within 20m of route used by construction traffic	Medium

Table 5-4: Determination of the sensitivity of the surrounding area

5.1.4 Risk of Impact

The risk of dust impact to both dust soiling and human-health effects for each construction activities are summarised in Table 5-5.

Potential Impact (Sensitivity of the Area)	Dust Risk (Dust Emission Category)				
	Demolition (N/A)	Earthworks (Medium)	Construction (Large)	Trackout (Medium)	Overall Risk
Dust Soiling (Medium for Earthworks, Construction, High for Trackout)	N/A	Medium	Medium	Medium	Medium
Human-health (Low for Earthworks, Construction, Medium for Trackout)	N/A	Low	Low	Low	Low
Overall Risk	N/A	Medium	Medium	Medium	Medium

Table 5-5: Risk of Impacts

The dust impact assessment has demonstrated that the risk of dust soiling without any mitigation is Medium for earthworks, construction and trackout.

The risk of adverse human-health effects of PM₁₀ without any mitigation is Low for earthworks, construction and trackout.

The overall risk of unmitigated impacts is **Medium** for earthworks, construction and trackout.

5.2 Operation Phase

5.2.1 Human Exposure

5.2.1.1 Impacts at Nearby Sensitive Receptors

Air quality conditions and operation phase impacts for existing receptors close to the Proposed Development are presented in Appendix I.

The results compare conditions at each of the receptors 'under business as usual' (Do-minimum (DM)) and 'with development' (Do-Something (DS)) scenarios. Impact descriptors are assigned in accordance with IAQM guidelines.

A sensitivity test has been carried out to investigate the magnitude of impacts under the following conditions:

- a) 2019 Background with traffic flows factored to 2024 and 2019 emission factors (worst case)
- b) 2024 Background with traffic flows factored to 2024 and 2024 emission factors (best case)

Assuming worst case conditions, i.e., no decrease in background pollutant concentrations between base year and opening year, no improvement in vehicle emission factors, distribution of predicted development trips as per Transport Consultant calculations and general traffic growth in line with TEMPRO factors, the worst-case impact is 'moderate' at Receptor R6, where there is a predicted increase of $0.4 \mu\text{g}/\text{m}^3$. There are no new exceedances of the NO_2 annual mean air quality objective.

Assuming best case conditions in which vehicle emission factors decrease in line with predicted trends, air quality concentrations at all modelled receptor locations will meet the annual mean NO_2 objectives. The increase at receptor R6 is reduced to $0.2 \mu\text{g}/\text{m}^3$, and the impact at all receptors will be negligible.

Modelled PM_{10} and $\text{PM}_{2.5}$ concentrations in both the best- and worst-case scenarios meet the relevant air quality objectives at all modelled receptor locations. The impact of operation traffic phase increases is negligible at all locations.

It is likely that future predicted pollutant concentrations are likely to remain somewhere between those predicted within the best- and worst-case scenarios, however, it should be noted that all mitigation measures recommended within this assessment have been on worst-case predictions.

5.2.1.2 Future Sensitive Receptors at the Proposed Development

Air quality conditions for future occupiers and visitors of the Proposed Development are presented in Appendix J, see proposed receptors P1 to P4.

Results are presented for 2 different scenarios:

- a) 2019 Background with traffic flows factored to 2024 and 2019 emission factors (worst case)
- b) 2019 Background with traffic flows factored to 2024 and 2024 emission factors (best case)

Interpretation of worst-case data has initially been undertaken in relation to comparison with the national air quality objectives, although it should be noted that for planning purposes, the objectives do not apply at building façades of offices or other places of work where members of the public do not have regular access.

Following interpretation of modelled results, the following exceedances of the annual mean NO_2 objective were recorded:

- **P1-** Worst case: exceedances at floors ground floor,1, 2; best case: exceedances limited to ground floor
- **P2-** Worst case: exceedances at floors ground floor,1; best case: no exceedances on any floors
- **P3-** Worst case: exceedances at floors ground floor,1, 2; best case: no exceedances on any floors
- **P4-** Worst case: exceedances at floors ground floor,1, 2,3; best case: exceedances limited to ground floor and first floor

The annual mean PM_{10} and $\text{PM}_{2.5}$ objectives are predicted to meet the air quality objective threshold values in the opening year. Since all modelled NO_2 values are below $60 \mu\text{g}/\text{m}^3$, it is concluded that there will be no exceedances of the NO_2 1-hour mean objective.

Based on worst case evaluation from 2019 data, exceedances of the annual mean NO_2 objectives are likely up to and including third floor level throughout the development in the opening year. It is anticipated that concentrations

in the area will reduce further in the future, due to reduced traffic emissions associated with the implementation of the CAZ, due in 2022. However, it should be noted that as the Proposed Development has a commercial use, short-term rather than long-term objectives will apply for the future site users. Since the estimated NO₂ value is predicted to be well below 60 µg/m³, it is concluded that there are unlikely to be any exceedances of the NO₂ 1-hour mean objective at the Proposed Development.

PM₁₀ and PM_{2.5} concentrations at the development are predicted to meet the air quality objective threshold values in the opening year.

The local review of air quality has confirmed that there has been an overall downtrend in pollutant concentrations, and concentrations are anticipated to be lower by the opening year. This is likely to be associated with the uptake of lower emission vehicles and in particular the introduction of the Clean Air Zone. The Proposed Development is located in the centre of the Proposed Clean Air Zone. It is anticipated with the induction of the Clean Air Zone in 2022 (see section 4.6), particulate concentrations will reduce further.

Greater Manchester had previously made a commitment to achieving WHO guideline levels by 2030 as part of the Breathe-Life Initiative⁵⁵. However, the recommended guidelines were recently updated in September 2021⁵⁶. The update includes Air Quality Guideline (AQG) levels for the pollutants of relevance to this assessment (NO₂, PM₁₀ and PM_{2.5}) which are significantly lower than the previous WHO guidelines, which correspond to the lower range of the interim targets for PM₁₀ and PM_{2.5} and the higher range for NO₂. Greater Manchester has not yet issued any statement regarding the latest WHO recommendations.

Concentrations of all pollutants at the Proposed Development are likely to exceed the recently revised WHO targets, however this will not impact on current planning requirements.

⁵⁵ <https://www.businessgrowthhub.com/green-technologies-and-services/green-intelligence/resource-library/greater-manchester-becomes-uk-s-first-breathelife-region>. Accessed December 2021.

⁵⁶ World Health Organisation (WHO) (2021) WHO global air quality guidelines, Particulate matter (PM_{2.5} and PM₁₀), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide, <https://apps.who.int/iris/handle/10665/345329>.

6.0

Assumptions and Limitations

6.0 Assumptions and Limitations

The following assumptions have informed this assessment:

- Assumptions relating to quantities for construction are based on the design details provided by Jon Matthews Architects.
- Based on the size of the Proposed Development, it is assumed that daily construction vehicles will not exceed 50 heavy good vehicles (HGVs). This may be overly conservative if prefabrication is included within the construction. Should daily HGVs exceed 50, high risk mitigation measures would be required for trackout activities.
- Proposals are for an emergency generator to be located within an external roof plant area at 10th Floor. At the time of writing, generator requirements / specifications are not available, although design measures will be adopted to see that the compliance with the relevant requirements are achieved. Further screening will be required once details are finalised.
- The office floors will be served by a mixed mode ventilation system. Automatically opening ventilation panels, installed above the glazing panels, allow the building to be naturally ventilated when the external weather conditions permit. Outside air will be supplied via the opening vents in the façade, with the central extract system used to provide an exhaust air path.

7.0

Mitigation

7.0 Mitigation

7.1 Construction

The primary aim of the dust risk assessment is to identify the appropriate site-specific mitigation measures that will be adopted to ensure there will be no significant effect on local amenity and public health.

Full details of mitigation measures are presented in Appendix K and should be read in accordance with the findings of the construction dust assessment (section 5.0).

It is anticipated that the dust generation and harmful emissions from construction site activities will be greatly reduced or eliminated with the correct implementation of the best practice methods identified.

7.2 Operation

7.2.1 Impacts on Surrounding Receptors

It is anticipated that the impact of the operation phase on sensitive receptors is likely to be negligible, apart from one residential receptor (R6) where impacts could range between negligible and moderate, depending upon how quickly vehicle emission factors and pollution baseline levels improve. Further mitigation measures are provided within the development design and Framework Travel Plan produced by Vectos⁵⁷ and are summarised as follows:

- Provision of adequate cycle parking facilities within the proposals, to encourage cycling
- No on-site car parking except for 26 accessible car parking spaces), to further encourage sustainable travel modes
- Management of Travel Plan via an appointed co-ordinator to encapsulate all measures to be undertaken to encourage sustainable travel
- Production and implementation of Delivery and Servicing Plans, to manage these trips to occur outside the network peak hours

7.2.2 Impacts on Future Users of the Proposed Development

As there are not predicted to be any exceedances of the short-term NO₂ concentrations at building facades, there will be no requirement for gaseous filtration. As there are not predicted to be any exceedances of annual mean PM₁₀ and PM_{2.5} concentrations, PM_{10/2.5} filtration is unlikely to be required for planning (as it considers exceedances of national air quality objectives)

Good practice design is promoted via Building Regulations, which often promote adoption of more stringent WHO guidelines, see Table 7-1 below. Compliance with WHO recommended guidelines for residential and non-residential elements is considered 'best practice' but is non-mandatory at present, i.e., suitable control can be adopted on an 'as-required' basis. The WHO recommended guidelines were recently updated in September 2021⁵⁸. The update includes Air Quality Guideline (AQG) levels for the pollutants of relevance to this assessment (NO₂, PM₁₀ and PM_{2.5}) which are significantly lower than the previous WHO guidelines, which correspond to the lower range of the interim targets for PM₁₀ and PM_{2.5} and the higher range for NO₂.

The office floors will be served by a mixed mode ventilation system. Automatically opening ventilation panels, installed above the glazing panels, allow the building to be naturally ventilated when the external weather conditions permit. Outside air will be supplied via the opening vents in the façade, with the central extract system used to provide an exhaust air path.

⁵⁷ First Street Plot 9A Framework Travel Plan VN81029 Issue 8. Prepared by Vectos. 20 December 2021.

⁵⁸ World Health Organisation (WHO) (2021) WHO global air quality guidelines, Particulate matter (PM_{2.5} and PM₁₀), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide, <https://apps.who.int/iris/handle/10665/345329>.

Pollutant	Averaging Period	Air Quality Objective (AQO) ($\mu\text{g}/\text{m}^3$)	WHO Guidelines ($\mu\text{g}/\text{m}^3$)	
			Interim Target	AQG Level
NO ₂	Annual mean	40	40 to 20	10
PM ₁₀	Annual mean	40	70 to 20	15
PM _{2.5}	Annual mean	25	35 to 10	5

Table 7-1: Comparison of WHO Guidelines with National Air Quality Objectives

Worst-case dispersion modelling has indicated that NO₂ levels range from 32.8 to 54.4 $\mu\text{g}/\text{m}^3$ throughout the development, with potential exceedances of the 40 $\mu\text{g}/\text{m}^3$ annual mean NO₂ objective on lower levels at all building facades. There are no exceedances of the current annual mean NO₂ objective and current WHO threshold value at fourth floor levels and higher throughout the Proposed Development.

Worst-case dispersion modelling has indicated that PM₁₀ levels range from 19.3 to 23.5 $\mu\text{g}/\text{m}^3$ and there are no exceedances of the annual mean PM₁₀ objective or the WHO interim threshold values throughout the Proposed Development.

Worst-case dispersion modelling has indicated that PM_{2.5} levels range from 11.2 to 13.7 $\mu\text{g}/\text{m}^3$. Although there are no exceedances of the annual mean PM_{2.5} objective, the lower WHO threshold value of 10 $\mu\text{g}/\text{m}^3$ is exceeded throughout the Proposed Development.

For optimum design, air intake positions should be located at higher levels or roof level, where NO₂ concentrations are lowest. This will ensure that NO₂ levels throughout the Proposed Development will meet planning and current WHO requirements.

Predicted particulate matter concentrations meet current planning requirements, however PM_{2.5} concentrations are predicted to exceed the lower WHO threshold value of 10 $\mu\text{g}/\text{m}^3$.

The intake air filters will be selected based on the prevailing ambient air quality, so theoretically, these should be based on the ISOPM_{2.5} specification as poorer ambient air quality drives the need for finer filters. Integrating particulate filters into the design should be considered where this is practicable, to help strive towards achieving the more stringent WHO guideline values, particularly the lower interim target of 10 $\mu\text{g}/\text{m}^3$ PM_{2.5}, thereby delivering compliance with Greater Manchester's Breathe-Life Initiative 2030 target. However, the performance of the filters also needs to be carefully balanced around energy performance; fine filters result in significant pressure drop and thus energy consumption and operational carbon emissions.

The modelling has been based on 2019 monitored data and has therefore not considered future air quality improvements which may be delivered by forthcoming implementation of the Manchester CAZ in 2022. Further monitoring of indoor and ambient air quality around the development would provide a useful evidence base for further refinement of the ventilation strategy to include greater levels of natural ventilation and elimination of particulate filtration requirements as conditions allow. The IAQM⁵⁹ have published comprehensive guidance on indoor air quality. Further consultancy advice on indoor air quality can be provided on request but is not currently a prerequisite for planning applications.

⁵⁹ Institute of Air Quality Management (IAQM) (2021), Indoor Air Quality Guidance: Assessment, Monitoring, Modelling and Mitigation, version 1.0, September 2021, https://iaqm.co.uk/wp-content/uploads/2013/02/iaqm_indoorairquality.pdf

8.0

Residual Effects

8.0 Residual Effects

8.1 Construction

With appropriate mitigation in place, it is considered that the residual effects on dust soiling and human health from the construction phase activities would be reduced and not significant.

The mitigation measures required are detailed in Appendix K and are based upon the IAQM guidance. Selection of appropriate mitigation measures should be based on the findings of the construction dust assessment (section 5.1).

8.2 Operation

Residual effects on human health from operation phase emissions are expected to be negligible.

9.0

Conclusion

9.0 Conclusion

This report presents the air quality assessment to support a planning application for the redevelopment of Plot 9a, First Street, Manchester. A review of current legislation and national and local policy has been made. An assessment has been made of existing baseline air quality conditions and potential impacts associated with construction and operational of the Proposed Development.

The Proposed Development lies within Greater Manchester's Air Quality Management Area (AQMA), which was declared in 2000 due to exceedances of the annual mean nitrogen dioxide (NO₂) objective threshold and 24-hour particulate matter (PM₁₀) objective. Existing conditions within the study area indicate that there is potential for nitrogen dioxide (NO₂) concentrations in the wider area to exceed the National Air Quality Objective threshold levels.

Emissions of construction dust have been assessed using the qualitative approach outlined in the IAQM guidance. It was concluded that in the absence of any adequate mitigation, there is a *medium* risk from the construction, earthworks and trackout dust-generating activities associated with the Proposed Development. With appropriate mitigation measures implemented for all dust generating activities, it is anticipated that the dust generation and harmful emissions from construction site activities will not be significant.

There will be 26 accessible car parking spaces located in the basement of the Proposed Development and predicted daily vehicle trips are likely to exceed the IAQM threshold criterion (of 100 vehicles per day) for when a detailed assessment of transport emissions is required. Detailed assessment of transport related emissions indicated negligible air quality impacts at all surrounding receptors, apart from one residential receptor where impacts ranged between negligible and moderate. Mitigation measures include the exclusion of standard car parking places and a Framework Travel Plan has been prepared to encourage future users of the building to use Public Transport modes.

The energy design for the Proposed Development has not yet been finalised. Energy requirements for the development is proposed to be provided by electrical sources. Based on the current design proposals, there is unlikely to be any large, centralised combustion plant for the building that would result in NO_x emissions above threshold values published by the Institute of Air Quality Management. Proposals are for an emergency generator to be located within an external plant area at roof level. At the time of writing, generator requirements / specifications are not available, although design measures will be adopted to see that the compliance with the relevant requirements are achieved. Further screening in accordance with the criteria listed in the IAQM guidance will be required once details are finalised.

Worst-case dispersion modelling has indicated that NO₂ levels range from 32.8 to 54.4 µg/m³ throughout the development, with potential exceedances of the 40µg/m³ annual mean NO₂ objective being predicted on lower levels at all building facades. There are no exceedances of the current annual mean NO₂ objective and current WHO threshold value at fourth floor levels and higher throughout the Proposed Development.

Worst-case dispersion modelling has indicated that PM₁₀ levels range from 19.3 to 23.5 µg/m³ and there are no exceedances of the annual mean PM₁₀ objective, the lower WHO threshold value of 20µg/m³ is exceeded throughout the Proposed Development.

Worst- case dispersion modelling has indicated that PM_{2.5} levels range from 11.2 to 13.7 µg/m³. Although there are no exceedances of the annual mean PM_{2.5} objective, the lower WHO threshold value of 10µg/m³ is exceeded throughout the Proposed Development.

Since the estimated NO₂ values are predicted to be well below 60µg/m³ compliance with the short-term objectives (applicable to a commercial use) is anticipated. There will therefore not be a requirement for gaseous filtration. However, in order to comply with best practice guidelines, consideration should be made for positioning air inlets on higher floors of the development or at roof level and integrating particulate filters into the design where this is practicable. This will assist in striving towards achieving the more stringent WHO guideline values, and meeting Greater Manchester's Breathe-Life Initiative 2030 target.

Indoor air testing within the building would provide operational data on indoor air quality to inform the acceptability

of the ventilation strategy. Indoor air quality monitoring could also be used to confirm the suitability opening windows for purge or natural ventilation purposes as external conditions allow.

With the provision of the recommendation mitigation measures, it can be concluded that there are no air quality constraints to the construction and operation of the Proposed Development.

10.0

References

10.0 References

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11.0

Glossary

11.0 Glossary

Term/Acronym	Details
$\mu\text{g}/\text{m}^3$	Micrograms (one-millionth of a gram) per cubic metre of air
AADT	Annual average daily traffic
AQAL	Air Quality Assessment Level
AQAP	Air quality action plan
AQMA	Air quality management area. Areas where the air quality objectives are likely to be exceeded. Declared by way of an order issued under the Section 83(1) of the Environment Act 1995.
AQO	Air quality objective. Air quality targets to be achieved locally as set out in the Air Quality Regulations 2000 and subsequent Regulations. Objectives are expressed as pollution concentrations over certain exposure periods, which should be achieved by a specific target date. Some objectives are based on long term exposure (e.g., annual averages), with some based on short term objectives. Objectives only apply where a member of the public may be exposed to pollution over the relevant averaging time.
AQS	Air quality strategy
ASR	Annual status report
Defra	Department for Environment, Food and Rural Affairs
EA	Environment Agency
Earthworks	The process of soil stripping, ground-levelling, excavation and landscaping.
Eft	Emission Factor Toolkit
EU	European union
Exceedance	Concentrations of a specified air pollutant greater than the appropriate Air Quality Objective.
HDV	Heavy duty vehicle
IAQM	Institute of Air Quality Management
LA	Local authority
LAQM	Local air quality management
LAQM, TG	Local air quality management technical guidance
LBH	London Borough of Hackney
LDV	Light duty vehicle
Limit Values / EU limit values	The maximum pollutant levels set out in the EU Daughter Directives on Air Quality. In some cases, the limit values are the same as the national air quality objective but may allow a longer period for achieving.
LT	Long-term averaging period (i.e., Annual mean)
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NPPF	National Planning Policy Framework
PCM	Pollution climate model
PM_{10}	The fraction of particulates in air of very small size (less than 10 micrometres).
$\text{PM}_{2.5}$	Fine particles in the (ambient) air 2.5 micrometres or less in size.
Ramsar/ Ramsar site	The Convention on Wetlands of International Importance, called the Ramsar Convention is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. Ramsar sites are wetlands of international importance, designated under the Ramsar Convention.
SAC/ pSAC/ cSAC	Special area of conservation / potential SAC / candidate SAC
SDF	Strategic Development Framework
SPA / pSPA	Special protection area / potential special protection area
SPG	Supplementary planning guidance
SSSI	Site of special scientific interest

Term/Acronym	Details
ST	Short-term averaging period (i.e., Daily, hourly, or 15-min means)
TC	Transport Consultant
TEMPRO	Trip End Model Presentation Program
TP	Travel Plan
Trackout	The transfer of dust or dirt on the local road network and then re-suspended by vehicles on the network.
TS	Transport Statement

Appendices

Appendix A – Air Quality Assessment Authors

Author: **Glyn Hodgkiss**

Glyn is a Principal Consultant in Cundall's Air Quality Team. He has 30 years' experience working in the environmental field and has specialised in Air Quality for over 15 years. He is a Chartered Environmentalist and Member of the Institute of Air Quality Management.

Working in both the private and public sectors, Glyn has gained extensive experience in monitoring and modelling air quality. His role in Local Government included air quality action planning, working with developers to minimise air quality impacts of new development, working on regional planning policy initiatives and on the delivery of government funded air quality improvement programs. He has also worked in private sector consultancy on the delivery of multiple air quality assessments ranging from small, single source dispersion modelling studies through to complex multi-source assessments and major road and infrastructure projects. This work has provided valuable support in the design, planning, construction and operation of new developments.

Glyn has a pedigree in collaborative working, bringing together the expertise of Cundall alongside other consultants and stakeholders to promote smooth project progression from inception to conclusion.



Reviewer: **Jenny Carrington**

Jenny Carrington is a Chartered Scientist (CSci) and is based in Birmingham, where she works as a Principal Air Quality Consultant.

Jenny has sixteen years' experience working in the environmental sector for a range of both public and private clients.

She is responsible for undertaking air quality assessments and is fully conversant with atmospheric dispersion modelling through the use of ADMS software as part of more detailed air quality assessments. She also has responsibility for managing air quality monitoring programs.

In her role as an environmental specialist Jenny has worked on a range of multi-disciplinary projects often fulfilling the role of project manager in coordinating third parties to enable a successful completion of the project.

She is experienced in producing air quality chapters for Environmental Statements for a range of different developments and has previously reviewed Environmental Statement's on behalf of Local Authorities.

Jenny is a full member of the Institute of Air Quality Management (IAQM) and an the Institution of Environmental Sciences (IES).



Graduate Consultant: **Brittany Huggins**

Brittany is a Graduate Air Quality Consultant with Cundall, having joined the company in 2021.

She has a MSc degree in Air Pollution Management and Control from University of Birmingham, which explored air pollution management control technology, atmospheric data processing, micrometeorology and theoretical meteorology.

She also has a BSc degree in Environmental Science from Manchester Metropolitan University which included aviation and its environmental impacts, environmental monitoring and earth observation, environmental risk management and natural resources and pollution.

She has experience of a wide range of atmospheric data processing techniques and geographical information systems (GIS). She is an affiliate member of the Institute of Air Quality Management (IAQM) and an associate member Institution of Environmental Sciences (IES).



Appendix B – Consultation with Manchester City Council

Hodgkiss, Glyn

From: Hodgkiss, Glyn <g.hodgkiss@cundall.com>
Sent: 17 December 2021 12:47
To: Laura Miller
Subject: RE: Plot 9A First Street, Air Quality Assessment

Good Afternoon Laura,

Please excuse the delay in getting back to you on this enquiry, there have been further revisions to the scheme proposals of which I wanted to make you aware:

- a) Updated scheme description: Erection of a 9-storey building with basement comprising office accommodation (Use Class E(c)), car parking, cycle parking and associated facilities, landscaping and associated works
- b) Anticipated vehicle trip generation will exceed the IAQM threshold of 100 two way trips, therefore I will include an assessment of transport related AQ impacts on sensitive local receptors within the report. I will verify the model against the more conservative 2019 monitoring data set to avoid any underestimation due to Covid lockdown conditions. The proposed opening year will be 2024.

Otherwise, I will complete the assessment in accordance with our agreed scope below, paying due regard to your comments re: PM2.5.

I trust that this meets your requirements and will proceed on the assumption that the above will be acceptable unless I hear back from you.

Best Regards,

Glyn

From: Laura Miller <laura.miller@manchester.gov.uk>
Sent: 12 October 2021 08:35
To: Hodgkiss, Glyn <g.hodgkiss@cundall.com>
Subject: Plot 9A First Street, Air Quality Assessment

Good morning Glyn,

I have been forwarded your email below as I am officer covering this part of the city centre.

I have read your proposals and agree with what is being recommended.

PM2.5 - Please consider the previous WHO guideline for PM2.5 of 10ug/m3 annual average, as we're signed up with GMCA to be a BreatheLife city by 2030 and achieve this limit (notwithstanding the latest WHO guideline updates). This would future proof the development.

Kind Regards

Laura

Laura Miller (MRes, MA, BSc(Hons))

Please note that due to working compressed hours Wednesdays are a non-working day for me, I will respond to your email when I return to the office

Environmental Protection Section
Environmental Health
Neighbourhoods Directorate
Manchester City Council

Telephone: 0161 234 1742/0161 234 5004
email: laura.miller@manchester.gov.uk
website: www.manchester.gov.uk

For the latest support and information about the coronavirus visit www.manchester.gov.uk/coronavirus

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Dear Lisa & Graeme,

Cundall has been commissioned to carry out an air quality assessment in support of the planning application at Plot 9A, First Street, Manchester.

The Proposed Development will deliver 21,500sqm of commercial office space over 11 floors with winter gardens, and associated gym space. It is part of a wider vision to create a mixed-use neighbourhood in the area, supported by a mixture of leisure, office and residential blocks. The proposed development does not include any car parking.

Lighting and heating for the Proposed Development are to electrically powered. There will be a diesel fuelled back-up generator, allowing for required maintenance testing, operating hours are anticipated to be below 50 hours per year. Proposals are for the emergency generator to be located within an external roof plant area at 10th Floor. At the time of writing, generator requirements / specifications are not available, although design measures will be adopted to see that the compliance with the relevant requirements are achieved. Further screening will be provided once design details and specifications are confirmed.

We are therefore proposing the following scope of work:

Baseline assessment of existing air quality in the area using findings the Local Authority review and assessment process and data available from the Defra Local Air Quality Management website. We have obtained a copy of the latest Greater Manchester ASR and reviewed the Clean Air Greater Manchester website for 2019 and 2020 data. Interpretation and recommendations will be based on worst case 2019 data, due to the

Covid lockdown in 2020 and subsequent reduction in ambient air pollution.

An assessment of new exposure at the Proposed Development in accordance with IAQM/EPUK guidance. This will be based on existing baseline conditions, using available Greater Manchester monitoring data in the area and Defra background predictions. Consideration that given the commercial nature of the development, the short-term, rather

than long-term objectives are applicable. We are also aware of the site's location within the proposed Clean Air Zone

Undertaking a construction dust risk assessment following the latest Institute of Air Quality Management (IAQM) guidance;

Where appropriate, recommending appropriate mitigation measures in line with IAQM/EPUK guidance and Local policy; and

Preparation of a report to accompany the documents for the planning application.

If you disagree with any elements of the proposed scope please let me know, otherwise I will proceed with the assumption it is acceptable.

Thank you for your assistance in this matter and feel free to call me with any further queries.

Best Regards,

Glyn

Glyn?

Hodgkiss

Principal Air Quality Consultant

Cundall

4th Floor, 15 Colmore Row, Birmingham, B3 2BH, United Kingdom

Appendix C – IAQM Construction Assessment Methodology

Screening (Step 1)

As 'human receptors' were identified within 50 m of the boundary of the site; and within 50 m of the route(s) to be used by construction vehicles on the public highway, up to 500 m from the site entrance, a detailed risk assessment was undertaken.

Dust Emission (Step 2A)

The potential dust emission magnitude for different activities have been defined based on the criteria listed in Table C-1.

Stage	Description	Large	Medium	Small
Demolition	Definitions for demolition are:	1. Total building volume >50,000 m ³ 2. Potentially dusty construction material (e.g., concrete) 3. On-site crushing and screening 4. Demolition activities >20 m above ground level	5. Total building volume 20,000 m ³ – 50,000 m ³ 6. Potentially dusty construction material (e.g., concrete) 7. Demolition activities 10 – 20 m above ground level	8. Total building volume <20,000 m ³ 9. Construction material with low potential for dust release (e.g., metal cladding or timber) 10. Demolition activities <10 m above ground, demolition during wetter months
Earthworks	Earthworks will primarily involve excavating material, haulage, tipping, and stockpiling. This may also involve levelling the site and landscaping.	11. Total site area >10,000 m ² 12. Potentially dusty soil type (e.g., clay, which will be prone to suspension when dry due to small particle size) 13. >10 heavy earth moving vehicles active at any one-time formation of bunds >8 m in height 14. Total material moved >100,000 tonnes	15. Total site area 2,500 m ² – 10,000 m ² 16. Moderately dusty soil type (e.g., silt) 17. 5-10 heavy earth moving vehicles active at any one-time formation of bunds 4 m – 8 m in height 18. Total material moved 20,000 tonnes – 100,000 tonnes	19. Total site area <2,500 m ² 20. Soil type with large grain size (e.g., sand) 21. <5 heavy earth moving vehicles active at any one-time formation of bunds <4 m in height 22. Total material moved <20,000 tonnes, earthworks during wetter months
Construction	The key issues when determining the potential dust emission magnitude during the construction phase include the size of the building(s) / infrastructure, method of construction, construction materials, and duration of build.	23. Total building volume >100,000 m ³ 24. On-site concrete batching and sandblasting	25. Total building volume 25,000 m ³ – 100,000 m ³ 26. Potentially dusty construction material (e.g., concrete) 27. On-site concrete batching	28. Total building volume <25,000 m ³ 29. Construction material with low potential for dust release (e.g., metal cladding or timber)

Stage	Description	Large	Medium	Small
Trackout	Factors which determine the dust emission magnitude are vehicle size, vehicle speed, vehicle numbers, geology, and duration. Only receptors within 50 m of the routes used by vehicles on the public highway and up to 500 m from the site entrances are considered to be at risk from the effects of dust.	30. >50 HDV (>3.5 tonnes) outward movements in any one day 31. Potentially dusty surface material (e.g., high clay content) 32. Unpaved road length >100 m	33. 10-50 HDV (>3.5 tonnes) outward movements in any one day 34. Moderately dusty surface material (e.g., high clay content) 35. Unpaved road length 50 m – 100 m	36. <10 HDV (3.5 tonnes) outward movements in any one day 37. Surface material with low potential for dust release 38. Unpaved road length <50 m

Table C-1: Potential Dust Emission Magnitude Criteria

Sensitivity of the Area (Step 2B)

The sensitivity of the area takes account of several factors:

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

Table C-2 provides guidance on the sensitivity of different types of receptor.

Description	High Sensitivity Receptor	Medium Sensitivity Receptor	Low Sensitivity Receptor
Sensitivities of People to Dust Soiling Effects	1. Users can reasonably expect enjoyment of a high level of amenity 2. The appearance, aesthetics, or value of their property would be diminished by soiling 3. 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 4. Indicative examples include dwellings, museums, and other culturally important collections, medium, and long-term car parks, and car showrooms	5. Users would expect a to enjoy a reasonable level of amenity, but would not reasonably expect a to enjoy the same level of amenity as in their home 6. The appearance, aesthetics, or value of their property could be diminished by soiling 7. The people or property wouldn't reasonably be expected a to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land 8. Indicative examples include parks and places of work	9. The enjoyment of amenity would not reasonably be expected; or 10. Property would not reasonably be expected a to be diminished in appearance, aesthetics, or value by soiling 11. 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 12. Indicative examples include playing fields, farmland (unless commercially sensitive horticultural), footpaths, short-term car parks, and roads

Description	High Sensitivity Receptor	Medium Sensitivity Receptor	Low Sensitivity Receptor
Sensitivities of People to the Health Effects of PM₁₀	13. 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) 14. Indicative 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	15. Locations where the people exposed are workers d, 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). 16. Indicative 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	17. Locations where human exposure is transient. 18. Indicative examples include public footpaths, playing fields, parks, and shopping streets
Sensitivities of Receptors to Ecological Effects	19. Locations with an international or National designation and the designated features may be affected by dust soiling 20. 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 21. Indicative examples include a Special Area of Conservation designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings	22. Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown 23. Locations with a National designation where the features may be affected by dust deposition 24. Indicative example is a Site of Special Scientific Interest with dust sensitive features	25. Locations with a local designation where the features may be affected by dust deposition. 26. Indicative example is a local Nature Reserve with dust sensitive features

Table C-2: Sensitivities of People to Dust Soiling Effects, Health Effects of PM₁₀, and Sensitivities of Receptors to Ecological Effects

Full details of the sensitivities of receptors are provided in the IAQM Guidance document.

Table C-3, Table C-4, and Table C-5 show how the sensitivity of the area has been determined for dust soiling, human-health, and ecosystem impacts respectively.

These tables take account of several factors which may influence the sensitivity of the area. The highest level of sensitivity from each table has been recorded.

Receptor Sensitivity	Number of Receptors	Distance 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 C-3: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration (µg/m³)	Number of Receptors ^d	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<28	>10	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

Table C-4: Sensitivity of the Area to Human-Health Impacts

Table C5 Receptor Sensitivity	Distance from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Table C-5: Sensitivity of the Area to Ecological Impact

The highest level of sensitivity from each table has been recorded. Professional judgement has been used to determine alternative sensitivity categories with consideration of additional factors, such as any pre-existing screening between the source and the receptors, the season during which the works will take place, and duration of the potential impact.

Risk of Impact Definition

The dust emission magnitude (Step 2A) was combined with the sensitivity of the area (Step 2B) to determine the risk of impact with no mitigation applied. Tables C-6 to C-9 provide the method of assigning the level of risk of each activity and used to determine the level of site-specific mitigation.

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

Table C-6 Risk of Impact – Demolition

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 C-7: Risk of Impact – Earthworks

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 C-8: Risk of Impact – Construction

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

Table C-9: Risk of Impact – Trackout

Appendix D – IAQM Local Air Quality Assessment Screening Criteria

Comparison Against IAQM Criteria

IAQM's guidance note 'Land-Use Planning & Development Control: Planning for Air Quality' (updated in January 2017) was issued to ensure that air quality is adequately considered in the land-use planning and developmental control process.

It provides a decision-making process which assists with the understanding of air quality impacts and implications because of development proposals. It provides a framework for air quality considerations within local development control processes, promoting a consistent approach to the treatment of air quality issues within development control decisions.

The guidance includes a method for screening the requirement for an air quality assessment, the undertaking of an air quality assessment, the determination of the air quality impact associated with a development proposal and whether this impact is significant.

The guidance also provides some clarification as to when air quality constitutes a material consideration and highlights the links to other relevant issues (for example traffic speed reduction measure and the use of alternative technology to provide energy) and the importance of the understanding of these with the input from other discipline specialists. The 'creeping baseline' is another issue raised about cumulative impacts.

The guidance note is widely accepted as the most appropriate reference method for this purpose. This guidance refers to the Town and Country Planning (Development Management Procedure) Order (England) 2010 [(Wales) 2012] definition of a 'major' development when scoping assessments required for the planning process.

A 'major' development includes developments where:

- The number of dwellings is 10 or above
- The residential development is carried out of a site of more than 0.5ha where the number of dwellings is unknown
- The provision of more than 1,000m² commercial floor space; or,
- Development carried out on land of 1ha or more.

There are two types of air quality impacts to be considered:

- The impact of existing sources in the local area on the Proposed Development (governed by background pollutant levels and proximity to sources of air pollution); and,
- The impacts of the Proposed Development on the local area.

Regarding the changes in air quality or exposure to air pollution, the guidance indicates that each local authority will be likely to have their own view on the significance of this; these are to be described in relation to whether a National Air Quality Objective (NAQO) predicted to be met, or at risk of not being met. Exceedances of these objectives are considered as significant, if not mitigated.

As part of the impact of the Proposed Development on the local area, a two-staged assessment is recommended as per current guidance.

Stage 1: Determines whether an air quality assessment is required. In order to proceed to Stage 2, it requires any of the criteria under (A) coupled with any of the criteria under (B) in Table D-1 to apply.

Stage 2: Where an assessment is deemed appropriate, this may take the form of a Simple Assessment or a Detailed Assessment, using suitable guidance provided in Table D-2.

Criteria to Proceed to Stage 2

A. If any of the following apply:

- 10 or more residential units of a site area of more than 0.5ha
- More than 1,000m² of floor space for all other uses or a site area greater than 1ha

B. Coupled with any of the following:

- The development has more than 10 parking spaces
- The development will have a centralised energy facility or other centralised combustion process

Note: Consideration should still be given to the potential impacts of neighbouring sources on the site, even if an assessment of impacts of the development on the surrounding area is screened out.

Table D-1: Stage 1 Criteria

The Development will	Indicative Criteria to Proceed to an Air Quality Assessment
1. Cause a significant change in Light Duty Vehicle (LDV) traffic slows on local roads with relevant receptors. (LDV = cars and small vans <3.5t gross vehicle weight).	A change of LDV flows of: • More than 100 AADT within or adjacent to an Air Quality Management Area (AQMA) • More than 500 AADT elsewhere.
2. Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors. (HDV = goods vehicles + buses >3.5t gross vehicle weight).	A Change of HDV flows of: • More than 25 AADT within or adjacent to an AQMA • More than 100 AADT elsewhere.
3. Realign roads, i.e., changing the proximity of receptors to traffic lanes.	Where the change is 5m or more and the road is within an AQMA
4. Introduce a new junction or remove an existing junction near to relevant receptors.	Applies to junctions that cause traffic to significantly change vehicle accelerate/decelerate, e.g., Traffic lights, or roundabouts.
5. Introduce or change a bus station.	Where bus flows will change by: • More than 25 AADT within or adjacent to an AQMA • More than 100 AADT elsewhere.
6. Have an underground car park with extraction system.	The ventilation extract for the car park will be within 20m of a relevant receptor. Coupled with the car park having more than 100 movements per day (total in and out).
7. Have one or more substantial combustion processes, where there is a risk of impacts at relevant receptors. NB. this includes combustion plant associated with standby emergency generators (typically associated with centralised energy centres) and shipping.	Typically, any combustion plant where the single or combined NO _x emission rate is less than 5 mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion. In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates. Conversely, where existing NO ₂ concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable.

Table D-2: Indicative Criteria for Requiring an Air Quality Assessment

Impact Descriptors for Individual Receptors

The IAQM guidance contains a two Stage process for determining the likely significant effects of the impacts on air quality:

- A qualitative or quantitative description of the impacts on local air quality arising from the development; and
- A judgement on the overall significance of the effects of any impacts.

A framework for describing the impacts is set out in IAQM guidance and summarised in Table D-3 below.

Long-term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76 – 94% of AQAL	Negligible	Slight	Moderate	Moderate
95 – 102% of AQAL	Slight	Moderate	Moderate	Substantial
103 – 109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Table D-3: Indicative Criteria for Requiring an Air Quality Assessment

For air quality impacts arising from surrounding sources on new occupants of a development, then the impacts are best described in relation to whether an air quality objective will not be met or is at risk of not being met. Where the air quality is such that an air quality objective at the building façade is not met, the effect on residents or occupants will be judged as significant, unless provisions is made to reduce their exposure by some means.

Changes of less than 0.5%, will be described as Negligible.

Appendix E – Results of Screening Assessment

Where the Development will:	Indicative Criteria to Proceed to an Air Quality Assessment	Information Relevant to the Proposed Development
1. Cause a significant change in Light Duty Vehicle (LDV) traffic slows on local roads with relevant receptors.	IAQM Guidance states a change of LDV flows of: - More than 100 AADT within or adjacent to an Air Quality Management Area (AQMA) - More than 500 AADT elsewhere.	The development will generate more than 100 daily vehicle trips, therefore further assessment of increased transport emissions was included within this assessment.
2. Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors.	A Change of HDV flows of: - More than 25 AADT within or adjacent to an AQMA - More than 100 AADT elsewhere.	No increase in HDV flows is predicted
3. Realign roads, i.e., changing the proximity of receptors to traffic lanes.	Where the change is 5m or more and the road is within an AQMA	No realignment of >5m proposed
4. Introduce a new junction or remove an existing junction near to relevant receptors.	Applies to junctions that cause traffic to significantly change vehicle accelerate/decelerate, e.g., Traffic lights, or roundabouts.	No new junctions proposed
5. Introduce or change a bus station.	Where bus flows will change by: - More than 25 AADT within or adjacent to an AQMA - More than 100 AADT elsewhere.	No bus station proposed
6. Have an underground car park with extraction system.	The ventilation extract for the car park will be within 20m of a relevant receptor. Coupled with the car park having more than 100 movements per day (total in and out).	No underground car parking proposed
7. Have one or more substantial combustion processes, where there is a risk of impacts at relevant receptors.	Typically, any combustion plant where the single or combined NO _x emission rate is less than 5 mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion.	Proposals are for an emergency generator to be located within an external roof plant area at roof level. At the time of writing, generator requirements / specifications are not available, although design measures will be adopted to see that the compliance with the relevant requirements are achieved. Further screening will be required once details are finalised.

Table E-1: Indicative Criteria for Requiring a Detailed Air Quality Assessment

Appendix F – Traffic Data

Year	Tempo Growth Factor
	Average
2019 to 2024	1.0653

Table F-1: Tempo Growth Factors provided by Transport Consultant

Site	Receptor Name/Description	Easting	Northing	Receptor Height (m)	2019 Annual Mean NO ₂ Value µg/m ³
MAN77	Hewitt Street	383602	397488	2.5	43.7
MAN82_84	Oxford Road	384233	397287	2.5	51.3

Table F-2: Verification Sites

Figure F1 Trip Distribution Provided by Transport Consultant

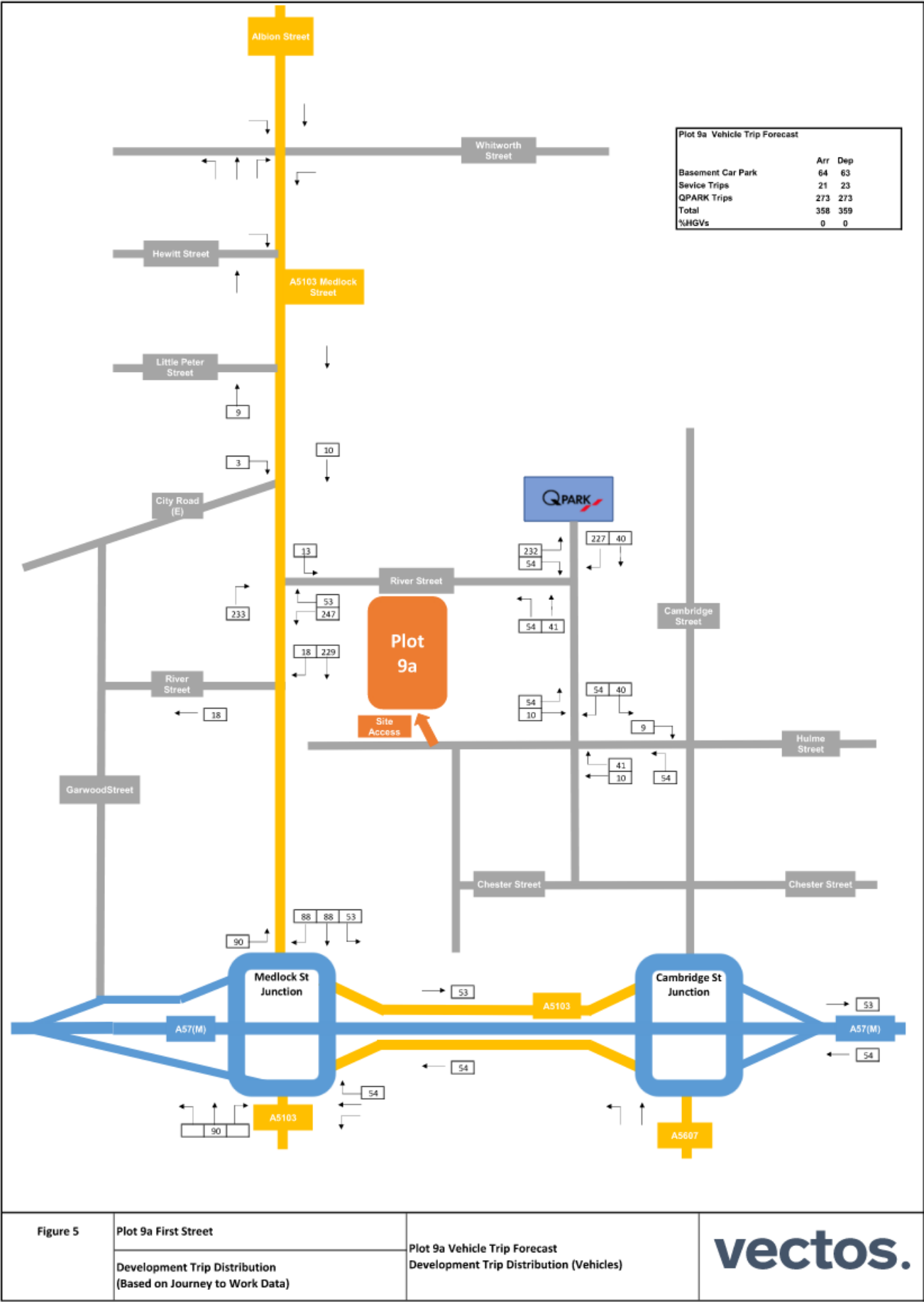
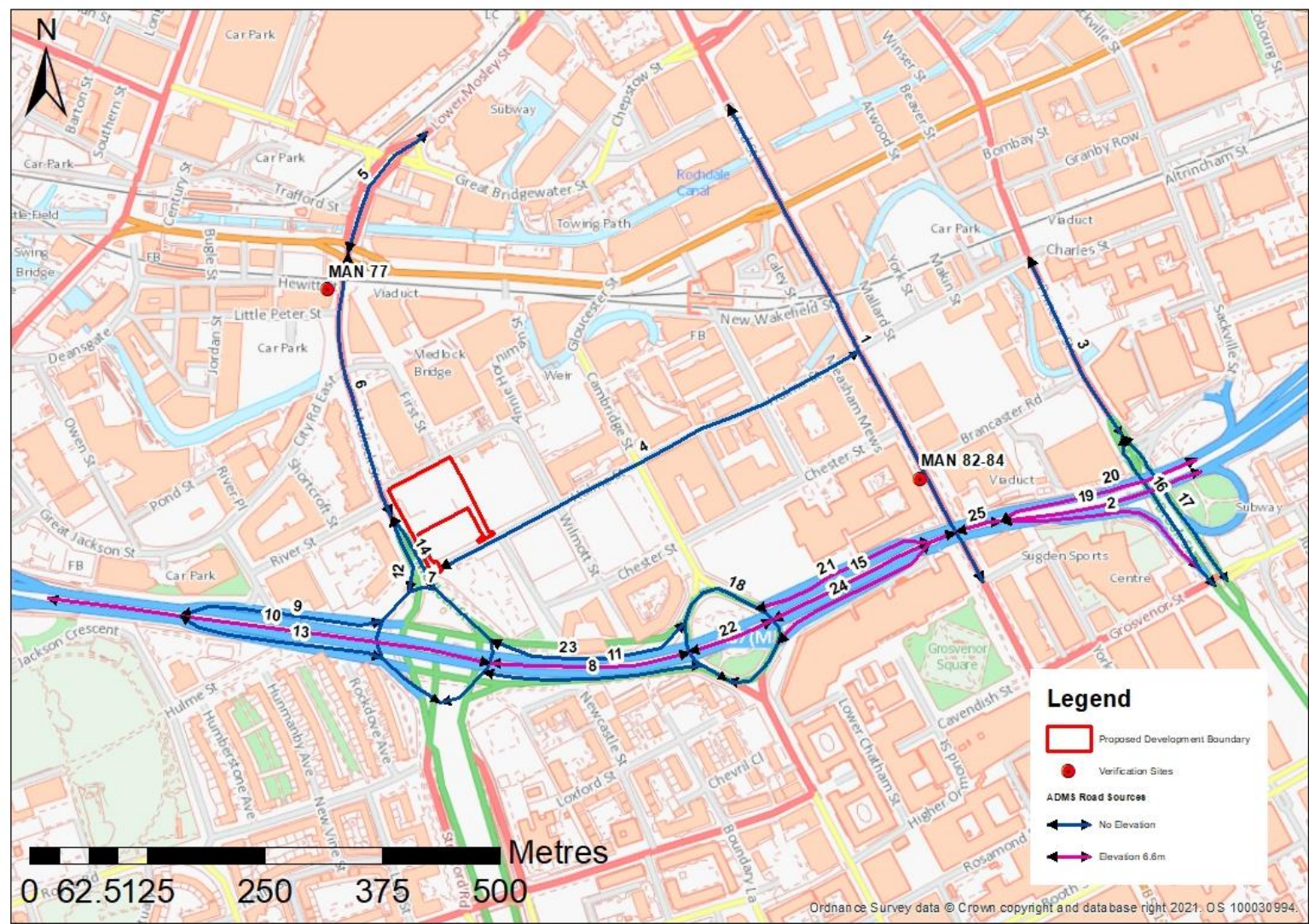


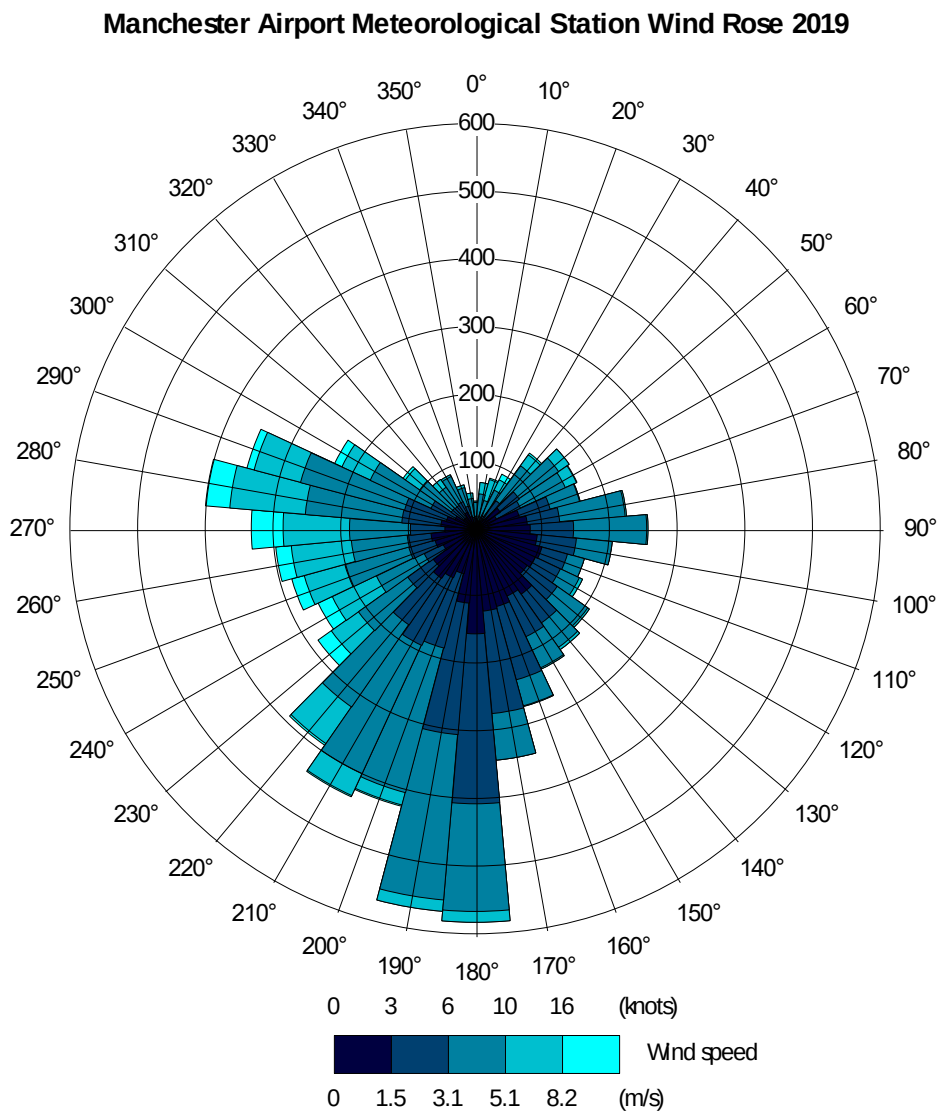
Figure F2 Road Links Used in Model and Position of Verification Sites



Link	Road	Road Width (m)	AADT			%HGV	Estimated Speed (kph)
			2019	2024DM	2024DS		
1	Oxford Road	8.3	5463	5907	5907	43.5	32
3	Brook Street	9.7	8081	8738	8738	4.5	32
4	Hulme Street	8.0	665	719	719	0.8	32
5	Medlock Street S	14.1	16913	18288	18376	3.6	32
6	Medlock Street N	6.2	16913	18288	18376	3.6	32
7	Roundabout 1	12.8	25276	27331	27421	3.3	20
8	Mancunian Way Slip W	6.8	12638	13665	13719	3.3	20
9	Mancunian Way Slip	8.9	-	-	90	0.9	20
10	Mancunian Way	17.9	73109	79053	79053	4.3	64
11	Mancunian Way	16.2	59556	64398	64557	3.8	64
12	Albion Street	7.2	8457	9144	9234	3.6	20
13	Mancunian Way Slip	7.1	-	-	160	0.9	20
14	Albion Street	6.5	8457	9144	9144	3.6	20
15	Mancunian Way	18.6	59556	64398	64398	3.8	64
16	Brook Street	7.6	4580	4952	4952	3.3	20
17	Brook Street	7.5	4580	4952	4952	3.3	20
18	Roundabout 2	10.4	25276	27331	27331	3.3	20
19	Mancunian Way	7.9	45393	49083	49083	3.9	64
20	Mancunian Way	5.3	45393	49083	49083	3.9	64
22	Mancunian Way	15.6	59556	64398	64451	3.8	64
23	Mancunian Way Slip E	7.5	12638	13665	13665	3.3	20
25	Mancunian Way	21.7	90785	98166	98166	3.9	64

Table F-3: Model Inputs

Appendix H Wind Rose for Manchester Airport 2019



Appendix H – Model Verification

Model Verification

Model verification is the process of comparing monitored and modelled pollutant concentrations for the same year, at the same locations, and adjusting modelled concentrations wherever necessary to be consistent with monitoring data. This increases the robustness of modelling results.

Discrepancies between modelled and measured concentrations can arise for a number of reasons, for example:

- Traffic data uncertainties
- Background concentration estimates
- Meteorological data uncertainties
- Sources not explicitly included within the model, for example car parks and bus stops
- Overall model limitations, including treatment of roughness and meteorological data, treatment of speeds), and:
- Uncertainty in monitoring data, particularly diffusion tubes

Verification is the process by which uncertainties such as those described above are investigated and minimised. Disparities between modelling and monitoring results are likely to arise as result of a combination of all of these aspects.

Using the guidance provided in Chapter 7 of LAQM.TG (16), the modelled output has been verified against the monitoring data obtained by Manchester City Council, the closest locations to the Proposed Development.

The performance of the dispersion model was assessed by comparing the modelled concentrations with measured concentrations. Meteorological data, monitored concentrations, vehicle emission rates and traffic data for 2019 were all used in the model verification process.

The model adjustment was undertaken using methodology which requires the determination of the ratio between the measured and modelled road contributed NO_x at each comparison site. The ratio between them, referred to as the adjustment factor, is applied to the modelled road contributed NO_x. The modelled NO₂ is then determined using the Defra NO_x/NO₂ calculator.

Table H-1 presents a summary of the model performance prior to bias adjustment. The model verification is based on Defra EFT V11.0 emission factors.

Ref	Description	Monitored NO ₂ (µg/m ³)	Modelled NO ₂ (µg/m ³)	% Difference (Modelled-Measured) / Measured
MAN77	Hewitt Street	43.7	34.2	-21.8
MAN82_84	Oxford Road	51.3	40.3	-21.4

Table H-1: Model Performance Prior To Bias Adjustment

These comparisons show that the model underpredicted annual mean concentrations of NO₂. Model verification was therefore carried out and an adjustment factor calculated and applied in all scenarios, in accordance with the methodology prescribed in LAQM.TG (16). A regression analysis was undertaken of modelled and measured road NO_x concentrations at these locations. The derived adjustment factor (3.146) was then applied to the modelled road NO_x concentrations to adjust for model bias. The comparison of modelled with measured values was then repeated

and the results are shown in Table H-2.

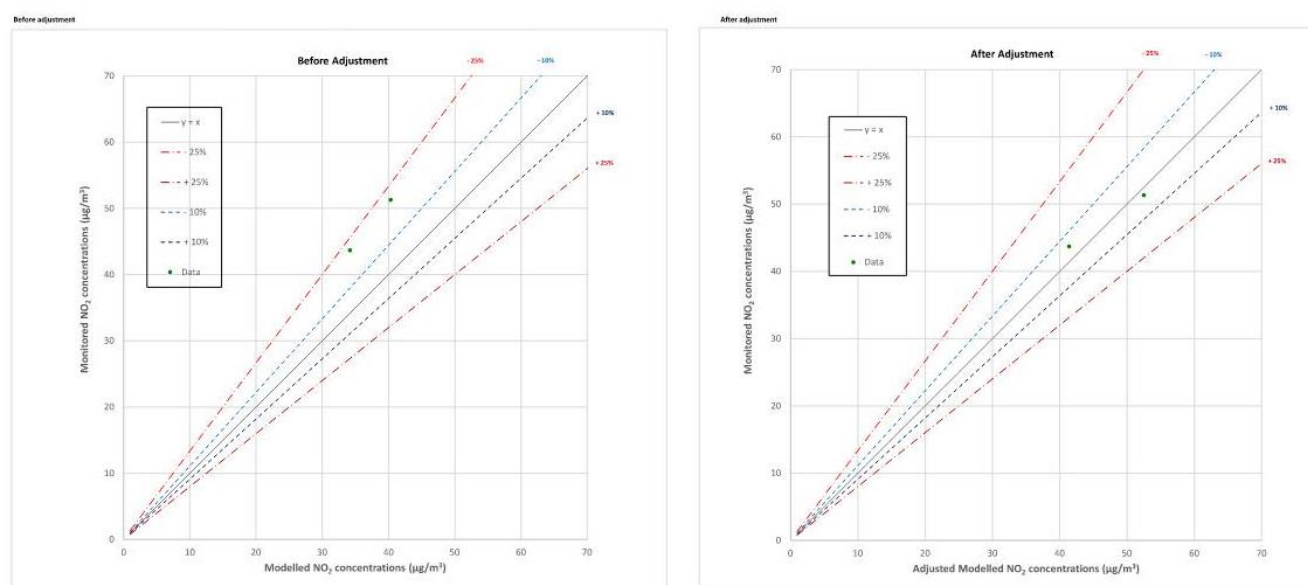
Ref	Description	Monitored NO ₂ (µg/m ³)	Modelled NO ₂ (µg/m ³)	% Difference (Modelled-Measured) / Measured
MAN77	Hewitt Street	43.7	41.4	-5.2
MAN82_84	Oxford Road	51.3	52.5	2.3

Table H-2: Model Performance After Bias Adjustment

The accuracy of the adjusted model was also considered via the calculation of the Root Mean Square Error (RMSE) and fractional bias.

With the unadjusted model results, the RMSE was 10.3 µg/m³, while with the adjusted model results this was reduced to 1.8 µg/m³ so the adjustment has reduced the average error or uncertainty in the model results. LAQM.TG (16) states that ideally, an RMSE within 10% of the air quality objective would be derived, which equates to 4 µg/m³ for the annual average NO₂ objective. In this respect, the model results are therefore considered robust. The agreement before and after adjustment is illustrated in Figure H1.

Figure H-1 Verification Sites



The fractional bias was 0.24 with the unadjusted model, which shows a slight tendency to under-predict, and 0.01 with the adjusted model, which shows that the under prediction has been mostly removed.

The final adjusted total NO₂ concentration predicted at the diffusion tubes sites is within ±25% of the measured values and is therefore considered satisfactory.

In accordance with Defra guidance, the road contributed NO_x adjustment factor was also applied to the road contributed PM concentration. The total PM₁₀ and PM_{2.5} concentrations are derived by adding the adjusted road contribution value to the Defra background concentrations.

Appendix I – Dispersion Modelling Results- Existing Receptors

Long-Term NO₂ Concentrations- Impacts from Road Traffic Emissions at Existing Receptors

The effects of the operation phase road traffic NO₂ emissions on existing sensitive receptors close to the Proposed Development are presented in Table I-1.

Receptor ID	Floor	Annual Mean NO ₂ Concentrations µg/m ³							
		2019 Background with 2024 traffic flows and 2019 Emissions (Worst Case)				2024 Background with 2024 traffic flows and 2024 Emissions (Best Case)			
		DM	DS	DS-DM	Impact	DM	DS	DS-DM	Impact
R1	GF	52.0	52.1	<0.1	Negligible	43.6	43.7	<0.1	Negligible
R2	GF	51.5	51.6	<0.1	Negligible	43.3	43.3	<0.1	Negligible
R3	1	<u>66.5</u>	<u>66.5</u>	0.1	Negligible	53.3	53.3	<0.1	Negligible
R4	GF	48.6	48.6	<0.1	Negligible	41.5	41.5	<0.1	Negligible
R5	5	35.7	35.8	<0.1	Negligible	33.7	33.7	<0.1	Negligible
R6	GF	51.7	52.1	0.4	Moderate	43.5	43.7	0.2	Negligible
R7	GF	45.6	45.7	0.1	Negligible	39.8	39.8	<0.1	Negligible
R8	GF	41.5	41.6	0.1	Negligible	37.2	37.2	<0.1	Negligible

Notes: Exceedances of the annual mean air quality objective are indicated in bold.
Values greater than 60µg/m³ are underlined.

Table I-1: NO₂ Annual Mean Concentrations at Modelled Receptors During the Operation Phase

Results are presented for 2 different scenarios:

- 2019 Background with traffic flows factored to 2024 and 2019 emission factors (worst case)
- 2024 Background with traffic flows factored to 2024 and 2024 emission factors (best case)

Assuming worst case conditions, i.e., no decrease in background pollutant concentrations between base year and opening year, no improvement in vehicle emission factors, distribution of predicted development trips as per Transport Consultant calculations and general traffic growth in line with TEMPRO factors, the worst-case impact is 'moderate' at Receptor R3, where there is a predicted increase of 0.4 µg/m³. There are no new exceedances of the NO₂ annual mean air quality objective.

Assuming best case conditions in which vehicle emission factors decrease in line with predicted trends, air quality concentrations at all modelled receptor locations will meet the annual mean NO₂ objectives. The increase at receptor R3 is reduced to 0.2 µg/m³, and the impact at all receptors will be negligible.

Long Term PM₁₀ Concentrations: Impacts from Road Traffic Emissions at Existing Receptors

The effects of the operation phase road traffic PM₁₀ emissions on existing sensitive receptors close to the Proposed Development are presented in Table I-2.

Modelled PM₁₀ concentrations in both the best- and worst-case scenarios meet the annual mean PM₁₀ objectives at all modelled receptor locations. The impact of operation traffic phase increases is negligible at all locations.

Receptor ID	Floor	Annual Mean PM ₁₀ Concentrations µg/m ³ (Daily Exceedances of 50 µg/m ³ in brackets)							
		2019 Background with 2024 traffic flows and 2019 Emissions (Worst Case)				2024 Background with 2024 traffic flows and 2024 Emissions (Best Case)			
		DM	DS	DS-DM	Impact	DM	DS	DS-DM	Impact
R1	GF	23.1 (8)	23.1 (8)	<0.1	Negligible	22.8 (8)	22.8 (8)	<0.1	Negligible
R2	GF	23.1 (8)	23.1 (8)	<0.1	Negligible	22.8 (8)	22.8 (8)	<0.1	Negligible
R3	1	27.2 (18)	27.2 (18)	<0.1	Negligible	26.8 (17)	26.8 (17)	<0.1	Negligible
R4	GF	22.5 (7)	22.5 (7)	<0.1	Negligible	22.3 (7)	22.3 (7)	<0.1	Negligible
R5	5	20.0 (3)	20.0 (3)	<0.1	Negligible	20.0 (3)	20.0 (3)	<0.1	Negligible
R6	GF	23.2 (9)	23.3 (9)	0.1	Negligible	23.0 (8)	23.0 (8)	<0.1	Negligible
R7	GF	21.9 (6)	21.9 (6)	<0.1	Negligible	21.8 (6)	21.8 (6)	<0.1	Negligible
R8	GF	21.1 (5)	21.1 (5)	<0.1	Negligible	20.9 (5)	20.9 (5)	<0.1	Negligible

Table I-2: PM₁₀ Annual Mean Concentrations at Modelled Receptors During the Operation Phase

Long Term PM_{2.5} Concentrations: Impacts from Road Traffic Emissions at Existing Receptors

The effects of the operation phase road traffic PM_{2.5} emissions on existing sensitive receptors close to the Proposed Development are presented in Table I-3.

Modelled PM_{2.5} concentrations in both the best- and worst-case scenarios meet the annual mean PM_{2.5} objectives at all modelled receptor locations. The impact of operation traffic phase increases is negligible at all locations.

Receptor ID	Floor	Annual Mean PM _{2.5} Concentrations µg/m ³							
		2019 Background with 2024 traffic flows and 2019 Emissions (Worst Case)				2024 Background with 2024 traffic flows and 2024 Emissions (Best Case)			
		DM	DS	DS-DM	Impact	DM	DS	DS-DM	Impact
R1	GF	13.5	13.5	<0.1	Negligible	13.2	13.2	<0.1	Negligible
R2	GF	13.4	13.4	<0.1	Negligible	13.2	13.2	<0.1	Negligible
R3	1	15.8	15.8	<0.1	Negligible	15.4	15.4	<0.1	Negligible
R4	GF	13.1	13.1	<0.1	Negligible	12.9	12.9	<0.1	Negligible
R5	5	11.6	11.6	<0.1	Negligible	11.6	11.6	<0.1	Negligible
R6	GF	13.6	13.6	<0.1	Negligible	13.3	13.3	<0.1	Negligible
R7	GF	12.8	12.8	<0.1	Negligible	12.6	12.6	<0.1	Negligible
R8	GF	12.3	12.3	<0.1	Negligible	12.1	12.1	<0.1	Negligible

Table I-3: PM_{2.5} Annual Mean Concentrations at Modelled Receptors During the Operation Phase

Appendix J Dispersion Modelling Results- New Receptors

Long-Term NO₂ Concentrations- Emissions from Road Traffic

The effects of the operation phase road traffic NO₂ emissions on new receptors within the Proposed Development are presented in Table J-1.

Receptor ID	Floor	Annual Mean NO ₂ Concentration µg/m ³	
		2019 Background with 2024 traffic flows and 2019 Emissions (Worst Case)	2024 Background with 2032 traffic flows and 2024 Emissions (Best Case)
P1a	GF	51.2	43.2
P1b	1	45.8	39.8
P1c	2	41.9	37.4
P1d	3	39.2	35.8
P1e	4	37.4	34.6
P1f	5	36.0	33.8
P1g	6	34.9	33.2
P1h	7	34.0	32.6
P1i	8	33.3	32.2
P1j	9	32.7	31.8
P2a	GF	41.8	37.3
P2b	1	40.9	36.7
P2c	2	39.8	36.1
P2d	3	38.5	35.3
P2e	4	37.2	34.5
P2f	5	36.0	33.8
P2g	6	35.0	33.2
P2h	7	34.2	32.7
P2i	8	33.5	32.3
P2j	9	32.8	31.9
P3a	GF	43.4	38.2
P3b	1	42.3	37.6
P3c	2	41.0	36.8
P3d	3	39.4	35.9
P3e	4	37.9	34.9
P3f	5	36.5	34.1
P3g	6	35.3	33.4
P3h	7	34.3	32.8
P3i	8	33.5	32.3

Receptor ID	Floor	Annual Mean NO ₂ Concentration µg/m ³	
		2019 Background with 2024 traffic flows and 2019 Emissions (Worst Case)	2024 Background with 2032 traffic flows and 2024 Emissions (Best Case)
P3j	9	32.8	31.9
P4a	GF	54.4	45.2
P4b	1	48.3	41.4
P4c	2	43.8	38.6
P4d	3	40.5	36.6
P4e	4	38.2	35.2
P4f	5	36.5	34.1
P4g	6	35.1	33.3
P4h	7	34.1	32.7
P4i	8	33.3	32.2
P4j	9	32.6	31.8

Table J-1: Annual Mean NO₂ Concentrations at Modelled Receptors During the Operation Phase

Results are presented for 2 different scenarios:

- 2019 Background with traffic flows factored to 2024 and 2019 emission factors (worst case)
- 2024 Background with traffic flows factored to 2024 and 2024 emission factors (best case)

Following interpretation of modelled results, the following exceedances of the annual mean objective were recorded:

- P1-** Worst case: exceedances at floors ground floor,1, 2; best case: exceedances limited to ground floor
- P2-** Worst case: exceedances at floors ground floor,1; best case: no exceedances on any floors
- P3-** Worst case: exceedances at floors ground floor,1, 2; best case: no exceedances on any floors
- P4-** Worst case: exceedances at floors ground floor,1, 2,3; best case: exceedances limited to ground floor and first floor

Long Term PM₁₀ Concentrations: Operation Phase Road Traffic Emissions

The effects of the operation phase road traffic PM₁₀ emissions are presented in Table J-2.

Modelled PM₁₀ concentrations in all scenarios meet the annual mean PM₁₀ objectives at all receptor locations.

Receptor ID	Floor	Annual Mean PM ₁₀ Concentration µg/m ³ (Daily Exceedances of 50 µg/m ³ in brackets)	
		2019 Background with 2024 traffic flows and 2019 Emissions (Worst Case)	2024 Background with 2032 traffic flows and 2024 Emissions (Best Case)
P1a	GF	23.0 (8)	22.8 (8)
P1b	1	21.9 (6)	21.7 (6)
P1c	2	21.1 (5)	21.0 (5)
P1d	3	20.6 (4)	20.5 (4)
P1e	4	20.3 (4)	20.2 (4)
P1f	5	20 (3)	20.0 (3)
P1g	6	19.8 (3)	19.8 (3)

Receptor ID	Floor	Annual Mean PM ₁₀ Concentration µg/m ³ (Daily Exceedances of 50 µg/m ³ in brackets)	
		2019 Background with 2024 traffic flows and 2019 Emissions (Worst Case)	2024 Background with 2032 traffic flows and 2024 Emissions (Best Case)
P1h	7	19.6 (3)	19.6 (3)
P1i	8	19.5 (3)	19.5 (3)
P1j	9	19.4 (3)	19.3 (3)
P2a	GF	21.1 (5)	21.0 (5)
P2b	1	20.9 (5)	20.8 (4)
P2c	2	20.7 (4)	20.6 (4)
P2d	3	20.5 (4)	20.4 (4)
P2e	4	20.2 (4)	20.2 (4)
P2f	5	20.0 (3)	19.9 (3)
P2g	6	19.8 (3)	19.8 (3)
P2h	7	19.6 (3)	19.6 (3)
P2i	8	19.5 (3)	19.5 (3)
P2j	9	19.4 (3)	19.4 (3)
P3a	GF	21.4 (5)	21.3 (5)
P3b	1	21.2 (5)	21.1 (5)
P3c	2	21.0 (5)	20.8 (5)
P3d	3	20.7 (4)	20.6 (4)
P3e	4	20.4 (4)	20.3 (4)
P3f	5	20.1 (4)	20.0 (3)
P3g	6	19.9 (3)	19.8 (3)
P3h	7	19.7 (3)	19.6 (3)
P3i	8	19.5 (3)	19.5 (3)
P3j	9	19.4 (3)	19.4 (3)
P4a	GF	23.5 (9)	23.3 (9)
P4b	1	22.4 (7)	22.2 (7)
P4c	2	21.5 (6)	21.4 (5)
P4d	3	20.9 (5)	20.8 (4)
P4e	4	20.5 (4)	20.4 (4)
P4f	5	20.1 (4)	20.1 (3)
P4g	6	19.9 (3)	19.8 (3)
P4h	7	19.6 (3)	19.6 (3)
P4i	8	19.5 (3)	19.5 (3)
P4j	9	19.3 (3)	19.3 (3)

Table J-2: PM₁₀ Annual Mean Concentrations at Modelled Receptors During the Operation Phase)

Long Term PM_{2.5} Concentrations: Operation Phase Road Traffic Emissions

The effects of the operation phase road traffic PM_{2.5} emissions are presented in Table J-3.

Modelled PM_{2.5} concentrations in all scenarios meet the annual mean PM_{2.5} objectives at all receptor locations.

Receptor ID	Floor	Annual Mean PM _{2.5} Concentration µg/m ³	
		2019 Background with 2024 traffic flows and 2019 Emissions (Worst Case)	2024 Background with 2024 traffic flows and 2024 Emissions (Best Case)
P1a	GF	13.4	12.6
P1b	1	12.7	12.2
P1c	2	12.3	11.9
P1d	3	12.0	11.7
P1e	4	11.8	11.6
P1f	5	11.6	11.5
P1g	6	11.5	11.4
P1h	7	11.4	11.3
P1i	8	11.3	11.2
P1j	9	11.3	12.2
P2a	GF	12.3	12.1
P2b	1	12.2	12.0
P2c	2	12.1	11.8
P2d	3	11.9	11.7
P2e	4	11.8	11.6
P2f	5	11.6	11.5
P2g	6	11.5	11.4
P2h	7	11.4	11.3
P2i	8	11.3	11.3
P2j	9	11.3	12.3
P3a	GF	12.5	12.2
P3b	1	12.4	12.1
P3c	2	12.2	11.9
P3d	3	12.0	11.8
P3e	4	11.8	11.6
P3f	5	11.7	11.5
P3g	6	11.6	11.4
P3h	7	11.4	11.3
P3i	8	11.4	11.3
P3j	9	11.3	13.5
P4a	GF	13.7	12.8

Receptor ID	Floor	Annual Mean PM _{2.5} Concentration µg/m ³	
		2019 Background with 2024 traffic flows and 2019 Emissions (Worst Case)	2024 Background with 2024 traffic flows and 2024 Emissions (Best Case)
P4b	1	13.0	12.4
P4c	2	12.5	12.1
P4d	3	12.2	11.8
P4e	4	11.9	11.6
P4f	5	11.7	11.5
P4g	6	11.6	11.4
P4h	7	11.4	11.3
P4i	8	11.3	11.2
P4j	9	11.3	12.6

Table J-3: PM_{2.5} Annual Mean Concentrations at Modelled Receptors During the Operation Phase

Appendix K Mitigation Measures for Construction

Primary measures are those that will be implemented at all times; Secondary measures will be implemented as necessary (in agreement with the local authority), while n/a measures are not required for a given level of risk.

Site Management	Low Risk	Medium Risk	High Risk
1. Display the name and contact details of person(s) accountable for air quality pollutant emissions and dust issues on the site boundary.	Primary		
2. Display the head or regional office contact information.	Primary		
3. Record and respond to all dust and air quality pollutant emissions complaints.	Primary		
4. Make a complaint log available to the local authority.	Primary		
5. Carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the local authority.	Primary		
6. Increase the frequency of site inspections by those accountable for dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions and dust are being carried out, and during prolonged dry, or windy conditions.	Primary		
7. Record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and the action taken to resolve the situation is recorded in the logbook.	Primary		
8. Develop and implement a stakeholder communications plan that includes community engagement before work commences on-site.	n/a	Primary	
9. Develop a dust management plan .	n/a	Primary	
10. 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.	n/a		Primary

Table K-1: Construction Mitigation Measures- Site Management

Preparing and Maintaining the Site	Low Risk	Medium Risk	High Risk
11. Plan site layout: machinery and dust causing activities will be located away from receptors.	Primary		
12. Erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on-site.	Primary		
13. Avoid site runoff of water or mud.	Primary		
14. Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.	Secondary	Primary	
15. Keep site fencing, barriers, and scaffolding clean using wet methods.	Secondary	Primary	
16. Remove materials from site as soon as possible.	Secondary	Primary	
17. Cover, seed, or fence stockpiles to prevent wind whipping.	Secondary	Primary	
18. Agree monitoring locations with the local authority.	n/a	Primary	
19. Where possible, commence baseline monitoring at least three months before phase begins.	n/a	Primary	
20. Put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly.	n/a	Primary	
21. Carry out regular dust soiling checks of buildings within 100 m of site boundary and, if necessary, cleaning to be provided.	n/a	Secondary	Primary
22. Consider, if practical, installation of green walls, screens, or other green infrastructure to minimise the impact of dust and pollution.	n/a	Secondary	

Table K-2: Construction Mitigation Measures- Preparing and Maintaining the Site

Operating Vehicle/Machinery and Sustainable Travel	Low Risk	Medium Risk	High Risk
23. Ensure all non-road mobile machinery (NRMM) complies with relevant local standards.	Primary		
24. Ensure all vehicles switch off engines when stationary – no idling vehicles.	Primary		
25. Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment.	Primary		
26. Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).	n/a	Secondary	Primary
27. Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	n/a	Primary	
28. Impose and signpost a maximum-speed-limit of 10 mph on surfaced haul routes and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority).	Secondary		Primary

Table K-3: Construction Mitigation Measures- Operating Vehicle/Machinery and Sustainable Travel

Operations	Low Risk	Medium Risk	High Risk
29. 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.	Primary		
30. Ensure an adequate water supply on the site for effective dust/particulate matter mitigation (using recycled water).	Primary		
31. Use enclosed chutes, conveyors, and covered skips.	Primary		
32. Minimise drop heights from conveyors, loading shovels, hoppers, and other loading, or handling equipment, and use fine water sprays on such equipment.	Primary		
33. Ensure equipment is readily available on-site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	n/a	Primary	

Table K-4: Construction Mitigation Measures- Operations

Waste Management	Low Risk	Medium Risk	High Risk
34. Reuse and recycle waste to reduce dust from waste materials	Primary		
35. Avoid bonfires and burning of waste materials.	Primary		

Table K-5: Construction Mitigation Measures- Waste Management Activities

Measurement Specific to Demolition	Low Risk	Medium Risk	High Risk
36. Ensure water suppression is used during demolition operations.	Primary		
37. Avoid explosive blasting, using appropriate manual, or mechanical alternatives.	Primary		
38. Bag and remove any biological debris or damp down such material before demolition.	Primary		
39. Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	Secondary		Primary

Table K-6: Construction Mitigation Measures- Demolition Activities

Measurement Specific to Earthworks	Low Risk	Medium Risk	High Risk
40. Consider re-vegetating earthworks and exposed areas/soil stockpiles to stabilise surfaces.	n/a	Secondary	Primary
41. Consider the use of hessian, mulches, or trackifiers where it is not possible to re-vegetate or cover with topsoil.	n/a	Secondary	Primary
42. Only remove secure covers in small areas during work and not all at once.	n/a	Secondary	Primary

Table K-7: Construction Mitigation Measures- Earthworks Activities

Measurement Specific to Construction	Low Risk	Medium Risk	High Risk
43. 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.	Secondary	Primary	
44. Avoid scabbling (roughening of concrete surfaces) if possible	Secondary		Primary
45. 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.	n/a	Secondary	Primary
46. For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.	n/a	Secondary	

Table K-8: Construction Mitigation Measures- Construction Activities

Measures Specific To Trackout	Low Risk	Medium Risk	High Risk
47. Regularly use a water-assisted dust sweeper on the access and local roads, as necessary, to remove any material tracked out of the site.	Secondary	Primary	
48. Avoid dry sweeping of large areas.	Secondary	Primary	
49. Ensure vehicles entering and leaving sites are securely covered to prevent escape of materials during transport.	Secondary	Primary	
50. Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site).	Secondary	Primary	
51. Record all inspections of haul routes and any subsequent action in a site log book.	Secondary	Primary	
52. Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems and regularly cleaned.	n/a	Primary	
53. Inspect haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;	n/a	Primary	
54. 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.	n/a	Primary	
55. Access gates to be located at least 10 m from receptors where possible.	n/a	Primary	
56. Apply dust suppressants to locations where a large volume of vehicles enter and exit the construction site.	n/a	Secondary	Primary

Table K-9: Construction Mitigation Measures- Trackout Activities

Cundall Johnston & Partners LLP

10th Floor Manchester One Portland Street
Manchester M1 3LD United Kingdom
Tel: +44 (0)161 244 5660

Asia, Australia, Europe MENA UK and Ireland
www.cundall.com

