

AIR QUALITY ASSESSMENT
33-41 CHEETHAM HILL ROAD
MANCHESTER
ZX CHEETHAM HILL DEVELOPMENTS LIMITED
AQA-22600-23-345-REV A
NOVEMBER 2023

IDOM



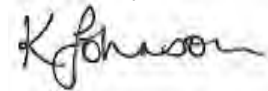
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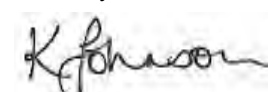
Sadaf Aftab
Harry Foster

Approved by



Kat Johnson

Issued by



Kat Johnson

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SECTION 1 INTRODUCTION

- 1.1 IDOM Merebrook Limited (IDOM) has been commissioned by ZX Cheetham Hill Developments Limited to undertake an Air Quality Assessment (AQA) for the proposed redevelopment of 33-41 Cheetham Hill Road in Manchester. The Proposed Development comprises a 23-storey building which will provide 237 residential units.
- 1.2 The objectives of the investigation are to:
- i.* Set out the legislative and planning policy context;
 - ii.* Establish baseline air quality from a desk-based review of published data sources;
 - iii.* Identify sources of existing air pollution and sensitive receptors in the vicinity of the site;
 - iv.* Assess the suitability of the Site for the Proposed Development;
 - v.* Undertake a qualitative assessment of the risk of dust impacts during the construction phase in accordance with guidance issued by the IAQM;
 - vi.* Undertake a quantitative assessment of air quality impacts associated with the operational phase of the development using ADMS Roads dispersion modelling software; and,
 - vii.* Where any significant air quality issues associated with the proposed developments are identified, make recommendations for further assessment and/or mitigation.
- 1.3 This report has been prepared for ZX Cheetham Hill Developments Limited for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties making reference to the report should consult ZX Cheetham Hill Developments Limited and IDOM as to the extent to which the findings may be appropriate for their use.

SECTION 2 PLANNING POLICY

2.1 NATIONAL POLICY

- 2.1.1 The National Planning Policy Framework (NPPF) published in March 2012 stated that air quality can be a material planning consideration and that local authority Air Quality Action Plans (AQAPs) for Air Quality Management Areas (AQMA) should be considered as part of the planning application process. It emphasised that the planning process should prevent both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of pollution and should consider cumulative impacts on air quality from individual sites in local areas.¹
- 2.1.2 The latest revision of the NPPF was published in September 2023² and reiterates these points stating that planning 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 (CAZs), and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. Planning decisions should ensure that any new development in AQMAs and CAZs is consistent with the local AQAP³.
- 2.1.3 National Planning Practice Guidance (NPPG) was launched on 6 March 2014 to support the previous version of the NPPF. The guidance set out guiding principles on how the planning regime can take account of the impacts of new development on air quality. The guidance relating to air quality was updated in November 2019 and places greater emphasis on biodiversity effects (including cumulative effects) and includes the aspiration to deliver a net improvement in overall air quality.
- 2.1.4 The NPPG states that *'Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity'*.⁴
- 2.1.5 The NPPG sets out the information that may be required in an air quality assessment, making clear that *'assessments need to be proportional to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions)'*⁵. It also provides guidance on options for mitigating

¹ Paragraph 174 (e)

² No material changes to air quality policy have been introduced since the version published in February 2019

³ Paragraph 186

⁴ Reference ID: 32-005-20191101

⁵ Reference ID: 32-007-20191101

air quality impacts, as well as examples of the types of measures to be considered. It makes clear that *'mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact'*.⁶

2.2 REGIONAL POLICY

2.2.1 The Greater Manchester Air Quality Action Plan

2.2.1.1 The Greater Manchester Air Quality Action Plan 2016 – 2021 was published in January 2018 and sets out measures to reduce air pollution whilst supporting sustainable economic growth of the region. In this plan 'Key Priority Areas' have been identified where air quality is poor and 'Key Performance Indicators' have been defined to help categorise improvement actions. Policies and interventions were subsequently divided into broad categories including Development Management and Planning Regulation based on the area and type of effects that may be achieved.⁷

2.2.1.2 For Development Management and Planning Regulation, Greater Manchester councils are instructed to adopt Institute of Air Quality Management (IAQM) guidance on the Assessment of Dust from Demolition and Construction Sites⁸ and the most recent IAQM air quality planning guidance⁹. These documents ensure that planning applications consider impacts consistently, that appropriate mitigation controls are conditioned and that opportunities to improve air quality are realised.

2.2.2 Greater Manchester Low Emission Strategy 2016

2.2.2.1 The Greater Manchester Low-Emission Strategy takes a long-term approach to carbon emissions and air quality, aiming to reduce emissions from transport and encourage sustainable travel including public transport, cycling and walking.

2.2.2.2 In terms of air quality, the aims of this strategy are to 'support the UK Government in meeting all EU thresholds for key pollutants at the earliest date' and 'reduce air pollution as a contributor to ill-health in Greater Manchester'.

2.2.3 Greater Manchester Transport Strategy 2040

2.2.3.1 The Greater Manchester Transport Strategy focuses on creating a sustainable and co-ordinated transport system which supports a wide range of different travel needs. It also aims to bring about a behaviour change to encourage the use of sustainable modes of travel, to reduce emissions from transport, and reduce the need to travel through better integration between land use and transport planning.

⁶ Reference ID: 32-008-20191101

⁷ Greater Manchester Air Quality Action Plan, 2016–2021

⁸ Holman et al, (2014) 'IAQM Guidance on the Assessment of Dust from Demolition and Construction', IAQM

⁹ Moorcroft and Barrowcliffe et al, (2017) 'Land-Use Planning & Development Control: Planning for Air Quality' v1.2, IAQM/EPUK

2.2.4 Places for Everyone

2.2.4.1 Places for Everyone is a long-term plan of nine Greater Manchester districts (Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford and Wigan) for jobs, new homes, and sustainable growth. It has been published by the Greater Manchester Combined Authority (GMCA) on behalf of the nine districts.

2.2.4.2 The plan is a joint development plan of the nine districts which will determine the kind of development that takes place in their boroughs until 2037, maximising the use of brownfield land and urban spaces while protecting Green Belt land from the risk of unplanned development.

2.2.4.3 It will also ensure all new developments are sustainably integrated into Greater Manchester's transport network or supported by new infrastructure.

2.3 LOCAL POLICY

2.3.1 Local Plan

2.3.1.1 MCC's Local Plan consists of the Core Strategy, Policies Map and the extant Unitary Development Plan policies (UDP). The Core Strategy was implemented by the Local Council in July 2012 replacing many of the UDP policies. It is the key strategic planning document for MCC and is used to help shape development and determine planning applications up until 2027.

2.3.1.2 The Core Strategy¹⁰ addresses the issue of poor air quality in various chapters throughout with specific reference made in Policy EN16 'Air Quality' which states:

'The Council will seek to improve the air quality within Manchester, and particularly within Air Quality Management Areas, 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 Combined Heat and Power and biomass plant.

When assessing the appropriateness of locations for new development the Council will consider the impacts on air quality, alongside other plan objectives. This includes cumulative impacts, particularly in Air Quality Management Areas.'

2.3.1.3 Policy DM 1 'Development Management' also includes a reference to air quality, stating that all development should have regard to effects on amenity, including air quality.

¹⁰ Core Strategy, Development Plan Document, July 2012

2.3.2 Air Quality and Planning Technical Guidance

- 2.3.2.1 The guidance¹¹ aims to provide help and advice in relation to air quality in a planning context to encourage good practice and mitigation of impacts. It outlines what is expected in relation to current guidance and policy with the aspiration that new developments achieve the highest possible standards without compromising the health and well-being of people that live and work within the City of Manchester.
- 2.3.2.2 The technical guidance is focused on reducing air pollution from road transport as the major source of emissions in Manchester.
- 2.3.2.3 For the purpose of improving air quality and health impacts in Manchester, the guidance is concerned with achieving and maintaining compliance with air quality objectives, and with improving air quality further, particularly with respect to particulate matter concentrations¹².
- 2.3.2.4 The document states that construction and operational phase assessments should be undertaken in accordance with relevant IAQM/EPUK guidance and outlines best practice recommendations for electric vehicle charging infrastructure.

SECTION 3 ASSESSMENT CRITERIA

3.1 AIR POLLUTANTS OF CONCERN

- 3.1.1 Oxides of nitrogen (NO_x) are emitted by combustion processes, mostly in the form of the less harmful nitrogen oxide (NO). This is converted in the atmosphere to the Air Quality Strategy pollutant NO₂. The amount of NO₂ produced depends on a number of factors, including the presence of other pollutants (particularly ozone) and meteorological conditions. It therefore varies considerably over time and geographical area. However, the relative contribution of various sources to the resulting ambient concentrations of NO₂ can generally be assumed to be in proportion to their emissions of NO_x.
- 3.1.2 PM₁₀ comprises the proportion of airborne particulate matter that is less than 10 µm in diameter. This includes fine particles of less than 2.5 µm diameter (PM_{2.5}), which can penetrate deeper into the lungs than coarser particles and are becoming increasingly associated with the health effects of particulate pollution. Fine particles are emitted by combustion processes, non-exhaust traffic-related emissions (tyre and brake wear) and also include secondary particles, which are formed in the atmosphere by chemical reactions between other pollutants. The sources of secondary particles can be very distant and include areas outside the UK. The coarser fraction of PM₁₀ originates primarily from non-combustion sources.

¹¹ Air Quality & Planning Technical Guidance, August 2022

¹² MCC, Air Quality & Planning Technical Guidance 2022

3.2 AIR QUALITY STANDARDS

- 3.2.1 The Environment Act 1995 requires Local Authorities to review and document air quality within their area with the aim of meeting specified Air Quality Objectives (AQO) by target years, as defined in the Air Quality (England) Regulations 2000 and Air Quality (England) (Amendment) Regulations 2002 and set out in the UK National Air Quality Strategy 2007. The AQO are designed to be protective of human health and where they are unlikely to be achieved by the target year the LA is required to designate an AQMA. The authority is then obliged to plan for future compliance with the objectives. Guidance is provided in the UK Air Quality Strategy 2007 and Local Air Quality Management (LAQM) Policy Guidance (PG22)¹³.
- 3.2.2 The 2008 European Directive on ambient air quality and cleaner air for Europe (2008/50/EC) was published in May 2008. The Directive sets limit values for NO₂, PM₁₀ and PM_{2.5}. The EU limit values are transposed into UK legislation within the Air Quality Standards Regulations 2010.
- 3.2.3 The relevant AQO for NO₂ are an annual mean concentration of 40 µg.m⁻³ and an hourly concentration of 200 µg.m⁻³ not to be exceeded more than 18 times per year. For PM₁₀ the AQO are an annual mean concentration of 40 µg.m⁻³ and a 24-hour mean of 50 µg.m⁻³ not to be exceeded more than 35 times per year. The objectives for NO₂ and PM₁₀ were to have been achieved by 2005 and 2004 respectively and continue to apply in all future years thereafter.
- 3.2.4 The focus of legislation for PM_{2.5} is on limiting long-term exposure through the use of annual standards, coupled with a reduction in PM_{2.5} background concentrations (15 %) in urban areas across the UK between 2010 and 2020. The annual mean objective of 25 µg.m⁻³ was to be achieved by 2020 and continues to apply in all future years thereafter.
- 3.2.5 This assessment has been undertaken in accordance with current legislation and guidance including LAQM Technical Guidance (TG22) issued by the Department for Environment Food and Rural Affairs (DEFRA) in August 2022¹⁴.

SECTION 4 SITE SETTING

- 4.1 The site is approximately 0.11 hectares in size, centred at approximate National Grid Reference ³84087,³99456 in Manchester as shown on drawing 22600-001-001 in Appendix 1.
- 4.2 The site is currently vacant and is bounded as follows:
- i.* To the north by Carnarvon Street (with a retail outlet beyond),

¹³ MCC, Air Quality & Planning Technical Guidance 2022

¹⁴ DEFRA (2018), Local Air Quality Management Technical Guidance (TG22)

- ii. To the east by Cheetham Hill Road (A665) with a fuel filling station and residential properties beyond, and
- iii. To the south and west by commercial properties at ground floor level and residential properties above.

SECTION 5 BASELINE AIR QUALITY

5.1 INTRODUCTION

- 5.1.1 The Site is situated within an AQMA which has been declared by the Greater Manchester Combined Authority (GMCA) in respect of annual NO₂ concentrations.
- 5.1.2 The main source of air pollution in the vicinity of the Site is anticipated to be transport emissions from the surrounding road network. The nearest major road is Cheetham Hill Road (A665) which is situated immediately east of the Site. It is therefore expected that baseline concentrations of key air pollutants at the Site will be significantly influenced by road traffic emissions, particularly along its eastern boundary.
- 5.1.3 Reference has been made to the following information sources:
 - i. 2022 Air Quality Annual Status Report (ASR), published by MCC in June 2023; and
 - ii. Air Quality England website¹⁵.

5.2 AUTOMATIC MONITORING

- 5.2.1 The closest Continuous Monitoring Station (CMS) is the 'urban centre' MAN3 site located approximately 1.07 km south of the site at Manchester Piccadilly. Table 1 below summarises the recent monitoring data from this site.

Table 1: Annual mean concentrations of NO₂ and PM₁₀ at MAN3

Site ID	Pollutant	Annual Mean Concentration (µg.m ⁻³)						
		2017	2018	2019	2020 ^A	2021 ^A	2022	AQO
MAN3	NO ₂	36	35	36	27	30	29	40
	PM ₁₀	20	21	20	15	15	17	40

Bold values exceed the AQO

^A Monitored concentrations from 2020 should be treated with caution due to Covid-19 pandemic

- 5.2.2 With reference to Table 1, annual mean concentrations of PM₁₀ and NO₂ have remained below the AQO at the MAN3 CMS in all years reviewed.

¹⁵ <https://www.airqualityengland.co.uk/> (accessed on 08/08/2023)

5.3 PASSIVE MONITORING

5.3.1 Diffusion tubes are also used to passively monitor concentrations of NO₂ across Greater Manchester.

5.3.2 The table below summarises the closest diffusion tube locations to the Site, along with bias-adjusted monitoring data from recent years. The locations of the monitoring sites are indicated on Figure 1.

Table 2: Diffusion tubes in the vicinity of the site

Site ID	Site type	Distance to development site (km)	Annual Mean Concentration NO ₂ (µg.m ⁻³)						
			2017	2018	2019	2020*	2021*	2022	AQO
MA26ANO	Urban background	0.52 S	35.5	33.4	33	22.9	25.9	27.5	40
MA88NO	Kerbside	0.56 SE	57.9	46.8	45.2	30.1	36.8	35.7	
MA104BNO	Roadside	0.73 NW	-	-	-	30.6	36.4	37.9	
MA36NO	Roadside	1.14 NE	34	33.1	31.0	24.3	26.7	27.4	
MA99BNO	Roadside	1.3 E	-	-	-	26.9	32.9	32.7	
MA103BNO	Roadside	1.8 NE	-	-	-	35.5	39.6	40.1	

Bold values exceed the AQO

*Monitored concentrations should be treated with caution due to unusually low traffic levels as a result of travel restrictions imposed during the Covid-19 pandemic

5.3.3 With reference to the table above, annual mean concentrations of NO₂ at the kerbside monitoring site MA88NO exceeded the AQO from 2017-2019 before dropping dramatically in 2020. Concentrations at MA103BNO, adjacent to Queens Road (A6010), also exceeded the AQO in 2022.

5.3.4 Annual mean NO₂ concentrations at all other monitoring sites in the vicinity were below the AQO in all years reviewed. Discounting monitoring data from 2020 and 2021 due to the influence of travel restrictions during the Covid-19 pandemic, a consistent declining trend has been observed at all three of the long-term monitoring sites.

5.3.5 It is noted that reported urban background concentrations at MA26ANO are higher than the roadside concentrations recorded at MA36NO therefore the monitoring site may not be representative of true urban background concentrations in the local area.

5.4 DEFRA BACKGROUND MAPS

5.4.1 Reference has also been made to the UK-AIR background air pollutant concentration maps. The background maps are presented in 1 km x 1 km grid squares across England, Wales, Scotland and Northern Ireland. The current version of the background maps (reference year 2018) contains estimates for NO_x, NO₂, PM₁₀ and PM_{2.5} for the period 2018 through to 2030.

- 5.4.2 The 2018 reference year background maps are based on monitoring and meteorological data for 2018. Predicted background concentrations for the reference year (2018) and current year (2023) are summarised in the table below.

Table 3: Predicted annual mean background map concentrations for grid square centred at ³84500, ³99500.

Pollutant	Annual Mean Concentration ($\mu\text{g.m}^{-3}$)		
	2018	2023	AQO
NO ₂	23.20	19.05	40
PM ₁₀	12.81	11.91	40
PM _{2.5}	8.40	7.78	25

- 5.4.3 The table above shows that the predicted background concentrations of all pollutants are well below their respective AQO.

5.5 INDUSTRIAL INSTALLATIONS

- 5.5.1 With reference to the Environment Agency (EA) online public register no Part A processes are permitted within 1 km of the Site.

- 5.5.2 With reference to MCC's Environmental Permitting Public Registers¹⁶, no Part A2 or B processes are permitted within 500 m of the Site.

5.6 SUMMARY

- 5.6.1 The Site is located within an AQMA and baseline concentrations of NO₂ are expected to be below, but close to the annual mean AQO. Concentrations of PM₁₀ and PM_{2.5} are expected to be below the relevant AQOs.

SECTION 6 POTENTIAL IMPACT OF THE SCHEME ON LOCAL AIR QUALITY

6.1 INTRODUCTION

- 6.1.1 Developments can introduce new receptors into an area of poor air quality. They can also increase emissions of air pollutants during their construction and operational phases and/or create a building configuration that inhibits effective pollution dispersion.

¹⁶ https://www.manchester.gov.uk/info/500217/licence_-_public_registers/8272/environmental_permit_register/3
(Accessed 08/08/2023)

6.2 SITE SUITABILITY

- 6.2.1 The Site is situated within an AQMA which has been declared in respect of the annual mean AQO for NO₂.
- 6.2.2 Detailed dispersion modelling has been undertaken as part of this AQA as described in later sections. As part of the modelling exercise, concentrations of key air pollutants (NO₂, PM₁₀ and PM_{2.5}) have been predicted along the roadside façade of the Proposed Development to determine whether any mitigation to reduce future occupants' exposure is required. The results of the assessment are presented in Section 8.5 and indicate that concentrations along the Cheetham Hill Road façade of the proposed building are predicted to be well below the relevant AQO in the opening year.
- 6.2.3 The site is therefore considered to be suitable for the Proposed Development.

6.3 CONSTRUCTION PHASE

- 6.3.1 The development has the potential to result in emissions of dust and PM₁₀ during the construction phase in the absence of appropriate mitigation. The risk of impacts is assessed in Section 7 with recommended mitigation measures outlined in Section 9.

6.4 OPERATIONAL PHASE

- 6.4.1 The Site is highly accessible and, as such, the Proposed Development has been designed to be 'car-free' with the exception of three on-street parking spaces (two accessible spaces and one for car club use). Residents are expected to walk/cycle to access the local facilities. The Site's baseline use is as a car sales / servicing facility and, whilst this is inactive, it could legitimately be brought back into use.
- 6.4.2 The Transport Consultant has advised that the Proposed Development is expected to generate in the region of 98 vehicles per day. As the site is 'car free', the traffic flows are predominantly made up of delivery and servicing vehicles. This figure is below indicative screening criteria recommended by the IAQM for assessment of air quality impacts within an AQMA. In addition, delivery and servicing vehicles are already expected to utilise the local road network and the actual net increase in daily trips is expected to be significantly lower. Detailed consideration of air quality impacts associated with increased traffic flows has therefore be scoped out of this assessment.
- 6.4.3 Notwithstanding this, the height of the proposed building, in combination with other tall buildings in close proximity, has the potential to restrict dispersion of existing road traffic emissions and may result in increased concentrations of air pollutants locally. Detailed dispersion modelling has therefore been undertaken to explore the potential street canyon effect created by the proposed building and predict concentrations of air pollutants along the roadside façades of existing and consented apartment buildings on the opposite site of Cheetham Hill Road. Full details of the modelling exercise are presented in Section 8.

- 6.4.4 The heat demand of the proposed development will be addressed using electric systems therefore no point sources of NO_x or PM₁₀ will be introduced on site.

SECTION 7 CONSTRUCTION PHASE IMPACT ASSESSMENT

7.1 GENERAL

- 7.1.1 Potential emissions during the construction phase include dust and other forms of air pollution. Sources of emissions of air pollutants are exhaust from on-site plant and site traffic and dust-generating activities, including earthworks and vehicle movements on dry ground.
- 7.1.2 The construction phase impacts on local air quality have been assessed in accordance with guidance published by the IAQM¹⁷.
- 7.1.3 In terms of vehicle movements within the site (plant exhaust), the impact of emissions would be very small, very localised and limited to vehicles in close proximity to potential receptors. With reference to the IAQM guidance, *'Experience of assessing the exhaust emissions from on-site plant (NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed.'* Exposure can be minimised by standard good practice.
- 7.1.4 The IAQM guidance indicates that construction impacts on local air quality can be divided into four key areas:
- i.* Demolition,
 - ii.* Earthworks,
 - iii.* Construction, and
 - iv.* Trackout.
- 7.1.5 Dust Emission Magnitude
- 7.1.5.1 Potential dust emission magnitude has been assessed for each of the four key areas above in relation to the development site. The dust emission magnitude is based on the scale of the anticipated works and is classified as small, medium, or large. The guidance provides examples of how the potential dust emission magnitude for different activities can be defined.
- 7.1.6 Demolition
- 7.1.6.1 The Site is currently occupied by an existing structure associated with its previous use as a car wash / car showroom facility which will be demolished as part of the redevelopment. The structure is comprised of two parts; a single-storey brick building

¹⁷ Stouling et al, (2023) 'Guidance on the Assessment of Dust from Demolition and Construction' v2.1 (updated 2023), IAQM.

and a steel, open-sided canopy. The total building volume is less than 20,000 m³ and demolition will occur within 10 m of ground level. Due to the small building volume and construction materials, the potential dust emission magnitude in the absence of mitigation is considered to be 'small'.

7.1.7 Earthworks

7.1.7.1 Total site area is less than 18,000 m². The total volume of material to be removed is estimated to be less than 20,000 tonnes with fewer than five heavy earth-moving vehicles active at one time.

7.1.7.2 With reference to the BGS online geology maps, the Site is indicated to be underlain by superficial deposits of Devensian Till (glacial clay and boulders) over bedrock geology of Chester Formation (sandstone and conglomerate). The dust-generation potential of the sub surface is considered to be 'moderate'.

7.1.7.3 Due to the small size of the site and the limited volume of material anticipated to be moved, the potential dust emission magnitude in the absence of mitigation is considered to be 'small'.

7.1.8 Construction

7.1.8.1 The total volume of the building to be constructed is between 12,000 and 75,000 m³. It is anticipated that the proposed building will comprise a reinforced concrete frame with a masonry façade. Concrete batching is not expected to be undertaken on site.

7.1.8.2 The potential dust emission magnitude in the absence of mitigation is considered to be 'medium'.

7.1.9 Trackout

7.1.9.1 Trackout dust impacts are associated with heavy-duty vehicles (HDVs) leaving the site after moving over unpaved ground where they will accumulate mud and dirt that can then be tracked out onto the public highway. Trackout impacts are linked to the number of outward HDV movements over the course of a day.

7.1.9.2 It is estimated that the maximum number of HDVs leaving site per day will be less than 20. The length of unpaved road on the site is expected to be less than 50 m and the dust-generation potential of the subsurface is assessed as 'moderate'.

7.1.9.3 The potential dust emission magnitude in the absence of mitigation is considered to be 'small'.

7.1.10 Summary

7.1.10.1 A summary of the assessed dust emission magnitude for each of the site activities is displayed in Table 4 below.

Table 4: Summary of the potential Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	Small
Earthworks	Small
Construction	Medium
Trackout	Small

7.2 SENSITIVITY OF THE AREA

7.2.1 Introduction

7.2.1.1 The following assessment of site sensitivity has been undertaken using IAQM methodology. The Site is located within a predominantly commercial and retail area. However, there are a number of large residential buildings within the Green Quarter to the east of the Proposed Development.

7.2.1.2 The overall sensitivity of the area (as determined by the number and sensitivity of receptors within a given distance) is summarised in the following sections.

7.2.2 Dust Soiling Effects

7.2.2.1 Nuisance dust is defined here as all particulate matter less than 75 µm but greater than 10 µm diameter, comprising both suspended and deposited dust.

7.2.2.2 The sensitivity of receptors to dust soiling effects is dependent upon the duration and frequency that people would expect to be exposed to the effects. Residential receptors can be expected to enjoy a high level of amenity and background levels of dust soiling are expected to be low. It can be expected that dust soiling would diminish the aesthetics of their property and such receptors are therefore assessed as being of high sensitivity. Residential properties, schools, nurseries and care homes are considered to be of high sensitivity for the purpose of this assessment.

7.2.2.3 Medium sensitivity receptors are those where users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home or people or property would not reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Places of work and community uses are considered to be of medium sensitivity for the purpose of this assessment.

7.2.2.4 Low sensitivity receptors are those where the enjoyment of amenity would not reasonably be expected or property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling. Exposure is of a transient nature and 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.

- 7.2.3 No high sensitivity receptors have been identified within 20 m of the Proposed Development boundary however, a small number of commercial, medium sensitivity receptors are present within 20 m. Fewer than 100 high sensitivity receptors are present within 50 m of the Proposed Development boundary and between 10 and 100 within 20 m of the anticipated trackout route (up to 50 m from the site exit).
- 7.2.4 The sensitivity of the surrounding area with regards to dust soiling effects is considered to be 'medium' associated with work undertaken on the Site itself and 'high' associated with trackout impacts.
- 7.2.5 Human Health
- 7.2.5.1 For health effects of PM₁₀, sensitivities are based on whether or not the receptor is likely to be exposed to elevated concentrations over a 24-hour period.
- 7.2.5.2 High sensitivity receptors are those locations where members of the public are exposed over a time period relevant to the air quality objective for PM₁₀ (eight hours or more in a 24-hour period). Indicative examples include residential properties, hospitals, schools, nurseries and residential care homes.
- 7.2.5.3 Workers are considered to be of medium sensitivity for the purpose of this assessment and low sensitivity receptors are those locations where human exposure is transient e.g. public footpaths, playing fields, parks and shopping streets.
- 7.2.5.4 With reference to DEFRA background maps annual mean concentrations of PM₁₀ are predicted to be below 24 µg.m⁻³ (12.81 µg.m⁻³ in 2018). Roadside receptors will experience elevated concentrations of PM₁₀ as a result of road traffic contributions. However, the modelling exercise undertaken to assess the operational impact of the Proposed Development (report in Section 8.5) indicates that roadside concentrations will remain below 24 µg.m⁻³.
- 7.2.5.5 As no high sensitivity receptors have been identified within 20 m of the site boundary and less than 100 high sensitivity receptors are estimated to be present within 20 m of the anticipated trackout route (up to 50 m from the site exit), the sensitivity of the surrounding area with regards to human health impacts is considered to be 'low'.
- 7.2.6 Ecological Sensitivity
- 7.2.6.1 An 'ecological receptor' refers to any sensitive habitat affected by dust soiling. This includes the direct impacts on vegetation or aquatic ecosystems of dust deposition, and the indirect impacts on fauna (e.g. on foraging habitats).
- 7.2.6.2 Dust can have two types of effect on vegetation: physical and chemical. Direct physical effects include reduced photosynthesis, respiration and transpiration through smothering. Chemical changes to soils or watercourses may lead to a loss of plants or animals for example via changes in acidity. Indirect effects can include increased susceptibility to stresses such as pathogens and air pollution. These changes are likely to occur only as a result of long-term demolition and construction

works adjacent to a sensitive habitat. Often impacts will be reversible once the works are completed, and dust emissions cease.

- 7.2.6.3 With reference to the Multi-Agency Geographic Information for the Countryside (MAGIC) website¹⁸ there are no designated ecological sites or waterways within 50 m of the site boundary or anticipated construction traffic routes.

7.2.7 Summary

- 7.2.7.1 The sensitivity of identified receptors within 350 m of the site boundary is summarised in the table below. For trackout impacts, receptors have been identified within 50 m of the edge of the anticipated HDV routes up to 50 m from the site entrance.

Table 5: Summary of the sensitivity of the surrounding area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	Medium	Medium	High
Human Health	Low	Low	Low	Low
Ecological	n/a	n/a	n/a	n/a

7.3 RISK OF DUST IMPACTS

- 7.3.1 The potential dust emissions magnitude for each of the site activities has been combined with the sensitivity of the surrounding area to summarise the risk of dust impacts with no mitigation. This in turn determines the level of mitigation which must be applied. The dust risk is summarised in Table 6 below.

Table 6: Summary of risk of impacts

	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low	Low	Medium	Low
Human Health	Negligible	Negligible	Low	Negligible
Ecological	n/a	n/a	n/a	n/a

- 7.3.2 There is considered to be a 'medium' risk of dust soiling impacts during construction in the absence of mitigation. The risk during demolition, earthworks and associated with trackout dust is assessed as 'low' in the absence of mitigation.
- 7.3.3 The risk to human health associated with construction of the Proposed Development is assessed as 'negligible to low' in the absence of mitigation.

¹⁸ www.magic.gov.uk

SECTION 8 OPERATIONAL PHASE IMPACT ASSESSMENT

8.1 METHODOLOGY

- 8.1.1 This section examines the impact of the Proposed Development on local air quality as a result of potential street canyon effects arising from the introduction of a tall building in the vicinity of existing, and consented, tall apartment blocks on the opposite side of Cheetham Hill Road.
- 8.1.2 The key existing buildings considered within this assessment are the Hallmark building (planning ref:109031/FO/2015) and Jefferson Place (planning ref: 073832/FO2004/NI). Planning consent has also been granted for the construction of a 16-storey building providing 192 residential apartments together with ground floor commercial uses at One Lord Street (planning ref: 113914/FO/2016). As this building has the potential to contribute to street canyon effects and introduce new sensitive receptors, this building has also been included in the 'with development' scenario as a conservative approach.
- 8.1.3 Dispersion modelling has been undertaken using ADMS Roads v.5.0.1.3. The model requires the user to provide various input data related to traffic flows and road characteristics.
- 8.1.4 The impact of the Proposed Development on local air quality has been assessed by comparing the predicted concentrations in the 'without development' and 'with development' scenarios in the assumed opening year of 2024. The significance of impacts (change in concentration) at existing receptors has been assessed in accordance with the jointly produced IAQM/EPUK planning guidance¹⁹.
- 8.1.5 The scenarios that have been considered are as follows:
- i.* 2019 Base Year for the purpose of model verification;
 - ii.* 2024 Future base year (including Hallmark and Jefferson Place buildings);
 - iii.* 2024 Future year (with the Proposed Development and consented development at One Lord Street).

8.2 INPUT PARAMETERS

8.2.1 Background Concentration

- 8.2.1.1 As discussed in Section 5.3.5, the closest monitored urban background concentrations of NO₂ are not considered to be representative of background concentrations at the Site. In the absence of representative local background monitoring data, DEFRA background maps have been used to define background concentrations of NO₂, PM₁₀ and PM_{2.5} across the study area.

¹⁹ Moorcroft and Barrowcliffe. et al. (2017) 'Land-use Planning & Development Control: Planning for Air Quality. v1.2'. IAQM

- 8.2.1.2 The background concentrations assumed in the assessment are summarised in the table below for each of the modelled scenarios.

Table 7: Background concentrations used in modelling exercise

Pollutant	2019 Base Year	2024 Future Year
NO ₂	22.19	18.41
PM ₁₀	12.53	11.81
PM _{2.5}	8.21	7.70

8.2.2 Traffic Data

- 8.2.2.1 This assessment focuses of the impact on the Proposed Development on sensitive receptors adjacent to Cheetham Hill Road in close proximity to the Site. However, for the purpose of model verification (discussed later in Section 8.4), traffic flows along Rochdale Road (A664) to the east were also modelled. The modelled road links are shown on Figure 2 in Appendix 2.
- 8.2.2.2 Average road widths for the individual links have been estimated from Ordnance Survey mapping and aerial imagery. Average speeds for the individual road links have been estimated based on speed limits and proximity to junctions.
- 8.2.2.3 Two-way traffic flows for Cheetham Hill Road (A665) and Rochdale Road (A664) have been obtained from the Department for Transport (DfT) website. The project transport consultant (SK Transport Planning Ltd) highlighted that, with reference to the DfT data, traffic levels had decreased between 2019 and 2022 (reflecting national trends and influences to come extent by changes in working practices). It was therefore recommended that traffic flows for 2022 be used to growth traffic to the opening year of 2024. The growth factor calculated by SK Transport Planning Ltd for 2022 – 2024 was 1.0253.
- 8.2.2.4 The DfT data is split into six vehicle classifications and the detailed input data for each road link is shown in Tables A1 and A2 in Appendix 2. The same distribution across the vehicle classifications was assumed to apply in the future year as in the base year.
- 8.2.2.5 In the absence of local Automatic Traffic Count (ATC) data, a diurnal traffic profile was generated using Table TRA0307 (Traffic distribution by time of day on all roads in Great Britain, 2019) produced by the DfT. This profile was applied to all roads within the study area to account for the variation in flows throughout the day and by day of the week. A graph illustrating the diurnal profile is provided as Figure 3, Appendix 2.

8.2.3 Emission Factors

8.2.3.1 Emission rates were calculated from traffic flows entered within ADMS Roads using the EFT 11.0. The EFT allows users to calculate road vehicle pollutant emission rates for NO_x, PM₁₀ and PM_{2.5} for a specified year, road type, vehicle speed and vehicle fleet composition. The road type was set as 'England (urban)' which is considered to be most representative of the study area.

8.2.3.2 In previous versions of the EFT there were concerns that the rate of decline in NO_x emissions assumed by DEFRA in future years was overly optimistic and sensitivity analysis was typically carried out (for example keeping future year emissions the same as base year emissions or using an uplift factor). More recent analysis undertaken by Air Quality Consultants (AQC) indicates that recent versions of the EFT are more likely to over-predict drive-cycle average NO_x emissions from Euro 6 diesel cars in the future. It is therefore no longer considered necessary to undertake sensitivity testing in relation to DEFRA's predictions of NO_x emissions from Euro 6 diesel vehicles in future years.

8.2.3.3 This is supported by long-term monitoring data in the area which demonstrates a consistent decline in emissions over time.

8.2.4 Street canyons

8.2.4.1 A street canyon is generally defined as narrow streets where the height of buildings on both sides of the road is greater than the road width, leading to the formation of vortices and recirculation of air flow that can trap pollutants and restrict dispersion.

8.2.4.2 The advanced street canyon module within ADMS Roads has been used in both the 'with' and 'without' development scenarios. In the 'without development' scenario the existing Hallmark and Jefferson Place buildings have been included. In the 'with development' scenario, the proposed building and the consented development at One Lord Street have also been included.

8.2.5 Meteorological data

8.2.5.1 ADMS Roads requires meteorological data, which it uses to simulate the behaviour of exhaust emission plumes in different weather conditions.

8.2.5.2 Data was acquired from ADM Ltd for the weather station at Manchester Airport situated approximately 15.4 km to the south which is considered to be adequately representative of the dispersion site. The data was in the form of an hourly sequential dataset for 2019 and has been used to simulate dispersion in base and future year scenarios.

8.2.5.3 A wind rose illustrating the meteorological data is presented in Figure 4 in Appendix 2. This indicates that the most frequent winds are from the south but the strongest winds are from the west.

8.2.5.4 The file for 2019 contains 8426 usable lines of meteorological data (met lines) which equates to over 96 % usable data.

8.2.6 Other parameters

8.2.6.1 The extent of mechanical turbulence (and hence, mixing) in the atmosphere is affected by the surface/ground over which the air is passing. Based on a review of the surrounding land use, surface roughness values of 0.75 m have been used to represent the dispersion site, and 0.2 m for the meteorological site.

8.2.6.2 The minimum Monin-Obukhov length is a model parameter which describes the extent to which the urban heat island effect limits stable atmospheric conditions. A Monin-Obukhov length of 30 m has been used to represent the dispersion site and 1 m has been used to represent the meteorological site.

8.3 MODELLED RECEPTORS

8.3.1 The proposed scheme will introduce new, highly sensitive (residential) receptors into the AQMA. Several receptor locations have been selected along the roadside façade of the proposed building to be representative of exposure at 1.5 m above finished floor level (breathing height) at each floor.

8.3.2 A number of receptor locations have also been modelled along the roadside façade of existing and consented residential developments on the opposite side of Cheetham Hill Road. The change in concentration experienced at these representative locations as a result of the Proposed Development has been used to assess the significance of impacts in accordance with IAQM/EPUK guidance.

8.3.3 Both proposed and existing modelled receptor locations are indicated on Figure 5 in Appendix 2 and are summarised in Table 8 below. Existing receptors are prefixed with 'ER' and proposed receptors are prefixed with 'PR'. Drawings available on the planning portal for the consented scheme as One Lord Street indicate that retail uses are to be provided at ground floor and first floor level on the Cheetham Hill Road façade with residential accommodation from second floor and above. Plans also show that ground floor uses on the Cheetham Hill Road façade in The Hallmark building are non-residential.

Table 8: Modelled receptor locations

Ref	Location	x	y	z
ER1	The Hallmark	384099.2	399357.0	Ground level, levels 1 - 15
ER2	Jefferson Place	384138.4	399348.9	Ground level, levels 1 - 15
ER3		384146.4	399372.8	Ground level, levels 1 - 15
ER4		384153.2	399391.6	Ground level, levels 1 - 15

Ref	Location	x	y	z
ER5	One Lord Street (consented)	384121.4	399420.8	Ground level, levels 1 - 15
PR1	Proposed Development	384095.3	399411.7	Ground level, mezzanine, levels 1 - 22
PR2		384090.8	399397.6	Ground level, mezzanine, levels 1 - 22
PR3		384082.2	399381.6	Ground level, mezzanine, levels 1 - 22

8.4 MODEL VERIFICATION & ADJUSTMENT

- 8.4.1 In order to ensure that ADMS-Roads predicts road NO_x contributions with reasonable accuracy, the model has been verified against local measurements.
- 8.4.2 Model verification has been undertaken using monitoring data from MA36NO as this is the only roadside diffusion tube in the local area with monitoring data for 2019 (which is considered to be the most recent year of reliable monitoring data excluding the effects of the Covid-19 pandemic). LAQM.22 states that kerbside and urban background sites should not be used for the purpose of model verification.
- 8.4.3 The road NO_x contribution at the diffusion tube site has been calculated from total NO₂ concentrations using the 'NO_x to NO₂ calculator' (v 8.1)²⁰, using the assumed background concentration of 20.83 µg.m⁻³ (the DEFRA predicted 2019 concentration for the grid square in which the diffusion tube is situated) and the 'all other urban UK traffic' option within the calculator. The calculated road NO_x contribution at the diffusion tube site compared to the corresponding modelled concentration for the same location is summarised below.

Table 9: Comparison of monitored and modelled road NO_x contributions at MA26NO

Monitored total NO ₂ (µg.m ⁻³)	Monitored road NO _x contribution (µg.m ⁻³)	Modelled road NO _x contribution (µg.m ⁻³)	Difference (%) +/-
31.7	21.49	8.17	-38

- 8.4.4 Comparison of the monitored and modelled road NO_x contributions indicates that the model is underpredicting.
- 8.4.5 After checking that all model inputs were reflective of the source data, it was considered appropriate to undertake adjustment of the model output as the

²⁰ <https://laqm.defra.gov.uk/review-and-assessment/tools/tools.html>

difference between monitored and modelled road NO_x contributions was greater than 25%.

8.4.6 Adjustment was performed on the modelled road NO_x contribution only. The ratio of modelled road NO_x to monitored road NO_x was calculated to be 2.63. The model output was multiplied by this factor to calculate adjusted road NO_x contributions. Total annual mean NO₂ concentrations were then calculated using the NO_x to NO₂ calculator (v 8.1). Within the calculator the traffic mix was specified as 'All other urban UK traffic' which is considered to be most representative of the site.

8.4.7 In the absence of any suitable monitoring data for verification of the model output for PM₁₀ and PM_{2.5}, the NO_x adjustment factor has also been applied to the modelled road PM₁₀ and PM_{2.5} contributions prior to combining with assumed background concentrations.

8.5 RESULTS & IMPACT ASSESSMENT

Proposed Receptors

8.5.2 Specific output has been generated for future receptors located along the Cheetham Hill Road façade of the proposed building. The range of predicted total NO₂ concentrations with the scheme in place is summarised in Table 10 below. Full results for individual receptors and floor heights are enclosed in Table A3 in Appendix 3.

Table 10: Predicted annual mean concentrations at proposed receptor locations

Floor Level	Range in overall pollutant concentration in opening year of 2024 (ug.m ³)		
	NO ₂	PM ₁₀	PM _{2.5}
Ground	22.27 - 27.99	13.15 - 15.31	8.45 - 9.66
Mezzanine	20.99 - 25.92	12.69 - 14.52	8.19 - 9.22
1st	19.95 - 24.26	12.33 - 13.91	7.99 - 8.87
2nd	19.24 - 22.87	12.08 - 13.40	7.85 - 8.58
3rd	18.88 - 21.95	11.96 - 13.07	7.78 - 8.40
4th	18.69 - 21.31	11.90 - 12.84	7.75 - 8.27
5th	18.58 - 20.86	11.86 - 12.68	7.73 - 8.18
6th	18.52 - 20.53	11.84 - 12.56	7.72 - 8.12
7th	18.48 - 20.30	11.83 - 12.48	7.71 - 8.07
8th	18.46 - 20.13	11.82 - 12.42	7.70 - 8.04
9th	18.45 - 20.00	11.82 - 12.37	7.70 - 8.01
10th	18.44 - 19.90	11.81 - 12.34	7.70 - 7.99
11th	18.43 - 19.82	11.81 - 12.31	7.70 - 7.98
12th	18.43 - 19.76	11.81 - 12.28	7.70 - 7.96

Floor Level	Range in overall pollutant concentration in opening year of 2024 ($\mu\text{g.m}^3$)		
	NO ₂	PM ₁₀	PM _{2.5}
13th	18.42 - 19.53	11.81 - 12.20	7.70 - 7.92
14th	18.42 - 19.28	11.81 - 12.11	7.70 - 7.87
15th	18.42 - 19.05	11.81 - 12.02	7.70 - 7.82
16th	18.42 - 18.82	11.81 - 11.95	7.70 - 7.78
17th	18.44 - 18.78	11.82 - 11.94	7.70 - 7.77
18th	18.45 - 18.76	11.82 - 11.93	7.70 - 7.77
19th	18.45 - 18.75	11.82 - 11.93	7.70 - 7.76
20th	18.45 - 18.74	11.82 - 11.92	7.70 - 7.76
21st	18.45 - 18.74	11.82 - 11.92	7.70 - 7.76
22nd	18.45 - 18.47	11.82 - 11.83	7.70 - 7.71

8.5.3 Annual mean concentrations of NO₂ are predicted to be below the AQO at all modelled receptor locations with a maximum of 27.99 $\mu\text{g.m}^{-3}$ predicted at receptor PR1.0 at the north-eastern extent of the Proposed Development. Maximum concentrations were predicted at ground floor level however, non-residential uses are to be provided at ground and mezzanine level.

8.5.4 With reference to LAQM.TG22, dispersion models cannot predict short-term concentrations as reliably as long-term concentrations. Previous research carried out on behalf of DEFRA²¹ concluded that exceedances of the 1-hour mean for NO₂ are unlikely to occur where the annual mean is below 60 $\mu\text{g.m}^{-3}$. The annual mean concentrations of NO₂ are predicted to be well below 60 $\mu\text{g.m}^{-3}$ at all of the proposed receptors and it can therefore be assumed that the short term (1-hour) mean AQO will not be exceeded.

8.5.5 For PM₁₀ and PM_{2.5} the predicted future year concentrations are well below the annual mean AQOs of 40 $\mu\text{g.m}^{-3}$ and 25 $\mu\text{g.m}^{-3}$ respectively at all of the modelled receptor locations. The maximum annual mean concentrations of PM₁₀ and PM_{2.5} (15.31 $\mu\text{g.m}^{-3}$ and 9.66 $\mu\text{g.m}^{-3}$ respectively) were predicted at receptor PR1.0.

8.5.6 With reference to guidance in LAQM TG22, using a dispersion model to predict exceedances of the short term (24-hour mean) AQO for PM₁₀ may be challenging. It therefore provides the following formula for estimating the number of daily exceedances based on the annual mean concentration:

$$\text{No. 24-hour mean exceedances} = -18.5 + 0.00145 \times \text{annual mean}^3 + (206/\text{annual mean})$$

²¹ Laxen D and Marner B (2003). Analysis of the relationship between 1-hour and annual mean nitrogen dioxide at UK roadside and kerbside monitoring sites

- 8.5.7 The maximum predicted annual mean concentration is $15.31 \mu\text{g.m}^{-3}$. Using the formula, the number of days predicted to exceed $50 \mu\text{g.m}^{-3}$ over a 24-hour averaging period would be less than one day, which is well below the permitted 35 exceedances. The short term AQO is therefore not predicted to be exceeded at any of the modelled receptors.

Existing Receptors

- 8.5.8 The maximum predicted concentration at each receptor is summarised in Table 11 below, all of which show that the maximum concentration is predicted at ground level. Full results, including predicted annual mean concentrations of NO_2 , PM_{10} and $\text{PM}_{2.5}$ at all modelled existing receptors at all floor heights, are enclosed in Table A4 in Appendix 3.

Table 11: Maximum predicted concentrations at each existing receptor.

Receptor	Maximum Predicted Concentration ($\mu\text{g.m}^{-3}$)		
	NO_2	PM_{10}	$\text{PM}_{2.5}$
ER1	29.39	15.82	9.94
ER2	19.07	12.02	7.81
ER3	20.85	12.66	8.17
ER4	20.83	12.65	8.17
ER5	29.27	15.80	9.94

- 8.5.9 Annual mean concentrations of NO_2 with the Proposed Development in place are well below the AQO with a maximum of $29.39 \mu\text{g.m}^{-3}$ recorded at ER1.0. As predicted annual mean concentrations are all below $60 \mu\text{g.m}^{-3}$ it can also be assumed that concentrations will not exceed the short-term (1-hour mean) AQO.
- 8.5.10 For PM_{10} and $\text{PM}_{2.5}$ the predicted future year concentrations are also well below the annual mean AQOs of $40 \mu\text{g.m}^{-3}$ and $25 \mu\text{g.m}^{-3}$ respectively at all of the modelled receptor locations. The maximum annual mean PM_{10} concentration of $15.82 \mu\text{g.m}^{-3}$ and maximum $\text{PM}_{2.5}$ concentration of $9.94 \mu\text{g.m}^{-3}$ were predicted at receptor ER1.0.
- 8.5.11 The impact at individual receptors for future year scenarios has been assessed with reference to guidance produced jointly by the IAQM and EPUK. An impact descriptor is determined for each receptor based on the change in annual mean pollutant concentration between the 'with-development' and 'without-development' scenarios and the total pollutant concentrations relative to the AQO with the scheme in place. Impacts have been assessed in the context of predicted annual mean NO_2 concentrations as this is the pollutant which is most significantly influenced.

- 8.5.12 Table 12 presents the impact of the scheme at ground floor level (where the highest concentrations were predicted) for each of the five modelled existing receptors based on the change in annual mean NO₂ concentrations.

Table 12: Impact at individual receptors

Receptor ID	Annual mean NO ₂ concentration in 2024 (µg.m ⁻³)		Impact (µg.m ⁻³)	Increase as % AQO	Total as % AQO	Significance
	With Development	Without development				
ER1.0	30.15	30.37	0.22	1	76	negligible
ER2.0	19.12	19.33	0.21	1	48	negligible
ER3.0	21.03	19.46	1.57	4	53	negligible
ER4.0	21.01	19.56	1.45	4	53	negligible
ER5.0	30.03	24.23	5.80	15	75	moderate

- 8.5.13 The impact at all modelled receptors is described as negligible with one exception (ER5). This is located on the roadside façade of the consented development at One Lord Street. As the predicted impact is described as 'moderate' at ground floor level at ER5, a full impact assessment at all floor heights was undertaken to evaluate the significance of the Proposed Development on this modelled receptor in more detail. This is shown in Table 13 below.

Table 13: Impact at ER5 (all floor heights)

Receptor ID	Annual mean NO ₂ concentration in 2022 (µg.m ⁻³)		Impact (µg.m ⁻³)	Increase as % AQO	Total as % AQO	Significance
	With Development	Without development				
ER5.0	30.03	24.23	5.80	15	75	moderate
ER5.1	27.72	21.07	6.65	17	69	moderate
ER5.2	25.99	19.64	6.35	16	65	moderate
ER5.3	24.74	19.07	5.67	14	62	moderate
ER5.4	23.90	18.81	5.09	13	60	moderate
ER5.5	23.33	18.67	4.66	12	58	moderate
ER5.6	22.96	18.58	4.38	11	57	moderate
ER5.7	22.72	18.53	4.19	10	57	slight
ER5.8	22.58	18.49	4.09	10	56	slight
ER5.9	22.49	18.47	4.02	10	56	slight
ER5.10	22.43	18.46	3.97	10	56	slight
ER5.11	22.38	18.45	3.93	10	56	slight

ER5.12	22.36	18.44	3.92	10	56	slight
ER5.13	22.35	18.43	3.92	10	56	slight
ER5.14	22.36	18.43	3.93	10	56	slight
ER5.15	22.35	18.43	3.92	10	56	slight

- 8.5.14 The results show that from ground floor to 6th floor, the adverse impact is described as 'moderate'. From the 7th floor upwards, the impact is described as 'slight'.
- 8.5.15 The footnotes to Table 6.3 of the IAQM/EPUK guidance (which recommends impact descriptors for use in Air Quality Assessments) states that the impact descriptors are for individual receptors only and that *'the overall significance is determined using professional judgement. For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered'*. Section 7.5 of the guidance goes on to state that a 'moderate' or 'substantial' impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health.
- 8.5.16 It is an important distinction that the Proposed Development is not expected to result in additional pollutant load. Rather, the impact of the proposed building on dispersion along Cheetham Hill Road will redistribute existing pollution levels such that the increase observed in some locations will result in a corresponding decrease elsewhere. It should also be emphasised that the majority of existing modelled receptors will experience a 'negligible' impact as a result of the Proposed Development.
- 8.5.17 The assessment in relation to modelled receptor ER5 represents an overestimation of impacts as it reflects the combined impact of introducing both the Proposed Development and the One Lord Street development simultaneously. In reality, assuming One Lord Street is constructed before the Proposed Development, the 'without development' concentrations at ER5 will be higher such that the impact (upon introduction of the Proposed Development) will be less. Even in the conservative assessment scenario which assumes that both developments are introduced simultaneously, overall air pollutant concentrations at all receptors are predicted to remain well below the relevant AQOs.
- 8.5.18 As the Proposed Development will not result in an appreciable increase in vehicle movements, the potential impact on existing receptors in the wider area (outside of the street canyon) will be 'negligible'.
- 8.5.19 In summary, with the exception of ER5, the predicted impact at existing receptors is 'negligible'. At ER5, the predicted impact of the Proposed Development is described as 'moderate adverse' at ground floor to sixth floor and 'slight adverse' at the floors above. This is an overestimation of impacts over a very limited geographical area which assumes that the One Lord Street consented development and the Proposed Development are introduced simultaneously.

- 8.5.20 The overall significance of effects of the Proposed Development on local air quality is considered to be 'not significant'.

8.6 **ASSUMPTIONS, UNCERTAINTY AND LIMITATIONS**

- 8.6.1 There are many components that contribute to the uncertainty of modelling predictions. Dispersion models such as ADMS Roads are dependent upon the traffic data that have been input, which will have inherent uncertainties associated with it. Additionally, the meteorological data required for the exercise has been obtained from a representative site but is not site-specific. There are also limitations, as the model is required to simplify real-world conditions into a series of algorithms.

SECTION 9 MITIGATION MEASURES

9.1 **CONSTRUCTION PHASE**

- 9.1.1 The IAQM guidance provides recommendations for mitigation measures commensurate with the risk of dust impacts.

- 9.1.2 With reference to IAQM guidance the following measures are highly recommended based on the risk assessment presented in Section 7.

9.1.3 Communications

- i. *Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;*
- ii. *Display the name and contact details of persons accountable for air quality and dust issues on the site boundary together with head or regional office contact information; and,*
- iii. *Develop and implement a Dust Management Plan (DMP) which may include measures to control other emissions, approved by the LA. The DMP may include monitoring of dust deposition, dust flux, real-time PM₁₀ continuous monitoring and/or visual inspections.*

9.1.4 Site Management

- i. *Record all dust and air quality complaints, identify causes and take appropriate measures to reduce emissions in a timely manner. All records should be made available to the LA when asked; and,*
- ii. *Record any exceptional incidents that occur, causing dust and/or air emissions, either on or off site, and the action taken to resolve the situation.*

9.1.5 Monitoring

- i. *Carry out regular site inspections to monitor compliance with the DMP, increasing the frequency when activities with a high potential to produce dust are being carried out or during prolonged dry/windy conditions; and,*

- ii. Agree dust deposition, dust flux, or real-time PM₁₀ continuous monitoring locations with the LA. Where possible commence baseline monitoring at least three months before work commences on site.*

9.1.6 Preparing and maintaining the site

- i. Plan site layout so that, where possible, machinery and dust causing activities are located away from receptors;*
- ii. Erect solid screens or barriers around the site boundary and implement intelligent screening, such as positioning site offices between potentially dusty activities and receptors;*
- iii. Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;*
- iv. Avoid site runoff of water and mud;*
- v. Keep site fencing, barriers and scaffolding clean using wet methods;*
- vi. Remove materials that have a potential to produce dust from site as soon as possible unless being re-used on site. If being retained on site cover as described below; and,*
- vii. Cover, seed or fence stockpiles to prevent wind whipping.*

9.1.7 Operating vehicle/machinery and sustainable travel

- i. Implement a site policy that no vehicles are left idling and engines are switched off when not in use; and*
- ii. Avoid the use of diesel or petrol-powered generators using mains electricity or battery powered equipment where practicable.*

9.1.8 Operations

- i. Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques;*
- ii. Ensure adequate water supply for dust suppression, to avoid generation of wind-blown dust, using non-potable water where possible;*
- iii. Minimise drop-heights into skips and use enclosed chutes, conveyers and covered skips, where possible; and,*
- iv. Ensure equipment is readily available on site to clean any dry spillages as soon as reasonably practicable after the event using wet cleaning methods.*

9.1.9 Waste Management

- i. Ban the disposal of waste material by burning on site.*

9.1.10 Construction

- i. Ensure sand and other aggregates are stored in bunded area and are not allowed to dry out unless this is required for a particular process, in which case that appropriate additional control measures are in place.*

9.1.11 Provided mitigation is employed for the duration of the construction works the overall effect on local air quality is judged to be 'not significant'.

9.2 **OPERATIONAL PHASE**

9.2.1 Recommended Measures

9.2.1.1 Guidance on mitigating against air quality impacts is provided in the IAQM/EPUK guidance document. The guidance emphasises that all developments should adopt good design principles to reduce emissions and minimise cumulative impacts regardless of the outcome of individual air quality assessments.

9.2.1.2 For the design phase:

- i. New developments should not contravene the Council's AQAP, or render any of the measures unworkable;*
- ii. Wherever possible, new developments should not create a new 'street canyon', or a building configuration that inhibits effective pollution dispersion;*
- iii. Delivering sustainable development should be the key theme of any application; and,*
- iv. New development should be designed to minimise public exposure to pollution sources, e.g. by locating habitable rooms away from busy roads, or directing combustion generated pollutants through well sited vents or chimney stacks.*

9.2.1.3 For the operational phase:

- i. The provision of at least 1 Electric Vehicle (EV) "rapid charge" point per 10 residential dwellings and/or 1000m² of commercial floorspace. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made.*
- ii. Where development generates significant additional traffic, provision of a detailed travel plan (with provision to measure its implementation and effect) which sets out measures to encourage sustainable means of transport (public, cycling and walking) via subsidised or free-ticketing, improved links to bus stops, improved infrastructure and layouts to improve accessibility and safety.*
- iii. A presumption should be to use natural gas-fired installations as opposed to biomass especially in urban areas. All gas-fired boilers should meet a minimum standard of <40 mgNO_x/kWh and all gas-fired CHP plant to meet minimum emissions standards as dictated by the engine type.*

9.2.2 Minimising exposure to poor air quality

9.2.2.1 There is a wide pavement along Cheetham Hill Road and additionally, no residential uses are proposed at ground level along the Cheetham Hill Road façade of the proposed building.

9.2.2.2 The concentrations predicted at the worst-case proposed receptor locations (closest to Cheetham Hill Road) in the opening year are well below the annual mean AQO (maximum of $28.66 \mu\text{g.m}^{-3}$) and no additional mitigation to reduce future residents' exposure to air pollution is considered to be necessary.

9.2.3 Traffic

9.2.3.1 The site is highly accessible and, as such, the Proposed Development has been designed to be 'car-free' with the exception of three, on-street parking spaces (two accessible and one for car club use). A high level of cycle parking is to be provided (one space per apartment).

9.2.3.2 A Travel Plan has been prepared to support the planning application and sets out a range of measures to support active / sustainable travel as follows:

- i.* Travel packs will be provided to new occupants which contains information on nearby travel options and timetables, along with the Travel Plan Co-ordinators contact details.
- ii.* The Travel Plan Co-ordinator will offer personal travel planning services to help residents who require extra help familiarising themselves with their options.
- iii.* The proposed development will provide localised enhancements to pedestrian access routes, 100% resident cycle parking and visitor cycle parking.
- iv.* Details of the frequent bus services on Cheetham Hill Road and train/tram services at Victoria station will be provided in the Travel Pack.

9.2.4 Heating scheme

9.2.4.1 The heat demand of the development will be addressed using electric systems therefore no point source of NO_x or PM_{10} will be introduced on site and no mitigation is required.

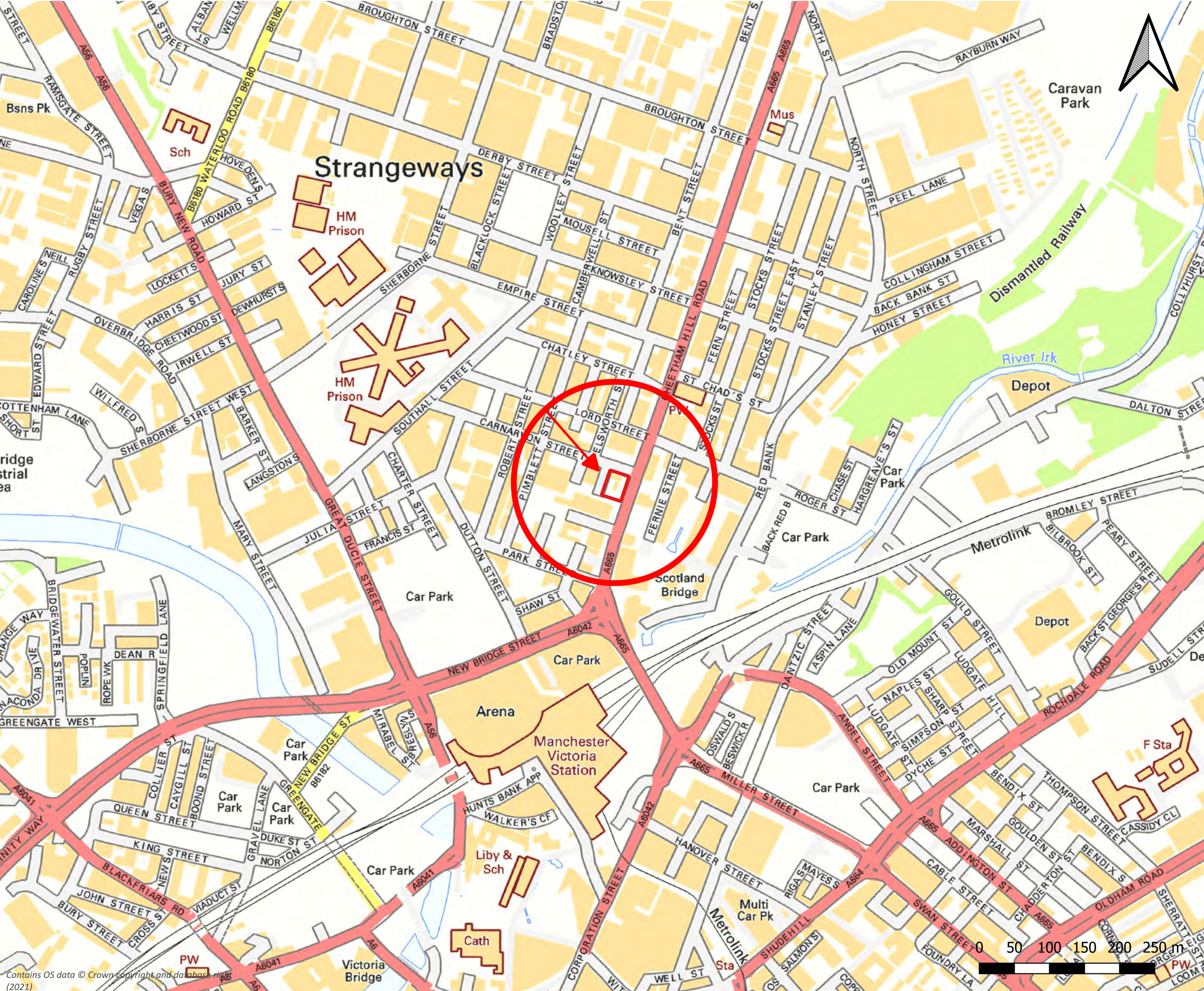
9.2.4.2 The overall effect of the operational scheme on local air quality is judged to be 'not significant'.

SECTION 10 CONCLUSIONS

- 10.1 The AQA has been prepared for the proposed construction of a 23-storey, residential apartment block at 33-41 Cheetham Hill Road in Manchester. Due to the Site's highly accessible location, the Proposed Development will be 'car-free' with 100 % cycle parking provision.
- 10.2 The Site is situated within an AQMA, however, concentrations at the Proposed Development façade are expected to be below the relevant AQOs in the opening year (and thereafter). The Site is therefore considered to be suitable for the Proposed Development in air quality terms without the requirement for mitigation to reduce future residents' exposure.
- 10.3 The risk of dust soiling impacts is assessed as 'medium' during construction and 'low' during demolition, earthworks and associated with trackout in the absence of mitigation. The risk of human health impacts in the absence of mitigation is assessed as 'negligible' to 'low'.
- 10.4 Risks can be mitigated using appropriate management and dust suppression techniques commensurate with the level of risk and secured via planning condition. Provided appropriate mitigation is employed for the duration of the construction works the overall effect on local air quality is judged to be 'not significant'.
- 10.5 The Proposed Development will not result in a significant increase in traffic on the local road network. However, the introduction of the proposed building in close proximity to existing and consented tall buildings on the opposite side of Cheetham Hill Road has the potential to result in street canyon effects. Dispersion modelling has been undertaken using ADMS Roads to examine the impact on existing and proposed receptors located within the canyon created by the proposals.
- 10.6 The predicted impact at the vast majority of existing receptors can be described as 'negligible' in accordance with industry-standard guidance. At one receptor (representative of future exposure within the consented development at One Lord Street), the predicted impact of the Proposed Development is described as 'slight to moderate adverse'. However, this is likely to be an overestimation of impacts and concentrations of key air pollutants at all existing and proposed receptors are predicted to be well below the relevant AQOs with the Proposed Development in place.
- 10.7 The Proposed Development will not increase traffic on the local road network or introduce point sources of emissions. Combined with the findings of the impact assessment (which predicts 'negligible' impacts at the vast majority of receptors and concentrations of air pollutants which are below the relevant AQOs), the overall effect of the operational development on local air quality is considered to be 'not significant'.

- 10.8 It is considered that the development proposals adhere to policy guidance and that there is no reason falling within the scope of this report, that precludes the granting of planning permission for the development as proposed.

APPENDIX 1 ▪ Drawings



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Legend

Site Boundary



First Issue	10/10/23	-
Issue Details	HDF	KRJ
Issue Purpose	Dwn	Chd

Client
ZX Cheetham Hill Developments Limited

Project
33-41 Cheetham Hill Road, Manchester

Dwg Title
Site Location Plan

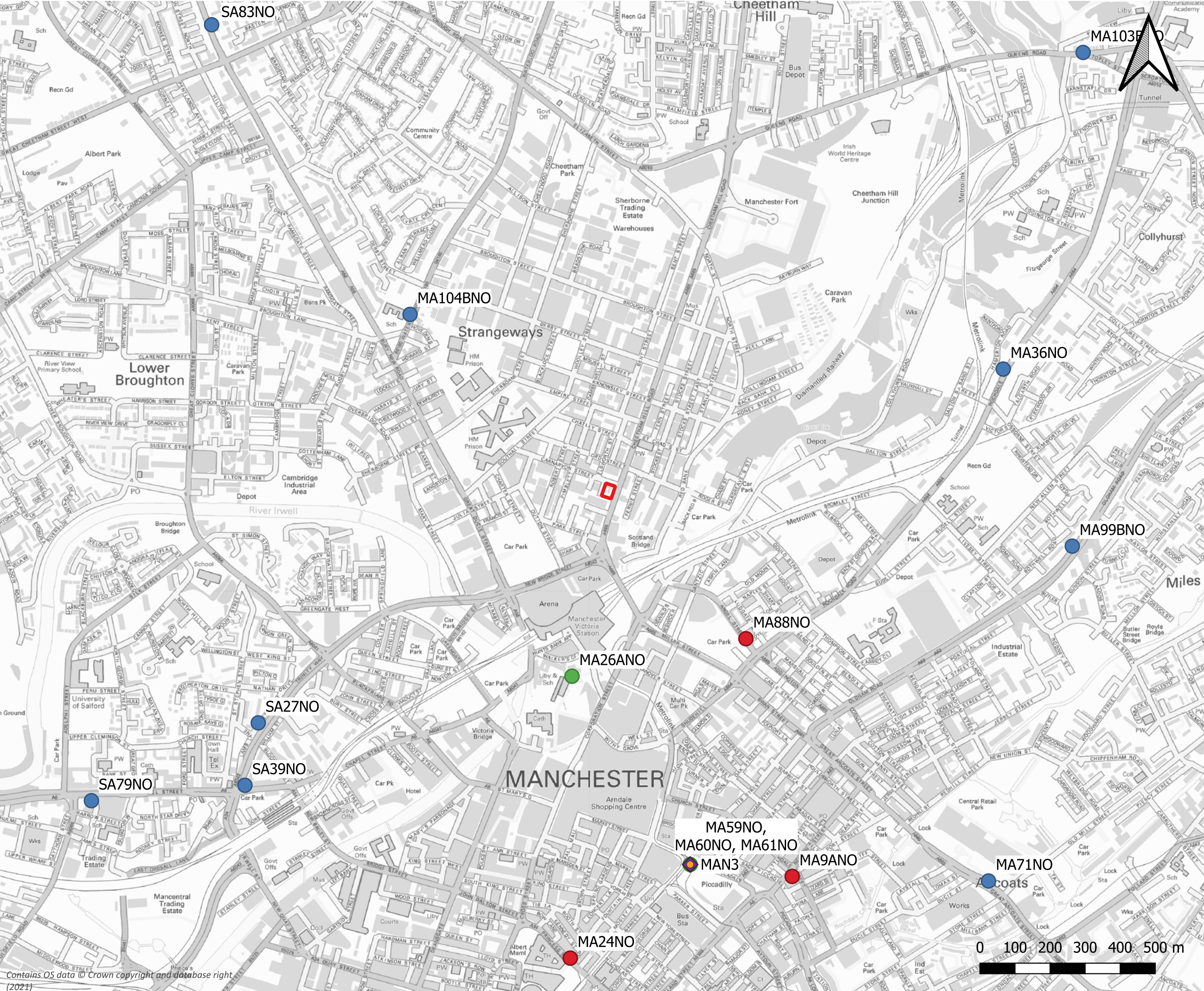
Drawing No.
22600-001-001

Scale 1:5,000	Date 10/10/23	Frame dimension mm (A3) 392 x 277
Drawn HDF	Checked KRJ	Approved KRJ

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Cromford Mills, Mill Lane, Matlock, Derbyshire DE4 3RQ
t: +44(0)1773 829 988 e: info.derbyshire@idom.com

APPENDIX 2 ▪ Input parameters



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Legend

- Site Boundary
- Continuous Monitoring Station
- Urban Centre
- Diffusion Tube
- Kerbside
- Roadside
- Urban Background

First Issue	06/09/23		-
	HDF	KRJ	KRJ
Issue Details	Dwn	Chd	App'd
Issue Purpose			

Client
ZX Cheetham Hill Developments Limited

Project
33-41 Cheetham Hill Road, Manchester

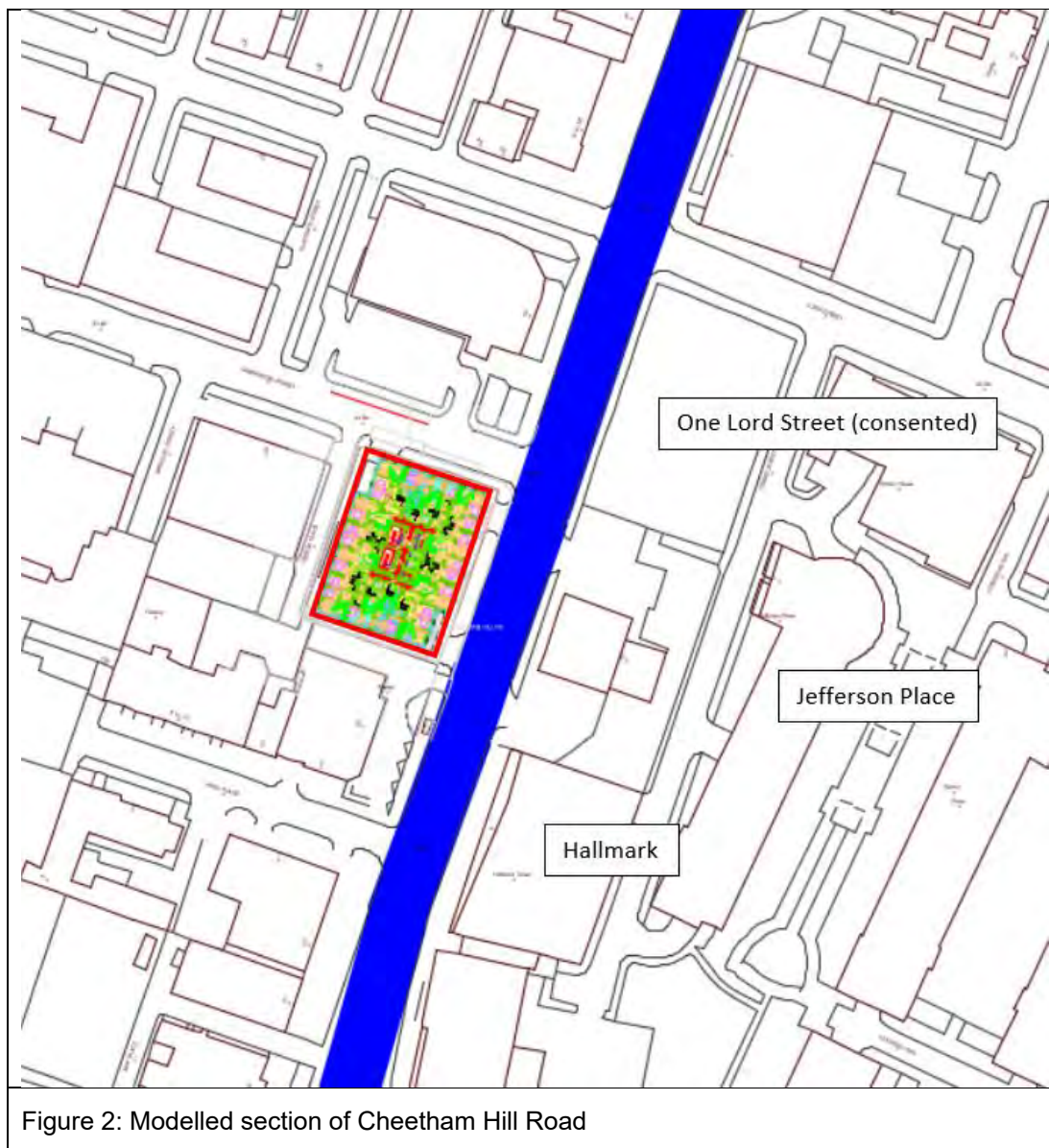
Dwg Title
Automatic and Diffusion Tube Monitoring Locations

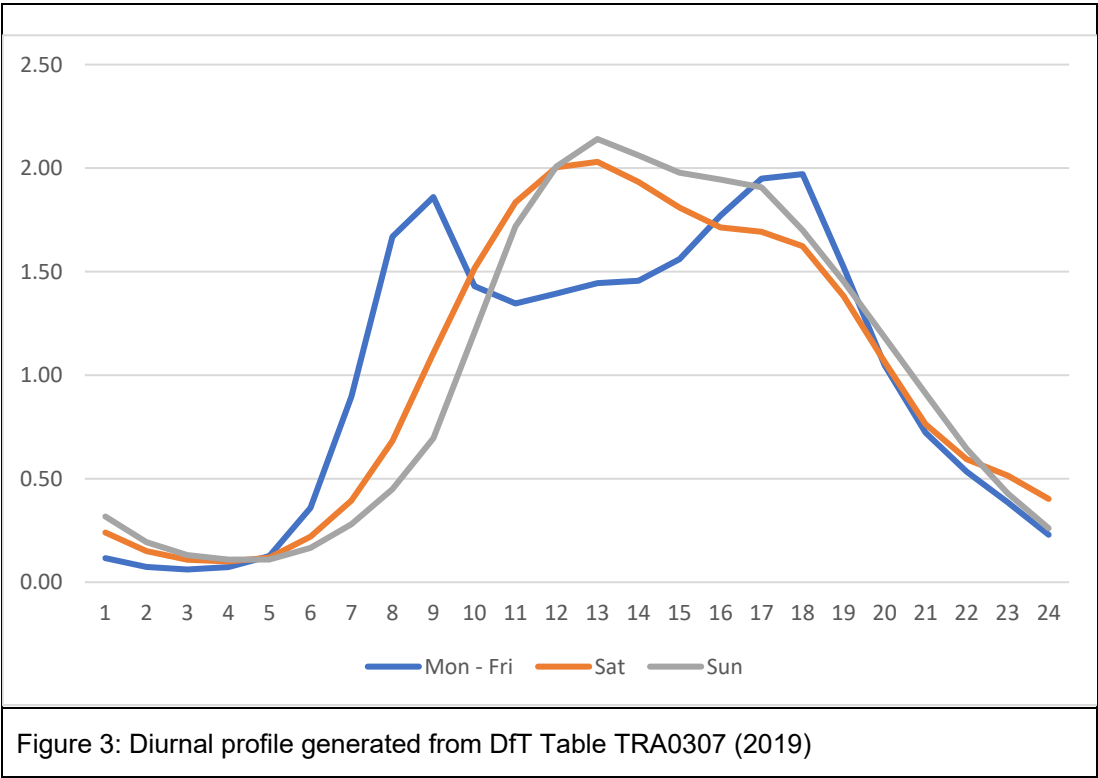
Drawing No. **Figure 1**

Scale 1:10,000	Date 06/09/23	Frame dimension mm (A3) 392 x 277
Drawn HDF	Checked KRJ	Approved KRJ

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Crumford Mills, Mill Lane, Matlock, Derbyshire DE4 3RQ
t: +44(0)1773 829 988 e: info.derbyshire@idom.com





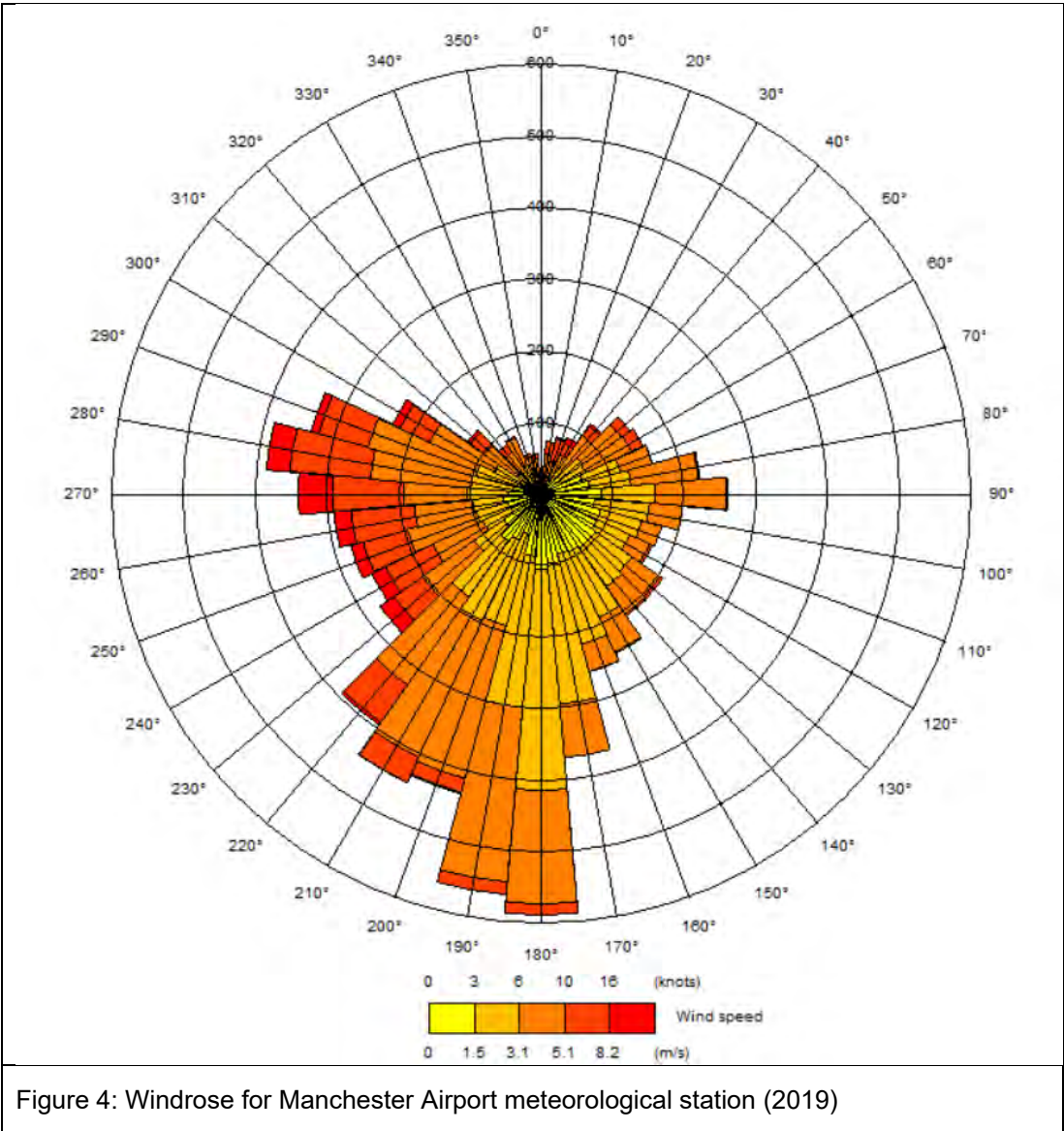




Table A1: ADMS Traffic inputs for verification year 2019

DfT count point	Road name	Road width (m)	Speed (kph)	2019						
				Total AADT	Motorcycle	Car	LGV	Bus/Coach	Rigid HGV	Articulated HGV
7428	Cheetham Hill Road (A665)	12.5	48	18197	82	15930	1683	270	173	61
27447	Rochdale Road (A664)	10.5	48	14083	65	11796	1305	733	176	9

Table A2: ADMS Traffic inputs for opening year 2024

DfT count point	Road name	Road width (m)	Speed (kph)	2024 (growthed from 2022)						
				Total AADT	Motorcycle	Car	LGV	Bus/Coach	Rigid HGV	Articulated HGV
7428	Cheetham Hill Road (A665)	12.5	48	16897	72	14598	1799	194	174	59
27447	Rochdale Road (A664)	10.5	48	12975	56	10811	1395	526	177	9

APPENDIX 3 ▪ Results

Table A3: Predicted annual mean concentrations at proposed receptors

Receptor ID	X(m)	Y(m)	Z(m)	Total Annual Mean Concentration $\mu\text{g}\cdot\text{m}^{-3}$		
				NO ₂	PM ₁₀	PM _{2.5}
PR1.0	384095	399412	1.5	27.99	15.31	9.66
PR1.M	384095	399412	4.07	25.92	14.53	9.22
PR1.1	384095	399412	6.5	24.26	13.91	8.87
PR1.2	384095	399412	9.5	22.87	13.40	8.58
PR1.3	384095	399412	12.5	21.95	13.07	8.40
PR1.4	384095	399412	15.5	21.31	12.84	8.27
PR1.5	384095	399412	18.5	20.86	12.68	8.18
PR1.6	384095	399412	21.5	20.53	12.56	8.12
PR1.7	384095	399412	24.5	20.30	12.48	8.07
PR1.8	384095	399412	27.5	20.13	12.42	8.04
PR1.9	384095	399412	30.5	20.00	12.37	8.01
PR1.10	384095	399412	33.5	19.90	12.34	7.99
PR1.11	384095	399412	36.5	19.82	12.31	7.98
PR1.12	384095	399412	39.5	19.76	12.28	7.96
PR1.13	384095	399412	42.5	19.53	12.20	7.92
PR1.14	384095	399412	45.5	19.28	12.11	7.87
PR1.15	384095	399412	48.5	19.05	12.03	7.82
PR1.16	384095	399412	51.5	18.82	11.95	7.78
PR1.17	384095	399412	55.08	18.78	11.94	7.77
PR1.18	384095	399412	58.5	18.76	11.93	7.77
PR1.19	384095	399412	61.5	18.75	11.93	7.76
PR1.20	384095	399412	64.5	18.74	11.92	7.76
PR1.21	384095	399412	67.5	18.74	11.92	7.76
PR1.22	384095	399412	70.5	18.47	11.83	7.71
PR2.0	384091	399398	1.5	27.55	15.14	9.56
PR2.M	384091	399398	4.07	25.76	14.47	9.18
PR2.1	384091	399398	6.5	24.19	13.88	8.85
PR2.2	384091	399398	9.5	22.80	13.37	8.57
PR2.3	384091	399398	12.5	21.89	13.04	8.39
PR2.4	384091	399398	15.5	21.26	12.82	8.26
PR2.5	384091	399398	18.5	20.81	12.66	8.17
PR2.6	384091	399398	21.5	20.49	12.54	8.11
PR2.7	384091	399398	24.5	20.26	12.46	8.06
PR2.8	384091	399398	27.5	20.10	12.41	8.03
PR2.9	384091	399398	30.5	19.98	12.36	8.01
PR2.10	384091	399398	33.5	19.88	12.33	7.99
PR2.11	384091	399398	36.5	19.81	12.30	7.97
PR2.12	384091	399398	39.5	19.74	12.28	7.96
PR2.13	384091	399398	42.5	19.52	12.20	7.91
PR2.14	384091	399398	45.5	19.27	12.11	7.87
PR2.15	384091	399398	48.5	19.04	12.03	7.82
PR2.16	384091	399398	51.5	18.81	11.95	7.77
PR2.17	384091	399398	55.08	18.78	11.93	7.77
PR2.18	384091	399398	58.5	18.76	11.93	7.76
PR2.19	384091	399398	61.5	18.75	11.92	7.76
PR2.20	384091	399398	64.5	18.74	11.92	7.76
PR2.21	384091	399398	67.5	18.74	11.92	7.76
PR2.22	384091	399398	70.5	18.47	11.83	7.71
PR3.0	384082	399382	1.5	22.27	13.15	8.45
PR3.M	384082	399382	4.07	20.99	12.69	8.19
PR3.1	384082	399382	6.5	19.95	12.33	7.99
PR3.2	384082	399382	9.5	19.24	12.08	7.85
PR3.3	384082	399382	12.5	18.88	11.96	7.78
PR3.4	384082	399382	15.5	18.69	11.90	7.75
PR3.5	384082	399382	18.5	18.58	11.86	7.73
PR3.6	384082	399382	21.5	18.52	11.84	7.72
PR3.7	384082	399382	24.5	18.48	11.83	7.71
PR3.8	384082	399382	27.5	18.46	11.82	7.70
PR3.9	384082	399382	30.5	18.45	11.82	7.70
PR3.10	384082	399382	33.5	18.44	11.81	7.70
PR3.11	384082	399382	36.5	18.43	11.81	7.70
PR3.12	384082	399382	39.5	18.43	11.81	7.70
PR3.13	384082	399382	42.5	18.42	11.81	7.70
PR3.14	384082	399382	45.5	18.42	11.81	7.70
PR3.15	384082	399382	48.5	18.42	11.81	7.70
PR3.16	384082	399382	51.5	18.42	11.81	7.70
PR3.17	384082	399382	55.08	18.44	11.82	7.70
PR3.18	384082	399382	58.5	18.45	11.82	7.70
PR3.19	384082	399382	61.5	18.45	11.82	7.70
PR3.20	384082	399382	64.5	18.45	11.82	7.70
PR3.21	384082	399382	67.5	18.45	11.82	7.70
PR3.22	384082	399382	70.5	18.45	11.82	7.70

Table A4: Predicted annual mean concentrations at existing receptors

Receptor ID	X(m)	Y(m)	Z(m)	Total Annual Mean Concentration $\mu\text{g.m}^{-3}$		
				NO ₂	PM ₁₀	PM _{2.5}
ER1.0	384099.22	399356.94	1.5	29.39	15.82	9.94
ER1.1	384099.22	399356.94	5.9	26.15	14.58	9.26
ER1.2	384099.22	399356.94	8.85	24.56	14.00	8.93
ER1.3	384099.22	399356.94	11.81	23.49	13.61	8.71
ER1.4	384099.22	399356.94	14.77	22.77	13.35	8.57
ER1.5	384099.22	399356.94	17.72	22.29	13.18	8.47
ER1.6	384099.22	399356.94	20.67	21.98	13.07	8.41
ER1.7	384099.22	399356.94	23.63	21.79	13.00	8.37
ER1.8	384099.22	399356.94	26.58	21.67	12.96	8.35
ER1.9	384099.22	399356.94	29.54	21.60	12.93	8.33
ER1.10	384099.22	399356.94	32.49	21.55	12.91	8.32
ER1.11	384099.22	399356.94	35.69	21.51	12.90	8.31
ER1.12	384099.22	399356.94	38.9	21.49	12.89	8.31
ER1.13	384099.22	399356.94	41.85	21.48	12.89	8.31
ER1.14	384099.22	399356.94	44.81	18.61	11.87	7.73
ER1.15	384099.22	399356.94	48.01	18.59	11.87	7.73
ER2.0	384138.41	399348.94	1.5	19.07	12.02	7.81
ER2.1	384138.41	399348.94	5.9	18.94	11.98	7.79
ER2.2	384138.41	399348.94	8.85	18.82	11.93	7.77
ER2.3	384138.41	399348.94	11.81	18.70	11.90	7.75
ER2.4	384138.41	399348.94	14.77	18.61	11.87	7.73
ER2.5	384138.41	399348.94	17.72	18.55	11.85	7.72
ER2.6	384138.41	399348.94	20.67	18.50	11.84	7.71
ER2.7	384138.41	399348.94	23.63	18.48	11.83	7.71
ER2.8	384138.41	399348.94	26.58	18.46	11.82	7.71
ER2.9	384138.41	399348.94	29.54	18.46	11.82	7.70
ER2.10	384138.41	399348.94	32.49	18.46	11.82	7.71
ER2.11	384138.41	399348.94	35.69	18.48	11.83	7.71
ER2.12	384138.41	399348.94	38.9	18.49	11.83	7.71
ER2.13	384138.41	399348.94	41.85	18.51	11.84	7.71
ER2.14	384138.41	399348.94	44.81	18.52	11.84	7.72
ER2.15	384138.41	399348.94	48.01	18.51	11.84	7.71
ER3.0	384146.41	399372.75	1.5	20.85	12.66	8.17
ER3.1	384146.41	399372.75	5.9	20.71	12.61	8.15
ER3.2	384146.41	399372.75	8.85	20.58	12.56	8.12
ER3.3	384146.41	399372.75	11.81	20.45	12.52	8.10
ER3.4	384146.41	399372.75	14.77	20.34	12.48	8.08
ER3.5	384146.41	399372.75	17.72	20.25	12.45	8.06
ER3.6	384146.41	399372.75	20.67	20.18	12.43	8.05
ER3.7	384146.41	399372.75	23.63	20.13	12.41	8.03
ER3.8	384146.41	399372.75	26.58	20.08	12.39	8.03
ER3.9	384146.41	399372.75	29.54	20.04	12.38	8.02
ER3.10	384146.41	399372.75	32.49	20.01	12.37	8.01
ER3.11	384146.41	399372.75	35.69	19.98	12.36	8.01
ER3.12	384146.41	399372.75	38.9	19.96	12.35	8.00
ER3.13	384146.41	399372.75	41.85	19.81	12.30	7.97
ER3.14	384146.41	399372.75	44.81	19.58	12.22	7.93
ER3.15	384146.41	399372.75	48.01	19.34	12.13	7.88
ER4.0	384153.19	399391.62	1.5	20.83	12.65	8.17
ER4.1	384153.19	399391.62	5.9	20.70	12.61	8.15
ER4.2	384153.19	399391.62	8.85	20.58	12.56	8.12
ER4.3	384153.19	399391.62	11.81	20.45	12.52	8.10
ER4.4	384153.19	399391.62	14.77	20.35	12.49	8.08
ER4.5	384153.19	399391.62	17.72	20.26	12.46	8.06
ER4.6	384153.19	399391.62	20.67	20.19	12.43	8.05
ER4.7	384153.19	399391.62	23.63	20.13	12.41	8.04
ER4.8	384153.19	399391.62	26.58	20.08	12.39	8.03
ER4.9	384153.19	399391.62	29.54	20.04	12.38	8.02
ER4.10	384153.19	399391.62	32.49	20.01	12.37	8.01
ER4.11	384153.19	399391.62	35.69	19.98	12.36	8.01
ER4.12	384153.19	399391.62	38.9	19.95	12.35	8.00
ER4.13	384153.19	399391.62	41.85	19.80	12.30	7.97
ER4.14	384153.19	399391.62	44.81	19.59	12.22	7.93
ER4.15	384153.19	399391.62	48.01	19.34	12.14	7.88
ER5.0	384121.38	399420.78	1.5	29.27	15.80	9.94
ER5.1	384121.38	399420.78	4.9	27.10	14.97	9.47
ER5.2	384121.38	399420.78	7.9	25.48	14.36	9.13
ER5.3	384121.38	399420.78	10.9	24.32	13.92	8.89
ER5.4	384121.38	399420.78	13.9	23.53	13.63	8.72
ER5.5	384121.38	399420.78	16.9	23.00	13.44	8.62
ER5.6	384121.38	399420.78	19.9	22.65	13.31	8.54
ER5.7	384121.38	399420.78	22.9	22.43	13.23	8.50
ER5.8	384121.38	399420.78	25.9	22.30	13.19	8.47
ER5.9	384121.38	399420.78	28.9	22.21	13.15	8.46
ER5.10	384121.38	399420.78	31.9	22.16	13.13	8.44
ER5.11	384121.38	399420.78	34.9	22.12	13.12	8.44
ER5.12	384121.38	399420.78	37.9	22.09	13.11	8.43
ER5.13	384121.38	399420.78	40.9	22.09	13.11	8.43
ER5.14	384121.38	399420.78	43.9	22.09	13.11	8.43
ER5.15	384121.38	399420.78	46.9	22.09	13.11	8.43

IDOM

IDOM Cromford Mills, Mill Lane, Matlock, Derbyshire DE4 3RQ
t +44 (0)1773 829 988 **f** +44 (0)1773 829 393 **e** info.derbyshire@idom.com **idom.com**

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