

Air Quality Assessment
Brunswick Street, Manchester

Client: Brunswick Living Limited

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Executive Summary

Redmore Environmental Ltd was commissioned by Brunswick Living Limited to undertake an Air Quality Assessment in support of a planning application for a residential development on land off Brunswick Street, Manchester.

The development may lead to the exposure of future users to elevated pollution levels, as well as adverse air quality effects at sensitive locations. As such, an Air Quality Assessment was required in order to determine baseline conditions, consider site suitability for the proposed end-use and assess potential impacts as a result of the scheme.

Potential construction phase air quality impacts from fugitive dust emissions were assessed as a result of earthworks, construction and trackout activities. It is considered that the use of good practice control measures would provide suitable mitigation for a development of this size and nature and reduce potential impacts to an acceptable level.

During the operational phase of the development there is the potential for air quality impacts as a result of traffic exhaust emissions associated with vehicles travelling to and from the site. These were assessed against the relevant screening criteria. Due to the low anticipated trip generation associated with the proposals, impacts were not predicted to be significant.

There is the potential for the exposure of future users to elevated pollution levels. Dispersion modelling was therefore undertaken in order to predict concentrations across the proposed development site as a result of emissions from the highway network. Results were subsequently verified using local monitoring data.

The results of the dispersion modelling assessment indicated that predicted pollution levels were below the relevant criteria at all locations across the development site. As such, the site is considered suitable for residential use from an air quality perspective.

Based on the assessment results, air quality issues are not considered a constraint to planning consent for the proposals.

Table of Contents

1.0 INTRODUCTION	1
1.1 Background	1
1.2 Site Location and Context	1
2.0 LEGISLATION AND POLICY	2
2.1 European Directives	2
2.2 UK Legislation	2
2.3 Local Air Quality Management	4
2.4 Dust	5
2.5 National Planning Policy	5
2.6 National Planning Practice Guidance	6
2.7 Local Planning Policy	7
3.0 METHODOLOGY	8
3.1 Introduction	8
3.2 Construction Phase Assessment	8
Step 1	9
Step 2	9
Step 3	15
Step 4	15
3.3 Operational Phase Assessment	15
Potential Development Impacts	15
Potential Future Exposure	17
4.0 BASELINE	18
4.1 Introduction	18
4.2 Local Air Quality Management	18
4.3 Air Quality Monitoring	18
4.4 Background Pollutant Concentrations	19
4.5 Sensitive Receptors	20
5.0 ASSESSMENT	23
5.1 Introduction	23
5.2 Construction Phase Assessment	23
Step 1	23
Step 2	23
Step 3	25
Step 4	27
5.3 Operational Phase Assessment	27

Potential Development Impacts	27
Potential Future Exposure	28
Mitigation	29
6.0 CONCLUSION	32
7.0 ABBREVIATIONS	34

Appendices

Appendix 1 - Assessment Input Data

Appendix 2 - Curricula Vitae

1.0 INTRODUCTION

1.1 Background

1.1.1 Redmore Environmental Ltd was commissioned by Brunswick Living Limited to undertake an Air Quality Assessment in support of a planning application for a residential development on land off Brunswick Street, Manchester.

1.1.2 The development may lead to the exposure of future users to poor air quality, as well as adverse impacts at sensitive locations. As such, an Air Quality Assessment was required in order to determine baseline conditions at the site, consider its suitability for the proposed end-use and assess potential impacts associated with the scheme.

1.2 Site Location and Context

1.2.1 The site is located on land off Brunswick Street, Manchester, at approximate National Grid Reference (NGR): 385257, 397066. Reference should be made to Figure 1 for a map of the site and surrounding area.

1.2.2 The proposals include the erection of a four storey residential block with an occupied lower level basement to provide 16 residential units, secure cycle storage and associated infrastructure.

1.2.3 The development has the potential to cause impacts at sensitive locations. These may include fugitive dust emissions during construction and road traffic exhaust emissions from vehicles travelling to and from the site during operation. Further to this, the proposals may introduce future users to exceedences of the relevant Air Quality Objectives (AQOs) or Air Quality Target Values (AQTVs). An Air Quality Assessment was therefore undertaken in order to determine baseline conditions and consider potential effects as a result of the proposals. This is detailed in the following report.

2.0 LEGISLATION AND POLICY

2.1 European Directives

2.1.1 European Union (EU) air quality legislation is provided within Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidated previous legislation which was designed to deal with specific pollutants in a consistent manner and provided new Air Quality Limit Values (AQLVs) for particulate matter with an aerodynamic diameter of less than 2.5µm (PM_{2.5}). The consolidated Directives include:

- Directive 1999/30/EC - the First Air Quality "Daughter" Directive - sets ambient AQLVs for nitrogen dioxide (NO₂), oxides of nitrogen (NO_x), sulphur dioxide, lead and particulate matter with an aerodynamic diameter of less than 10µm (PM₁₀);
- Directive 2000/69/EC - the Second Air Quality "Daughter" Directive - sets ambient AQLVs for benzene and carbon monoxide; and,
- Directive 2002/3/EC - the Third Air Quality "Daughter" Directive - seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

2.1.2 The fourth daughter Directive was not included within the consolidation and is described as:

- Directive 2004/107/EC - sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

2.2 UK Legislation

2.2.1 The Air Quality Standards Regulations (2010) came into force on 11th June 2010 and transpose EU Directive 2008/50/EC into UK law. AQLVs were published in these regulations for 7 pollutants, as well as AQTVs for an additional 5 pollutants.

2.2.2 Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by the Department for

Environment, Food and Rural Affairs (DEFRA) and published in July 2007¹. The AQS sets out AQOs that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedences over a specified timescale. These are generally in line with the AQLVs, although the requirements for the determination of compliance vary.

2.2.3 Table 1 presents the AQOs for pollutants considered within this assessment.

Table 1 Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Period
NO ₂	40	Annual mean
	200	1-hour mean, not to be exceeded on more than 18 occasions per annum
PM ₁₀	40	Annual mean
	50	24-hour mean, not to be exceeded on more than 35 occasions per annum

2.2.4 Table 2 presents the AQTVs considered within this assessment.

Table 2 Air Quality Target Values

Pollutant	Air Quality Target Values	
	Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Period
PM _{2.5}	25	Annual mean

2.2.5 Table 3 summarises the advice provided in DEFRA guidance² on where the AQOs and AQTV for pollutants considered within this report apply.

¹ The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.

² Local Air Quality Management (TG16), DEFRA, 2016.

Table 3 Examples of Where the Air Quality Objectives Apply

Averaging Period	Objective Should Apply At	Objective Should Not Apply At
Annual mean	All locations where members of the public might be regularly exposed Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence Gardens of residential properties Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
24-hour mean	All locations where the annual mean objective would apply, together with hotels Gardens of residential properties	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access

2.3 Local Air Quality Management

- 2.3.1 Under Section 82 of the Environment Act (1995) (Part IV) Local Authorities (LAs) are required to periodically review and assess air quality within their area of jurisdiction under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves comparing present and likely future pollutant concentrations against the AQOs. If it is predicted that levels at locations of relevant exposure, as summarised in Table 3, are likely to be exceeded, the LA is required to declare an Air Quality Management Area (AQMA). For each AQMA the LA is required to produce an Air Quality Action Plan (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.4 Dust

- 2.4.1 The main requirements with respect to dust control from industrial or trade premises not regulated under the Environmental Permitting (England and Wales) Regulations (2016), such as construction sites, is that provided in Section 79 of Part III of the Environmental Protection Act (1990). The Act defines nuisance as:

"any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance."

- 2.4.2 Enforcement of the Act, in regard to nuisance, is currently under the jurisdiction of the local Environmental Health Department, whose officers are deemed to provide an independent evaluation of nuisance. If the LA is satisfied that a statutory nuisance exists, or is likely to occur or happen again, it must serve an Abatement Notice under Part III of the Environmental Protection Act (1990). Enforcement can insist that there be no dust beyond the boundary of the works. The only defence is to show that the process to which the nuisance has been attributed and its operation are being controlled according to best practice measures.

2.5 National Planning Policy

- 2.5.1 The National Planning Policy Framework³ (NPPF) was published on 27th March 2012 and sets out the Government's core policies and principles with respect to land use planning, including air quality. The document includes the following considerations which are relevant to the proposed development:

"The planning system should contribute to and enhance the natural and local environment by: [...]"

Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability"

³ NPPF, Department for Communities and Local Government, 2012.

"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."

2.5.2 The implications of the NPPF have been considered throughout this assessment.

2.6 National Planning Practice Guidance

2.6.1 The National Planning Practice Guidance⁴ (NPPG) web-based resource was launched by the Department for Communities and Local Government on 6th March 2014 to support the NPPF and make it more accessible. The air quality pages are summarised under the following headings:

1. Why should planning be concerned about air quality?
2. What is the role of Local Plans with regard to air quality?
3. Are air quality concerns relevant to neighbourhood planning?
4. What information is available about air quality?
5. When could air quality be relevant to a planning decision?
6. Where to start if bringing forward a proposal where air quality could be a concern?
7. How detailed does an air quality assessment need to be?
8. How can an impact on air quality be mitigated?
9. How do considerations about air quality fit into the development management process?

2.6.2 These were reviewed and the relevant guidance considered as necessary throughout the undertaking of this assessment.

⁴ <http://planningguidance.planningportal.gov.uk>.

2.7 Local Planning Policy

2.7.1 The Manchester Local Development Framework consists of a series of planning documents of which the Core Strategy⁵ is central. This was adopted by Manchester City Council (MCC) on 11th July 2012 and provides policies which guide the determination of planning applications within the city.

2.7.2 A review of the Core Strategy identified Policy EN 16 Air Quality which is relevant to this assessment. The policy 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 effect 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 effects on air quality, alongside other plan objectives. This includes cumulative effects, particularly in Air Quality Management Areas."

2.7.3 This policy has been considered throughout this assessment by considering potential air quality effects as a result of the proposals.

⁵ Core Strategy, MCC, 2012.

3.0 METHODOLOGY

3.1 Introduction

3.1.1 The proposed development has the potential to cause air quality impacts during the construction and operational phases, as well as expose future occupants to elevated pollution levels. These issues have been assessed in accordance with the following methodology.

3.2 Construction Phase Assessment

3.2.1 There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined within the Institute of Air Quality Management (IAQM) document 'Guidance on the Assessment of Dust from Demolition and Construction V1.1'⁶.

3.2.2 Activities on the proposed construction site have been divided into three types to reflect their different potential impacts. These are:

- Earthworks;
- Construction; and,
- Trackout.

3.2.3 The potential for dust emissions was assessed for each activity that is likely to take place and considered three separate dust effects:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and,
- The risk of health effects due to a significant increase in exposure to PM₁₀.

3.2.4 The assessment steps are detailed below.

⁶ Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

Step 1

3.2.5 Step 1 screens the requirement for a more detailed assessment. Should human receptors be identified within 350m from the boundary or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment proceeds to Step 2. Additionally, should ecological receptors be identified within 50m of the site or the construction vehicle route up to 500m from the site entrance, then the assessment also proceeds to Step 2.

3.2.6 Should sensitive receptors not be present within the relevant distances then **negligible** impacts would be expected and further assessment is not necessary.

Step 2

3.2.7 Step 2 assesses the risk of potential dust impacts. A site is allocated a risk category based on two factors:

- The scale and nature of the works, which determines the magnitude of dust arising as: small, medium or large (Step 2A); and,
- The sensitivity of the area to dust impacts, which can be defined as low, medium or high sensitivity (Step 2B).

3.2.8 The two factors are combined in Step 2C to determine the risk of dust impacts without mitigation applied.

3.2.9 Step 2A defines the potential magnitude of dust emission through the construction phase. The relevant criteria are summarised in Table 4.

Table 4 Construction Dust - Magnitude of Emission

Magnitude	Activity	Criteria
Large	Earthworks	• Total site area greater than 10,000m² • Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • More than 10 heavy earth moving vehicles active at any one time • Formation of bunds greater than 8m in height • More than 100,000 tonnes of material moved

Magnitude	Activity	Criteria
	Construction	- Total building volume greater than 100,000m³ - On site concrete batching - Sandblasting
	Trackout	- More than 50 Heavy Duty Vehicle (HDV) trips per day - Potentially dusty surface material (e.g. high clay content) - Unpaved road length greater than 100m
Medium	Earthworks	- Total site area 2,500m² to 10,000m² - Moderately dusty soil type (e.g. silt) 5 to 10 heavy earth moving vehicles active at any one time - Formation of bunds 4m to 8m in height - Total material moved 20,000 tonnes to 100,000 tonnes
	Construction	- Total building volume 25,000m³ to 100,000m³ - Potentially dusty construction material (e.g. concrete) - On site concrete batching
	Trackout	10 to 50 HDV trips per day - Moderately dusty surface material (e.g. high clay content) - Unpaved road length 50m to 100m
Small	Earthworks	- Total site area less than 2,500m² - Soil type with large grain size (e.g. sand) - Less than 5 heavy earth moving vehicles active at any one time - Formation of bunds less than 4m in height - Total material moved less than 20,000 tonnes - Earthworks during wetter months
	Construction	- Total building volume less than 25,000m³ - Construction material with low potential for dust release (e.g. metal cladding or timber)
	Trackout	- Less than 10 HDV trips per day - Surface material with low potential for dust release - Unpaved road length less than 50m

3.2.10 Step 2B defines the sensitivity of the area around the development to potential dust impacts. The influencing factors are shown in Table 5.

Table 5 Construction Dust - Examples of Factors Defining Sensitivity of an Area

Receptor Sensitivity	Examples	
	Human Receptors	Ecological Receptors
High	• Users expect high levels of amenity • High aesthetic or value property • People expected to be present continuously for extended periods of time • Locations where members of the public are exposed over a time period relevant to the AQO for PM₁₀. e.g. residential properties, hospitals, schools and residential care homes	• Internationally or nationally designated site e.g. Special Area of Conservation
Medium	• Users would expect to enjoy a reasonable level of amenity • Aesthetics or value of their property could be diminished by soiling • People or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land e.g. parks and places of work	• Nationally designated site e.g. Sites of Special Scientific Interest
Low	• Enjoyment of amenity would not reasonably be expected • Property would not be expected to be diminished in appearance • Transient exposure, where people would only be expected to be present for limited periods. e.g. public footpaths, playing fields, shopping streets, playing fields, farmland, footpaths, short term car park and roads	• Locally designated site e.g. Local Nature Reserve

3.2.11 The guidance also provides the following factors to consider when determining the sensitivity of an area to potential dust impacts:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;
- Any pre-existing screening between the source and receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which works will take place;
- Any conclusions drawn from local topography;

- Duration of the potential impact, as a receptor may become more sensitive over time; and,
- Any known specific receptor sensitivities which go beyond the classifications given in the document.

3.2.12 These factors were considered in the undertaking of this assessment.

3.2.13 The criteria for determining the sensitivity of the area to dust soiling effects on people and property is summarised in Table 6.

Table 6 Construction Dust - Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 350
High	More than 100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low
	1 - 10	Medium	Low	Low	Low
Medium	More than 1	Medium	Low	Low	Low
Low	More than 1	Low	Low	Low	Low

3.2.14 Table 7 outlines the criteria for determining the sensitivity of the area to human health impacts.

Table 7 Construction Dust - Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
High	Greater than 32µg/m ³	More than 100	High	High	High	Medium	Low
		10 - 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 - 32µg/m ³	More than 100	High	High	Medium	Low	Low

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24 - 28µg/m ³	More than 100	High	Medium	Low	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	Less than 24µg/m ³	More than 100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	Medium	Greater than 32µg/m ³	High	Medium	Low	Low	Low
			1 - 10	Medium	Low	Low	Low
		More than 10	Medium	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	28 - 32µg/m ³	More than 10	Medium	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	24 - 28µg/m ³	More than 10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	Less than 24µg/m ³	More than 10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	Low	-	1 or more	Low	Low	Low	Low

3.2.15 Table 8 outlines the criteria for determining the sensitivity of the area to ecological impacts.

Table 8 Construction Dust - Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	Less than 20	Less than 50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

3.2.16 Step 2C combines the dust emission magnitude with the sensitivity of the area to determine the risk of unmitigated impacts.

3.2.17 Table 9 outlines the risk category from earthworks and construction activities.

Table 9 Construction Dust - Dust Risk Category from Earthworks and Construction Activities

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

3.2.18 Table 10 outlines the risk category from trackout activities.

Table 10 Construction Dust - Dust Risk Category from Trackout Activities

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Low	Negligible
Low	Low	Low	Negligible

Step 3

3.2.19 Step 3 requires the identification of site specific mitigation measures within the IAQM guidance⁷ to reduce potential dust impacts based upon the relevant risk categories identified in Step 2. For sites with **negligible** risk, mitigation measures beyond those required by legislation are not required. However, additional controls may be applied as part of good practice.

Step 4

3.2.20 Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step is to determine the significance of any residual impacts. For almost all construction activity, the aim should be to control effects through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be **not significant**.

3.2.21 The determination of significance relies on professional judgement and reasoning should be provided as far as practicable. The IAQM guidance suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix 2.

3.3 Operational Phase Assessment

Potential Development Impacts

3.3.1 The development has the potential to impact on existing air quality as a result of road traffic exhaust emissions associated with vehicles travelling to and from the site during the operational phase. A screening assessment was therefore undertaken using the criteria contained within the Highways Agency 'Design Manual for Roads and Bridges' (DMRB)⁸ and IAQM 'Land-Use Planning & Development Control: Planning for Air Quality'⁹ guidance documents to determine the potential for trips generated by the development to affect local air quality.

⁷ Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

⁸ DMRB Volume 11, Section 3, Part 1, HA207/07, Highways Agency, 2007.

⁹ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

3.3.2 The DMRB¹⁰ provides the following criteria for determination of road links potentially affected by changes in traffic flow:

- Annual Average Daily Traffic (AADT) flows change by 1,000 or more;
- Daily HDV AADT flows change by 200 or more;
- Daily average speed changes by 10km/hr or more; or,
- Peak hour speed changes by 20km/hr or more.

3.3.3 The IAQM 'Land-Use Planning & Development Control: Planning for Air Quality' guidance¹¹ document provides the following criteria to help establish when an assessment of potential impacts on the local area is likely to be considered necessary:

- A change of Light Duty Vehicle (LDV) flows of more than 100 AADT within or adjacent to an AQMA or more than 500 AADT elsewhere;
- A change of HDV flows of more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere;
- Realignment of roads where the change is 5m or more and the road is within an AQMA; or,
- Introduction of a new junction or removal of an existing junction near to relevant receptors.

3.3.4 Should these criteria not be met, then the DMRB¹² and IAQM guidance¹³ documents consider air quality impacts associated with a scheme to be **negligible** and no further assessment is required.

3.3.5 Should screening of the relevant data indicate that any of the above criteria are met, then potential impacts at sensitive receptor locations can be assessed by calculating the change in pollutant concentrations as a result of the proposed development. The significance of predicted impacts can then be determined in accordance with the methodology outlined in the IAQM guidance¹⁴.

¹⁰ DMRB Volume 11, Section 3, Part 1, HA207/07, Highways Agency, 2007.

¹¹ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

¹² DMRB Volume 11, Section 3, Part 1, HA207/07, Highways Agency, 2007.

¹³ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

¹⁴ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

Potential Future Exposure

- 3.3.6 The proposed development has the potential to expose future users to poor air quality. In order to assess NO₂, PM₁₀ and PM_{2.5} concentrations across the site, detailed dispersion modelling was therefore undertaken. Reference should be made to Appendix 1 for a full description of the assessment input data.
- 3.3.7 Results of the dispersion modelling were compared against the relevant AQOs and AQTV in order to determine the potential for exposure of future occupants to elevated pollutant concentrations and identify appropriate mitigation, if necessary.

4.0 BASELINE

4.1 Introduction

- 4.1.1 Existing air quality conditions in the vicinity of the proposed development site were identified in order to provide a baseline for assessment. These are detailed in the following Sections.

4.2 Local Air Quality Management

- 4.2.1 As required by the Environment Act (1995), MCC has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that annual mean NO₂ concentrations are above the AQO within the city. As such, a number of roads within Manchester have been included within the Greater Manchester Combined Authority (GMCA) AQMA. This is described as follows:

"This is the part of the Greater Manchester Combined Authority AQMA located within the Manchester City Council area."

- 4.2.2 The development is located within the AQMA. As such, there is the potential for the exposure of future occupants to poor air quality and vehicles travelling to and from the site to increase pollution levels in this sensitive area. These issues have been considered throughout the assessment.
- 4.2.3 MCC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs. As such, no further AQMA's have been designated.

4.3 Air Quality Monitoring

- 4.3.1 Monitoring of pollutant concentrations is undertaken by MCC using continuous and periodic methods throughout their area of jurisdiction. Recent results recorded in the vicinity of the development are shown in Table 11. Exceedences of the relevant AQO are shown in **bold**.

Table 11 Monitoring Results

Monitoring Site		Monitored NO ₂ Concentration (µg/m ³)		
		2014	2015	2016
78	Rostron Avenue	30.96	31.89	35.82
79	Victoria Terrace	29.73	30.53	31.59
86	A6010 Pottery Lane	30.90	33.26	35.82
87	A57 Hyde Road	42.40	36.59	35.99
88	A57 Hyde Road and Clowes Street Junction	43.64	42.12	44.35
89	Wenlock Way	33.97	31.19	33.70

4.3.2 As shown in Table 11, annual mean NO₂ concentrations were above the AQO at the 88 - A57 Hyde Road and Clowes Street Junction diffusion tube between 2014 and 2016, and at the 87 - A57 Hyde Road diffusion tube during 2014. Due to the location of these monitors within an AQMA, elevated concentrations would be expected. Reference should be made to Figure 2 for a map of the survey positions.

4.3.3 MCC do not undertake PM₁₀ or PM_{2.5} monitoring within the vicinity of the site.

4.4 Background Pollutant Concentrations

4.4.1 Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist LAs in their Review and Assessment of air quality. The proposed development site is located in grid square NGR: 385500, 397500. Data for this location was downloaded from the DEFRA website¹⁵ for the purpose of the assessment and is summarised in Table 12.

Table 12 Background Pollutant Concentration Predictions

Pollutant	Predicted Background Pollutant Concentration (µg/m ³)		
	2016	2017	2019
NO ₂	28.64	27.36	24.80

¹⁵ <http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013>.

Pollutant	Predicted Background Pollutant Concentration ($\mu\text{g}/\text{m}^3$)		
	2016	2017	2019
PM ₁₀	16.92	16.76	16.44
PM _{2.5}	11.88	11.72	11.40

4.4.2 As shown in Table 12, predicted background NO₂, PM₁₀ and PM_{2.5} concentrations are below the relevant AQOs and AQTV at the development site.

4.5 Sensitive Receptors

4.5.1 A sensitive receptor is defined as any location which may be affected by changes in air quality as a result of a development. Receptors sensitive to potential dust impacts during earthworks and construction were identified from a desk-top study of the area up to 350m from the development boundary. These are summarised in Table 13.

Table 13 Earthworks and Construction Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Up to 20	10 to 100	0
Up to 50	More than 100	0
Up to 100	More than 100	-
Up to 350	More than 100	-

4.5.2 Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 50m from the road network within 500m of the site access. These are summarised in Table 14. For the purpose of the assessment it was assumed construction phase traffic would access the site from Brunswick Street. This ensured a worst-case assessment.

Table 14 Trackout Dust Sensitive Receptors

Distance from Site Access Route (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Up to 20	More than 100	0

Distance from Site Access Route (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Up to 50	More than 100	0

4.5.3 There are no ecological receptors within 50m of the site or trackout boundary. As such, ecological impacts have not been assessed further within this report.

4.5.4 A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in Table 15.

Table 15 Additional Area Sensitivity Factors

Guidance	Comment
Whether there is any history of dust generating activities in the area	The desk top study did not indicate any dust generating activities in the local area
The likelihood of concurrent dust generating activity on nearby sites	A review of the planning portal indicated an application for the development of a six storey building 18m south-east of the proposed development (Ref: 104931/FO/2014/N2). It is therefore possible that there will be concurrent dust generation in the area should the construction phases of the two developments overlap
Pre-existing screening between the source and the receptors	There is no pre-existing screening between the site and surrounding receptors
Conclusions drawn from analysing local meteorological data which accurately represent the area: and if relevant the season during which works will take place	As shown in Figure 3, the predominant wind bearing at the site is from the south-west. As such, receptors to the north-east of the site are most likely to be affected by dust releases
Conclusions drawn from local topography	There are no significant topographical constraints to dust dispersion
Duration of the potential impact, as a receptor may become more sensitive over time	Currently it is unclear as to the duration of the construction phase. However, it is possible that it will extend over one year
Any known specific receptor sensitivities which go beyond the classifications given in the document.	No specific receptor sensitivities identified during the baseline assessment

4.5.5 Based on the criteria shown in Table 5, the sensitivity of the receiving environment to potential dust impacts was determined as **high**. This was because users would expect to enjoy a reasonable level of amenity, aesthetics or the value of their property could be

diminished by soiling and people would be expected to be present for extended periods of time e.g. residential properties.

- 4.5.6 The sensitivity of the receiving environment to specific potential dust impacts, based on the criteria shown in Section 3.2, is shown in Table 16.

Table 16 Sensitivity of the Surrounding Area

Potential Impact	Sensitivity of the Surrounding Area		
	Earthworks	Construction	Trackout
Dust Soiling	High	High	High
Human Health	Medium	Medium	Medium

5.0 ASSESSMENT

5.1 Introduction

- 5.1.1 There is the potential for air quality impacts as a result of the construction and operation of the proposed development. These are assessed in the following Sections.

5.2 Construction Phase Assessment

Step 1

- 5.2.1 The undertaking of activities such as excavation, ground works, cutting, construction, concrete batching and storage of materials has the potential to result in fugitive dust emissions throughout the construction phase. Vehicle movements both on-site and on the local road network also have the potential to result in the re-suspension of dust from haul road and highway surfaces.
- 5.2.2 The potential for impacts at sensitive locations depends significantly on local meteorology during the undertaking of dust generating activities, with the most significant effects likely to occur during dry and windy conditions.
- 5.2.3 The desk-study undertaken to inform the baseline identified a number of sensitive receptors within 350m of the site boundary. As such, a detailed assessment of potential dust impacts was required.

Step 2

Earthworks

- 5.2.4 Earthworks will primarily involve excavating material, haulage, tipping and stockpiling, as well as site levelling and landscaping. The proposed development site is estimated to cover an area less than 2,500m². In accordance with the criteria outlined in Table 4, the magnitude of potential dust emissions from earthworks is therefore **small**.

5.2.5 Table 16 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 9, the development is considered to be a **low** risk site for dust soiling as a result of earthworks activities.

5.2.6 Table 16 indicates the sensitivity of the area to human health is **medium**. In accordance with the criteria outlined in Table 9, the development is considered to be a **low** risk site for human health as a result of earthwork activities.

Construction

5.2.7 Due to the size of the development and the nature of the proposals, the total building volume is likely to be less than 25,000m³. In accordance with the criteria outlined in Table 4, the magnitude of potential dust emissions from construction is therefore **small**.

5.2.8 Table 16 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 9, the development is considered to be a **low** risk site for dust soiling as a result of construction activities.

5.2.9 Table 16 indicates the sensitivity of the area to human health is **medium**. In accordance with the criteria outlined in Table 9, the development is considered to be a **low** risk site for human health as a result of construction activities.

Trackout

5.2.10 Information on the number of HDV trips to be generated during the construction phase of the development was not available at the time of assessment. Similarly, the surface material and unpaved road length was not known at this stage of the project.

5.2.11 Based on the site area and the access route comprising all tarmacked surfaces, it is anticipated that the unpaved road length will be less than 50m. In accordance with the criteria outlined in Table 4, the magnitude of potential dust emissions from trackout is therefore **small**.

5.2.12 Table 16 indicates the sensitivity of the area to dust soiling effects to people and property is **high**. In accordance with the criteria outlined in Table 10, the development is considered to be a **low** risk site for dust soiling as a result of trackout activities.

5.2.13 Table 16 indicates the sensitivity of the area to human health is **medium**. In accordance with the criteria outlined in Table 10, the development is considered to be a **negligible** risk site for human health as a result of trackout activities.

Summary of the Risk of Dust Effects

5.2.14 A summary of the risk from each dust generating activity is provided in Table 17.

Table 17 Summary of Potential Unmitigated Dust Risks

Potential Impact	Risk		
	Earthworks	Construction	Trackout
Dust Soiling	Low	Low	Low
Human Health	Low	Low	Negligible

5.2.15 As indicated in Table 17, the potential risk of dust soiling is **low** from construction, earthworks and trackout. The potential risk of human health effects is **low** from earthworks and construction and **negligible** from trackout.

5.2.16 It should be noted that the potential for impacts depends significantly on the distance between the dust generating activity and receptor location. Risk was predicted based on a worst-case scenario of works being undertaken at the site boundary closest to each sensitive area. Therefore, actual risk is likely to be lower than that predicted during the majority of the construction phase.

Step 3

5.2.17 The IAQM guidance¹⁶ provides potential mitigation measures to reduce impacts as a result of fugitive dust emissions during the construction phase. These have been adapted for the development site as summarised in Table 18. These may be reviewed prior to the commencement of construction works and incorporated into a Construction Environmental Management Plan if required by the LA.

¹⁶ Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

Table 18 Fugitive Dust Emission Mitigation Measures

Issue	Control Measure
Communications	• Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager • Display the head or regional office contact information • Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the LA
Site management	• Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken • Make the complaints log available to the LA upon request • Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book
Monitoring	• Undertake daily on-site and off-site inspection to monitor dust, record inspection results, and make the log available to the LA upon request • Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the LA upon request • Increase the frequency of site inspections when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions
Site preparation	• Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible • Fully enclose site or specific operations where there is a high potential for dust production and they are active for an extensive period • Avoid site runoff of water or mud • Keep site fencing, barriers and scaffolding clean using wet methods • Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used • Cover, seed or fence stockpiles to prevent wind whipping
Operating vehicle/machinery and sustainable travel	• Ensure all vehicles switch off engines when stationary - no idling vehicles • Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable • Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas

Issue	Control Measure
Operations	• Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques • Ensure an adequate water supply on the site for effective dust suppression, using non-potable water where possible and appropriate • Use enclosed chutes and conveyors and covered skips • Minimise drop heights and use fine water sprays wherever appropriate • Ensure equipment is available to clean any dry spillages, and clean up spillages as soon as reasonably practicable using wet cleaning methods
Waste management	• No bonfires or burning of waste materials
Construction	• Avoid scabbling (roughening of concrete surfaces) if possible • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out
Trackout	• Use water-assisted dust sweeper on access and local roads, if required • Avoid dry sweeping of large areas • Ensure vehicles entering and leaving site are covered to prevent escape of materials • Implement a wheel washing system, if required

Step 4

5.2.18 Assuming the relevant mitigation measures outlined in Table 18 are implemented, the residual impacts from all dust generating activities is predicted to be **not significant**, in accordance with IAQM guidance¹⁷.

5.3 Operational Phase Assessment

Potential Development Impacts

5.3.1 Any additional vehicle movements associated with the development will generate exhaust emissions on the local and regional road networks. Anticipated trip generation from the scheme was not available at the time of the assessment. However, the proposals only include 16 units and no parking spaces. As such, it is unlikely that the development will result in significant traffic generation on the local road network.

¹⁷ Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2017.

5.3.2 Based on the provided information, the proposals are not anticipated to result in an increase in AADT flows of more than 1,000, produce over 200 HDV movements per day or significantly affect average speeds on the local road network. Additionally, the development is not considered likely to result in an increase of LDV flows of more than 100 AADT on any individual road link, include significant highway realignment or the introduction of a junction and there will not be a requirement for more than 25 HDV deliveries per day. As such, potential air quality impacts associated with operational phase road vehicle exhaust emissions are predicted to be **negligible**, in accordance with the DMRB¹⁸ and IAQM¹⁹ screening criteria shown in Section 4.3.

Potential Future Exposure

5.3.3 The proposed development has the potential to cause the exposure of future users to elevated pollution levels. Dispersion modelling was therefore undertaken with the inputs described in Appendix 1 to quantify air quality conditions at the site. Reference should be made to Figures 4, 5 and 6 for graphical representations of the results.

5.3.4 As shown in Figure 4, annual mean NO₂ concentrations were predicted to be below the AQO of 40µg/m³ at all locations across the site. The maximum level at the boundary was 32.72µg/m³. As such, future residents are not predicted to be exposed to NO₂ concentrations above the AQO.

5.3.5 As shown in Figure 5, annual mean PM₁₀ concentrations were predicted to be below the AQO of 40µg/m³ at all locations across the site. The maximum level at the boundary was 18.27µg/m³. As such, future residents are not predicted to be exposed to PM₁₀ concentrations above the AQO.

5.3.6 As shown in Figure 6, annual mean PM_{2.5} concentrations were predicted to be below the AQTV of 25µg/m³ at all locations across the site. The maximum level at the boundary was 12.69µg/m³. As such, future residents are not predicted to be exposed to PM_{2.5} concentrations above the AQTV.

¹⁸ DMRB Volume 11, Section 3, Part 1, HA207/07, Highways Agency, 2007.

¹⁹ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

- 5.3.7 It should be noted that pollutant levels decrease with distance from pollutant sources, such as roads. As annual mean NO₂, PM₁₀ and PM_{2.5} concentrations were predicted to be below the relevant AQOs and AQTV at ground level, further assessment above this height was not considered necessary.

Mitigation

- 5.3.8 There are a number of mitigation options available to reduce or off-set potential air quality impacts. However, all techniques have financial implications and may therefore affect scheme viability. As such, they should only be included if necessary.
- 5.3.9 As air quality impacts associated with the development were predicted to be **negligible** and exposure of future occupants to exceedences of the AQOs and AQTV was not predicted, further mitigation to control effects is not considered necessary. However, a number of additional measures have been included within the development in accordance with the requirements of the IAQM document 'Land-Use Planning & Development Control: Planning for Air Quality'²⁰ to encourage the use of sustainable transport modes, manage vehicle flow and reduce pollution around the site. Table 19 describes the good practice principles detailed in the IAQM guidance along with how each has been addressed with regards to the proposals.

²⁰ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

Table 19 Good Practice Design Principles

Phase	Principle	Action
Design Phase	New developments should not contravene the Council's Air Quality Action Plan, or render any of the measures unworkable	The Greater Manchester Air Quality Action Plan²¹ (GMAQAP) highlights key actions to be taken to improve air quality both across Greater Manchester. The GMAQAP includes the following actions which relate specifically to the development: • Promotion of public transport; • Reduction of road traffic emissions; • Encouraging active transport; and, • Production of travel plans by relevant parties. A full Travel Plan has been produced, which highlights that the site is located in an area with excellent public transport, walking and cycling infrastructure. Provision of parking spaces is not included within the proposals, which will discourage private vehicle ownership Cycle storage has been included in the development plans, allowing safe storage of 16 bicycles. This will encourage active transport Based on the above, it is considered that the development will act in support of the actions highlighted in the GMAQAP
	Wherever possible, new developments should not create a new "street canyon", or a building configuration that inhibits effective pollution dispersion	The development will not lead to the generation of a new street canyon due to the relatively open nature of the area north-east and south-east of the site along Brunswick Street
	Delivering sustainable development should be the key theme of any application	The proposals have been designed to encourage sustainable behaviours, such as active and public transport, due to its accessible location by non transport modes and lack of car parking on site
	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 or chimney stacks	Predicted pollutant concentrations across the site were predicted to be below the relevant AQOs and AQTV. As such, exposure of future residents to poor air quality is considered unlikely

21

GMAQAP, MCC, 2004.

Phase	Principle	Action
Operational Phase	The provision of at least 1 Electric Vehicle (EV) "rapid charge" point per 10 residential dwellings and/or 1,000m ² of commercial floor space. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made	As the development does not include any car parking, EV charging points are not considered necessary
	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	A full Travel Plan has been produced in support of the development
	All gas-fired boilers to meet a minimum standard of <40mgNO_x/kWh. All gas-fired CHP plant to meet a minimum emissions standard of: • Spark ignition engine: 250mgNO_x/Nm³; • Compression ignition engine: 400mgNO_x/Nm³; • Gas turbine: 50mgNO_x/Nm³. A presumption should be to use natural gas-fired installations. Where biomass is proposed within an urban area it is to meet minimum emissions standards of: • Solid biomass boiler: 275mgNO_x/Nm³ and 25mgPM/Nm³	Any boilers to be included in the development will be provisioned in accordance with the relevant requirements

5.3.10 It is considered the above methods would further reduce potential impacts associated with the proposals. Specific mitigation suited to the development may be stipulated as a planning condition if deemed necessary by the LA.

6.0 CONCLUSION

- 6.1.1 Redmore Environmental Ltd was commissioned by Brunswick Living Limited to undertake an Air Quality Assessment in support of a planning application for a residential development on land off Brunswick Street, Manchester.
- 6.1.2 The proposals have the potential to cause air quality impacts as a result of fugitive dust emissions during construction and road traffic exhaust emissions associated with vehicles travelling to and from the site during operation, as well as expose future occupants to any existing air quality issues. As such, an Air Quality Assessment was required in order to determine baseline conditions and assess potential effects as a result of the scheme.
- 6.1.3 During the construction phase of the development there is the potential for air quality impacts as a result of fugitive dust emissions from the site. These were assessed in accordance with the IAQM methodology. Assuming good practice dust control measures are implemented, the residual significance of potential air quality impacts from dust generated by earthworks, construction and trackout activities was predicted to be **not significant**.
- 6.1.4 Potential impacts during the operational phase of the proposed development may occur due to road traffic exhaust emissions associated with vehicles travelling to and from the site. These were assessed against the screening criteria provided within the DMRB²² and IAQM²³ guidance documents. Due to the low anticipated trip generation associated with the proposals, road traffic impacts were predicted to be **negligible**.
- 6.1.5 The proposed development has the potential to expose future occupants to elevated pollution levels. Dispersion modelling was therefore undertaken using ADMS-Roads in order to predict concentrations as a result of emissions from the local highway network. Results were subsequently verified using monitoring data collected by MCC.
- 6.1.6 The results of the dispersion modelling assessment indicated that the predicted annual mean NO₂, PM₁₀ and PM_{2.5} concentrations were below the relevant AQOs and AQTV

²² DMRB Volume 11, Section 3, Part 1, HA207/07, Highways Agency, 2007.

²³ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

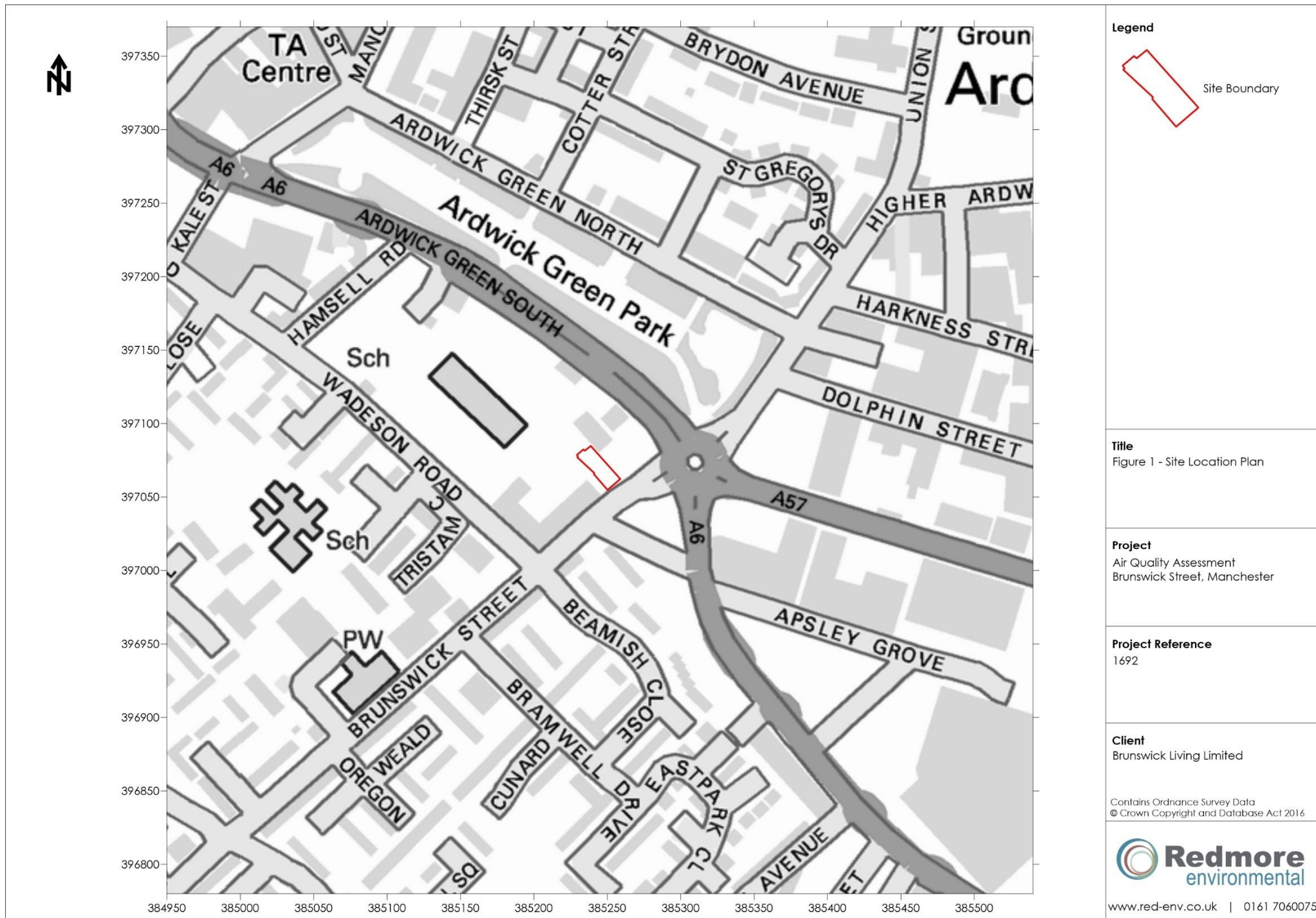
across the development site. The site is therefore considered suitable for residential use from an air quality perspective.

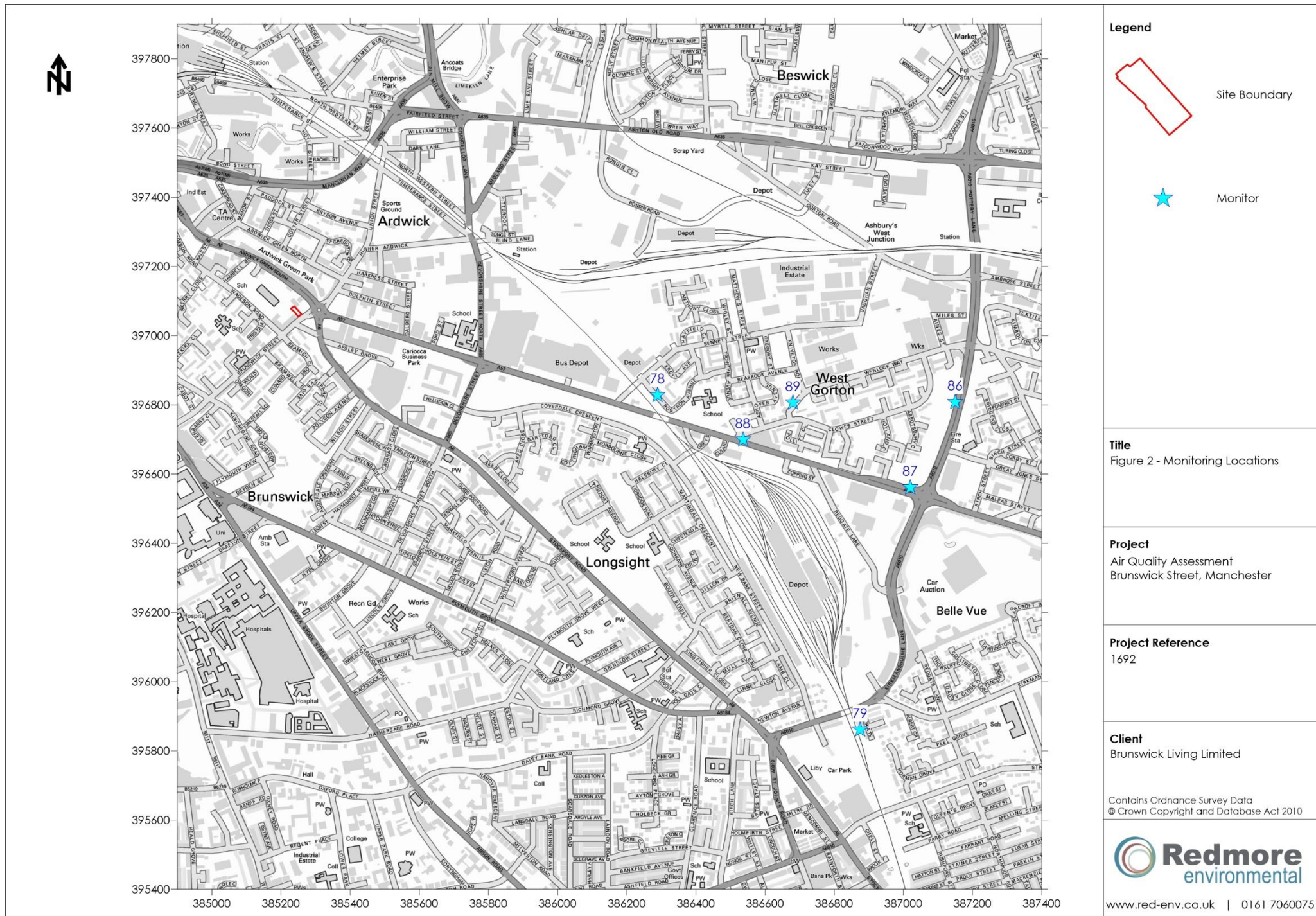
- 6.1.7 Based on the assessment results, air quality issues are not considered a constraint to planning consent for the development.

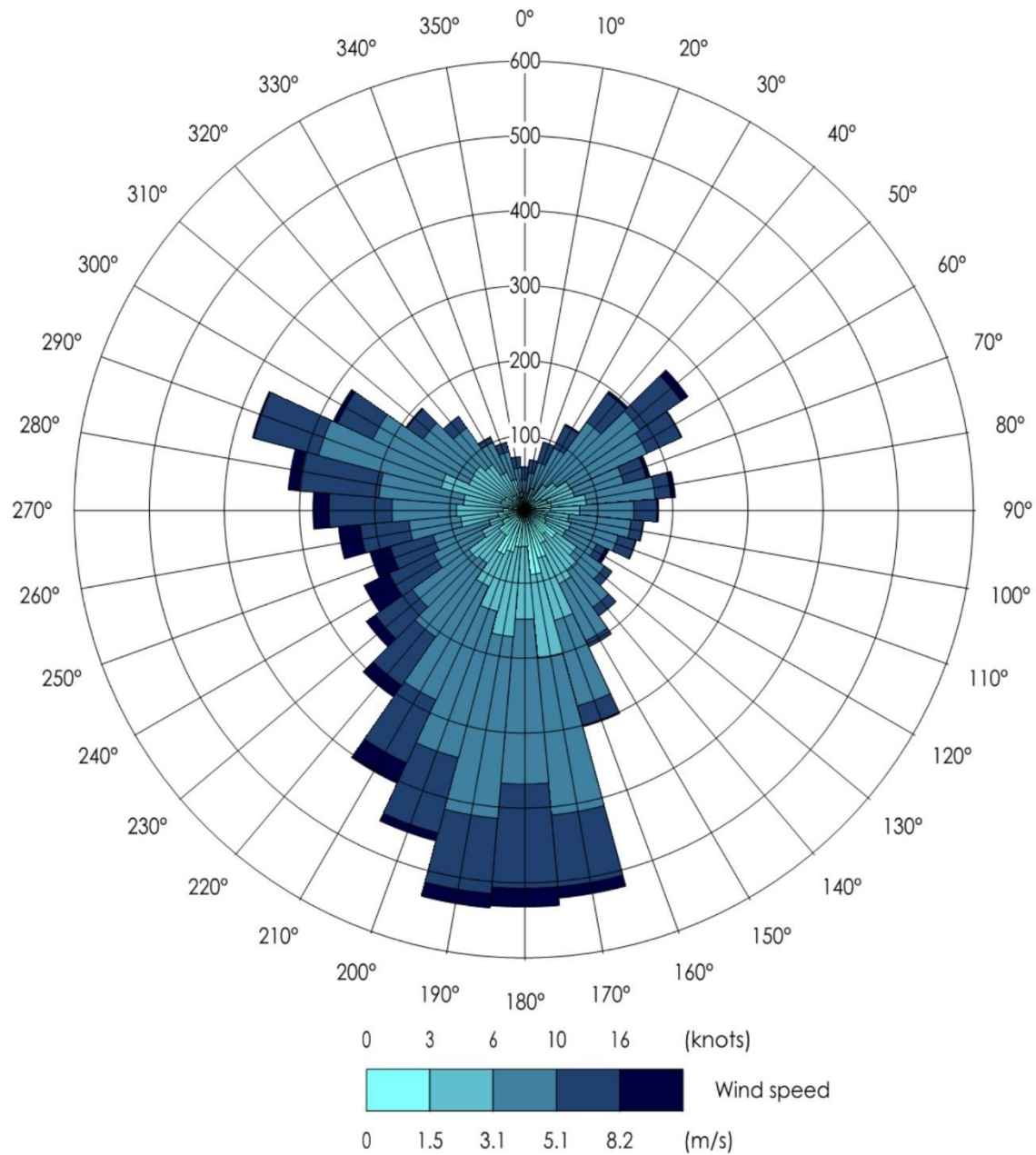
7.0 **ABBREVIATIONS**

AADT	Annual Average Daily Traffic
ADM	Atmospheric Dispersion Modelling
AQAP	Air Quality Action Plan
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
AQTV	Air Quality Target Value
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
DMP	Dust Management Plan
DMRB	Design Manual for Roads and Bridges
EB	Eastbound
EU	European Union
EV	Electric Vehicle
GMAQAP	Greater Manchester Air Quality Action Plan
GMCA	Greater Manchester Combined Authority
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
MCC	Manchester City Council
NB	Northbound
NGR	National Grid Reference
NPPF	National Planning Policy Framework
NPPG	National Planning Policy Guidance
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
PM ₁₀	Particulate Matter with an aerodynamic diameter of less than 10µm
PM _{2.5}	Particulate Matter with an aerodynamic diameter of less than 2.5µm
SB	Southbound
WB	Westbound
Z ₀	Roughness length

Figures







Legend

Title

Figure 3 - Wind Rose of 2016
Manchester Airport
Meteorological Data

Project

Air Quality Assessment
Brunswick Street, Manchester

Project Reference

1692

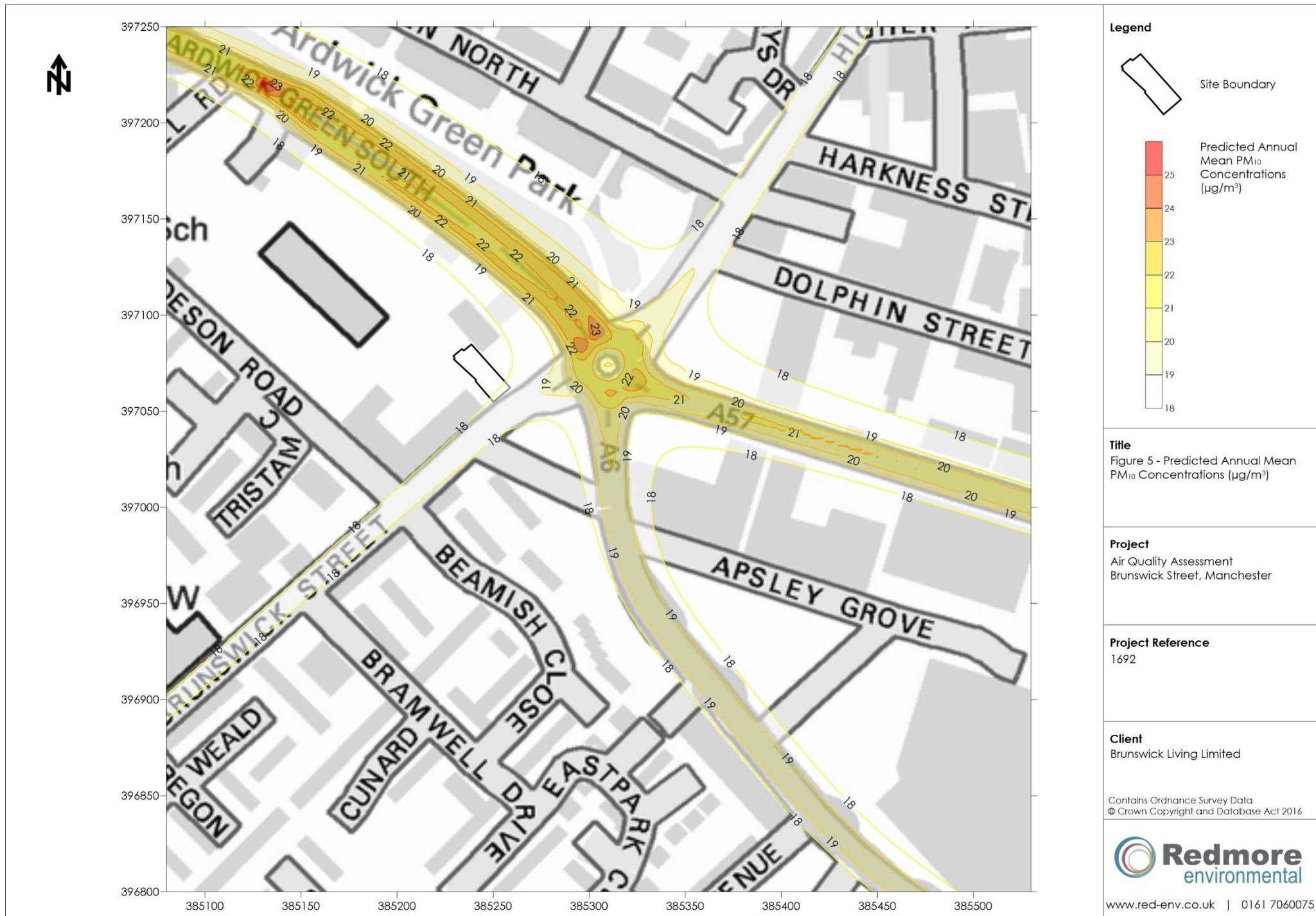
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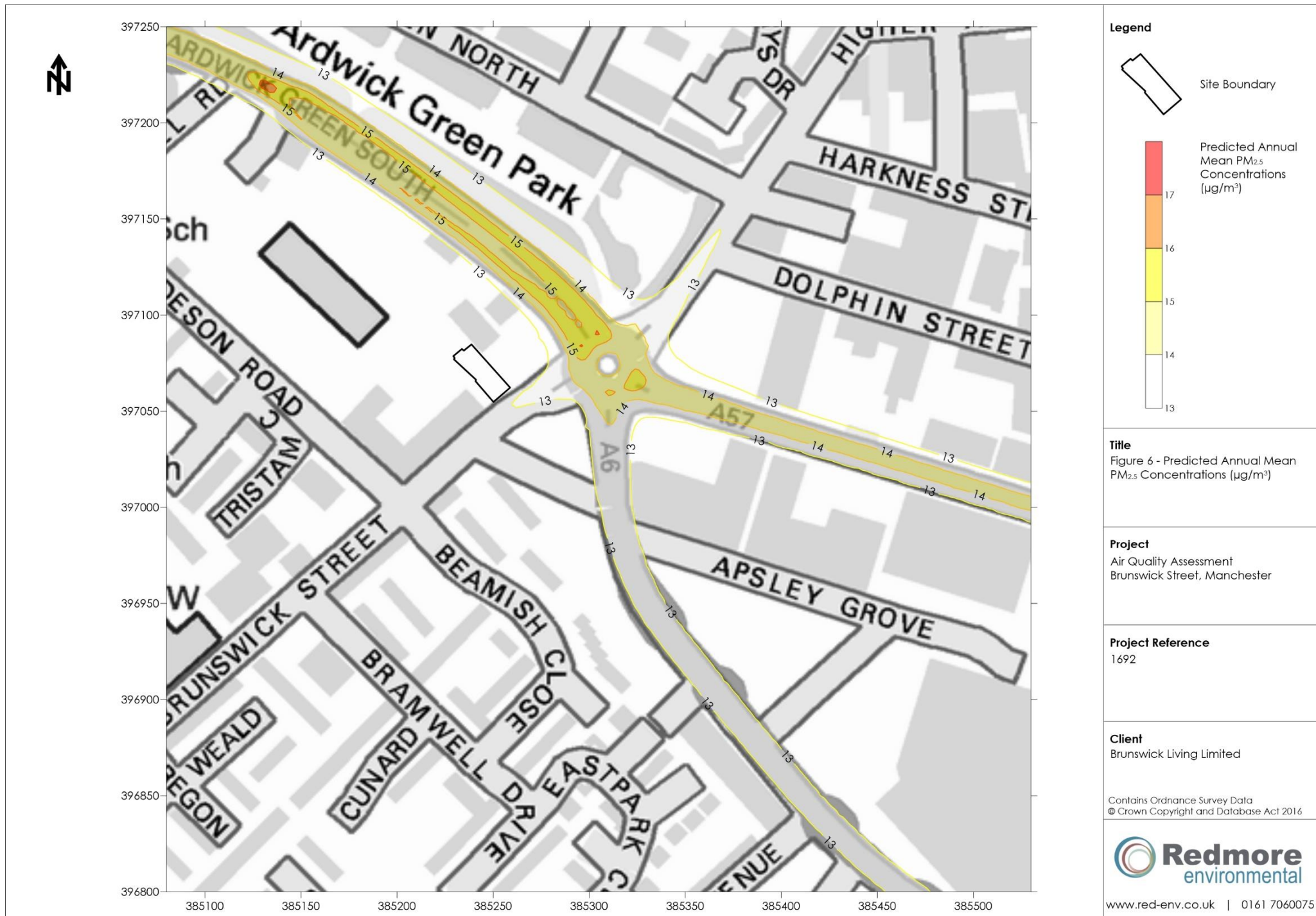
Brunswick Living Limited

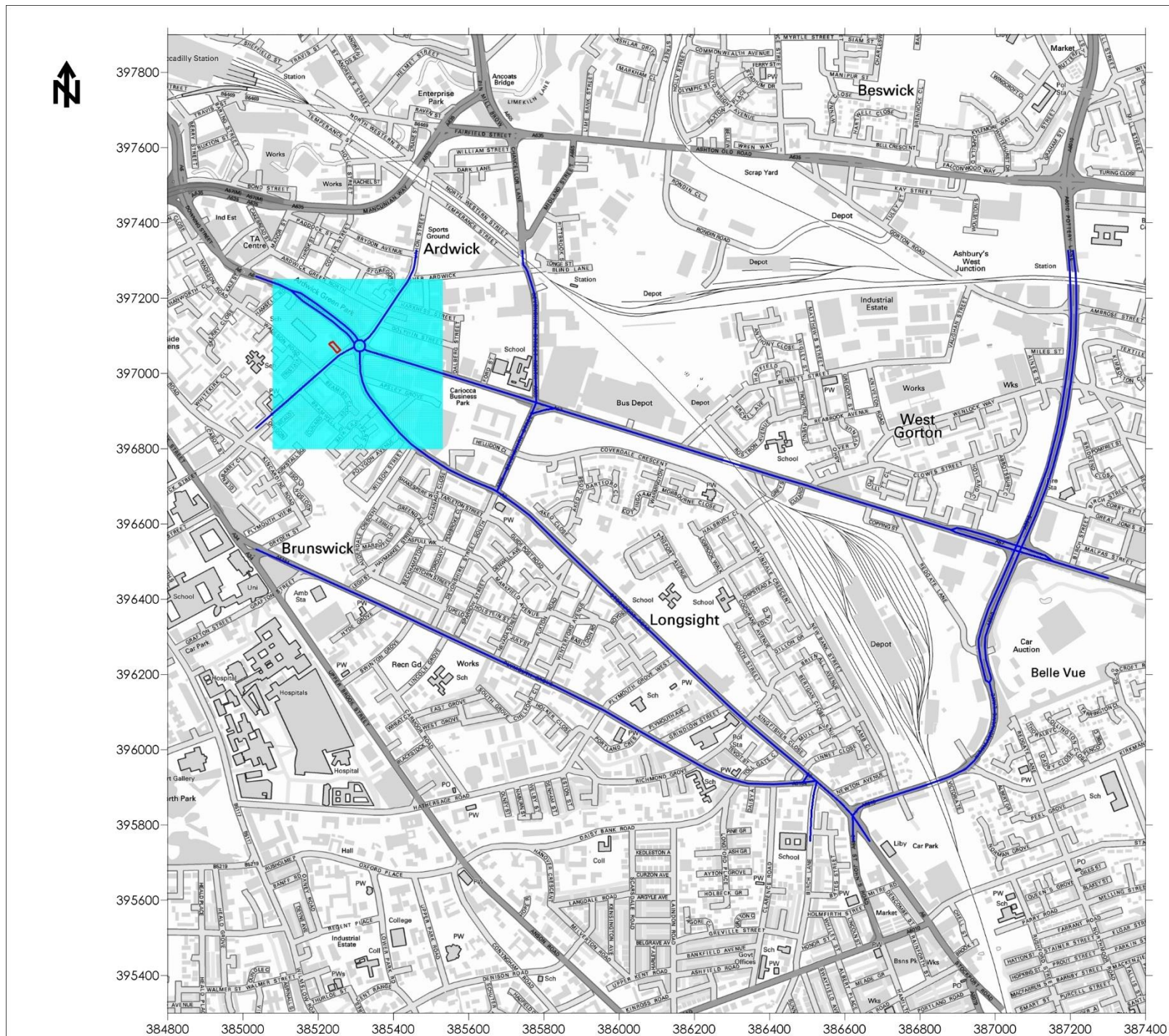


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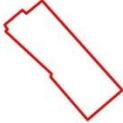








Legend

-  Site Boundary
-  Output Grid
-  Road Link

Title

Figure 7 - ADMS-Roads Inputs

Project

Air Quality Assessment
Brunswick Street, Manchester

Project Reference

1692

Client

Brunswick Living Limited

Contains Ordnance Survey Data
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Appendix 1 - Assessment Input Data

Introduction

The proposed development has the potential to expose future residents to elevated pollution levels. In order to assess NO₂, PM₁₀ and PM_{2.5} concentrations across the site, dispersion modelling was undertaken in accordance with the following methodology. Modelling was undertaken for 2016 to allow verification against recent monitoring results and 2019 to represent likely conditions in the opening year of the development.

Dispersion Model

Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 4.1.1.0). ADMS-Roads is developed by Cambridge Environmental Research Consultants (CERC) and is routinely used throughout the world for the prediction of pollutant dispersion from road sources. Modelling predictions from this software package are accepted within the UK by the Environment Agency and DEFRA.

The model requires input data that details the following parameters:

- Traffic flow data;
- Vehicle emission factors;
- Spatial co-ordinates of emissions;
- Street width;
- Meteorological data;
- Roughness length (z_0); and,
- Monin-Obukhov length.

These are detailed in the following Sections.

Assessment Area

The assessment area was defined based on the development location and roads likely to impact pollutant levels across the site. Ambient concentrations were predicted over NGR: 385080, 396800 to 385530, 397250. One Cartesian grid was used within the model to produce data suitable for contour plotting using the Surfer software package.

It should be noted that although the grid only covered the proposed site, source geometries were extended in order to ensure the impact of all relevant emissions in the vicinity of the development were considered.

Reference should be made to Figure 7 for a graphical representation of the assessment grid extents.

Traffic Flow Data

Traffic data for use in the assessment, including 24-hour AADT flows and fleet composition as HDV proportion, was obtained from the Department for Transport (DfT)²⁴. The DfT web tool enables the user to view and download traffic flows on every link of the 'A' road and motorway network in Great Britain for the years 1999 to 2016. It should be noted that the DfT web tool is referenced in DEFRA guidance²⁵ as being a suitable source of data for air quality assessments and it is therefore considered to provide a reasonable estimate of traffic flows in the vicinity of the site.

Traffic data for Birch Lane and Brunswick Street, small unclassified roads, was not available from the DfT web tool. As such, information for these links was obtained from the UK Traffic Data Website²⁶ for Daisy Bank Road and Higher Ardwick Street, respectively. These were considered suitable substitutes as they are both small unclassified roads in south Manchester.

The baseline traffic data was converted to the site opening year utilising factors obtained from TEMPro (version 7.0). This software package has been developed by the DfT to calculate future traffic growth throughout the UK.

Road widths were estimated from aerial photography and UK highway design standards. A summary of the traffic data used in the assessment is provided in Table A1.1.

²⁴ <http://www.dft.gov.uk/traffic-counts/>.

²⁵ Local Air Quality Management (TG16), DEFRA, 2016.

²⁶ <http://www.uktrafficdata.info/>.

Table A1.1 Traffic Data

Link		24-hour AADT Flow		HDV Prop. of Fleet (%)	Road Width (m)	Average Vehicle Speed (km/h)
		2016	2019			
L1	Plymouth Grove	9,767	10,334	2.18	7.7	45
L2	Plymouth Grove between Hayley Street and approach to A6 junction	9,767	10,334	2.18	8.2	25
L3	Plymouth Grove approach to A6 junction	7,325	7,751	2.18	7.3	20
L4	Plymouth Grove exit from A6 junction	2,442	2,584	2.18	5.0	20
L5	Stockport Road between Devonshire Street and approach to Plymouth Grove junction	18,533	19,610	7.66	12.5	45
L6	Stockport Road at Plymouth Grove junction	18,533	19,610	7.66	13.1	20
L7	Stockport Road between Plymouth Grove junction and Kirkmanshulme Lane	23,247	24,598	4.40	14.8	20
L8	Stockport Road south of Kirkmanshulme Lane junction	19,791	20,941	4.78	16.1	40
L9	St John's Road south of Kirkmanshulme Lane junction	10,322	10,922	1.92	11.6	40
L10	Birch Lane approach to Plymouth Grove junction	3,587	4,181	1.63	11.1	20
L11	Birch Lane south of Plymouth Grove junction	3,587	4,181	1.63	8.7	40
L12	Kirkmanshulme Lane approach to A6 junction	18,416	19,486	3.23	20.3	20
L13	Kirkmanshulme Lane between approach to A6 junction and wide section	18,416	19,486	3.23	7.1	45
L14	Kirkmanshulme Lane northbound (NB) between wide section and approach to Hyde Road junction	9,208	9,743	6.46	7.5	45
L15	Kirkmanshulme Lane NB approach to Hyde Road junction	9,208	9,743	6.46	11.4	25
L16	Kirkmanshulme Lane southbound (SB) between wide section and approach to Hyde Road junction	9,208	9,743	6.46	7.3	45
L17	Kirkmanshulme Lane SB exit from Hyde Road junction	9,208	9,743	6.46	8.7	25
L18	A6010 NB exit from Hyde Road junction	13,953	14,764	7.22	9.3	25
L19	A6010 NB north of approach to Hyde Road junction	13,953	14,764	7.22	7.0	45

Link		24-hour AADT Flow		HDV Prop. of Fleet (%)	Road Width (m)	Average Vehicle Speed (km/h)
		2016	2019			
L20	A6010 SB approach to Hyde Road junction	13,953	14,764	7.22	9.5	25
L21	A6010 SB north of Hyde Road junction	13,953	14,764	7.22	6.1	45
L22	Hyde Road between Culand Street and approach to Devonshire Street junction	18,408	19,478	5.48	10.5	45
L23	Hyde Road between Culand Street and Clowes Street	18,408	19,478	5.48	10.7	40
L24	Hyde Road between Clowes Street and Copping Street	18,408	19,478	5.48	10.7	45
L25	Hyde Road between Copping Street and approach to Kirkmanshulme junction	18,408	19,478	5.48	14.2	45
L26	Hyde Road eastbound (EB) approach to Kirkmanshulme junction	9,204	9,739	10.96	12.9	25
L27	Hyde Road EB exit from Kirkmanshulme junction	12,223	12,933	11.55	6.9	25
L28	Hyde Road east of Kirkmanshulme junction	24,446	25,866	5.78	10.5	45
L29	Hyde Road westbound (WB) exit from Kirkmanshulme junction	9,204	9,739	10.96	7.1	25
L30	Hyde Road WB approach to Kirkmanshulme junction	12,223	12,933	11.55	12.2	25
L31	Stockport Road between Devonshire Road and approach to A6 Roundabout	12,739	13,479	8.56	12.0	45
L32	Stockport Road approach to A6 Roundabout	12,739	13,479	8.56	14.5	25
L33	Brunswick Street west of approach to A6 Roundabout	6,321	7,366	3.12	9.3	45
L34	Brunswick Street approach to A6 Roundabout	6,321	7,366	3.12	13.2	25
L35	Ardwick Green South NB between exit from A6 Roundabout and Hamsell Road	13,017	13,773	15.67	5.8	45
L36	Ardwick Green South NB exit from A6 Roundabout	13,017	13,773	15.67	7.5	25
L37	Ardwick Green South SB between approach to A6 Roundabout and Hamsell Road	13,017	13,773	15.67	5.8	45
L38	Ardwick Green South SB approach to A6 Roundabout	13,017	13,773	15.67	7.5	25
L39	Union Street north of approach to A6 Roundabout	6,321	7,366	3.12	9.6	45

Link		24-hour AADT Flow		HDV Prop. of Fleet (%)	Road Width (m)	Average Vehicle Speed (km/h)
		2016	2019			
L40	Union Street approach to A6 Roundabout	6,321	7,366	3.12	12.9	25
L41	Hyde Road approach to A6 Roundabout	16,953	17,938	9.20	14.2	25
L42	Hyde Road between approach to A6 Roundabout and approach to Devonshire Street from west	16,953	17,938	9.20	10.2	45
L43	Hyde Road approach to Devonshire Street junction from east	13,806	14,608	7.31	16.5	25
L44	Devonshire Street	17,380	18,390	3.74	9.5	45
L45	Slip Road between Hyde Street and Devonshire Street	4,602	4,869	21.93	5.5	25
L46	Devonshire Street North	17,604	18,627	5.45	6.7	45
L47	Ardwick Green South north of Hamsell Road	26,034	27,547	7.84	15.3	45
R1	A6 Roundabout	11,126	12,043	10.85	10.1	30

Reference should be made to Figure 7 for a graphical representation of the road link locations.

Emission Factors

Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 7.0). This has been produced by DEFRA and incorporates updated COPERT4v11 vehicle emission factors and fleet information.

There is current uncertainty over NO₂ concentrations within the UK, with the implementation of new vehicle emission standards not resulting in the previously expected reduction in roadside levels. Therefore, 2016 emission factors were utilised in preference to the development opening year in order to provide robust model outputs. As predictions for 2016 were verified, it is considered the results are a robust indication of worst case concentrations for the future year.

Meteorological Data

Meteorological data used in the assessment was taken from Manchester Airport meteorological station over the period 1st January 2016 to 31st December 2016 (inclusive). Manchester Airport is located at NGR: 381792, 384116, which is approximately 13.4km south-west of the development.

It is anticipated that conditions would be reasonably similar over a distance of this magnitude. The data was therefore considered suitable for an assessment of this nature.

All meteorological records used in the assessment were provided by Atmospheric Dispersion Modelling (ADM) Ltd, which is an established distributor of data within the UK. Reference should be made to Figure 3 for a wind rose of utilised meteorological data.

Roughness Length

A z_0 of 0.5m was used to describe the modelling extents. This value of z_0 is considered appropriate for the morphology of the area and is suggested within ADMS-Roads as being suitable for 'parkland, open suburbia'.

A z_0 of 0.2m was used to describe the meteorological site. This value of z_0 is considered appropriate for the morphology of the area due to the large expanse of flat land use, such as runways and surrounding grassland, and is suggested within ADMS-Roads as being suitable for 'agricultural areas (min)'.

Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 30m was used to describe the modelling extents and meteorological site. This value is considered appropriate for the nature of the area and is suggested within ADMS-Roads as being suitable for 'cities and large towns'.

Background Concentrations

Background concentrations provided by DEFRA for the grid square containing the site, as shown in Table 12, were used in the assessment to represent annual mean NO₂ levels across the modelling extents.

In order to avoid 'double-counting' of road vehicle exhaust emissions, the proportion of the relevant background concentrations from primary A roads and minor roads within the grid square was removed in accordance with the methodology outlined in DEFRA guidance²⁷. These

²⁷ Local Air Quality Management (TG16), DEFRA, 2016.

sectors were considered to be most representative of those being modelled within ADMS-Roads. Background concentrations before and after adjustment are shown in Table A1.2.

Table A1.2 Background NO₂ Concentrations - Modelling Extents

Pollutant	Predicted Background Concentration (µg/m ³)	
	Total Predicted 2016 Background	Predicted Background with Sectors Removed
NO ₂	28.64	24.29

The background PM₁₀ and PM_{2.5} concentrations shown in Table 12 were utilised throughout the assessment.

Similarly to emission factors, background concentrations from 2016 were utilised in preference to the development opening year. This provided a robust assessment and is likely to overestimate pollutant concentrations during the operation of the proposal.

NO_x to NO₂ Conversion

Predicted annual mean NO_x concentrations were converted to NO₂ concentrations using the spreadsheet (version 5.1) provided by DEFRA, which is the method detailed within DEFRA guidance²⁸.

Verification

The predicted results from a dispersion model may differ from measured concentrations for a large number of reasons, including:

- Estimates of background concentrations;
- Uncertainties in source activity data such as traffic flows and emission factors;
- Variations in meteorological conditions;
- Overall model limitations; and,
- Uncertainties associated with monitoring data, including locations.

²⁸ Local Air Quality Management (TG16), DEFRA, 2016.

Model verification is the process by which these and other uncertainties are investigated and where possible minimised. In reality, the differences between modelled and monitored results are likely to be a combination of all of these aspects.

For the purpose of the assessment, model verification was undertaken for 2016 using traffic data, meteorological data and monitoring results from this year.

MCC undertook monitoring of NO₂ concentrations at six locations within the modelling extents during 2016. Review of these positions identified that the 79 - Victoria Terrace, 89 - Wenlock Way and 78 - Rostron Avenue diffusion tubes were located a considerable distance from roads included within the model. As such, they were removed from the verification process in order to prevent underestimation of pollutant emissions. Results from the remaining monitors were obtained and the road contributions to total NO_x concentrations calculated following the methodology contained within DEFRA guidance²⁹. The monitored annual mean NO₂ concentrations and calculated road NO_x concentrations are summarised in Table A1.3.

Table A1.3 Verification - Monitoring Results

Monitoring Location		Monitored NO ₂ Concentration (µg/m ³)	Calculated Road NO _x Concentration (µg/m ³)
86	A6010 Pottery Lane	35.82	24.31
87	A57 Hyde Road	35.99	24.69
88	A57 Hyde Road and Clowes Street junction	44.35	44.37

The annual mean road NO_x concentrations predicted from the dispersion model and the 2016 road NO_x concentrations calculated from the monitoring results are summarised in Table A1.4.

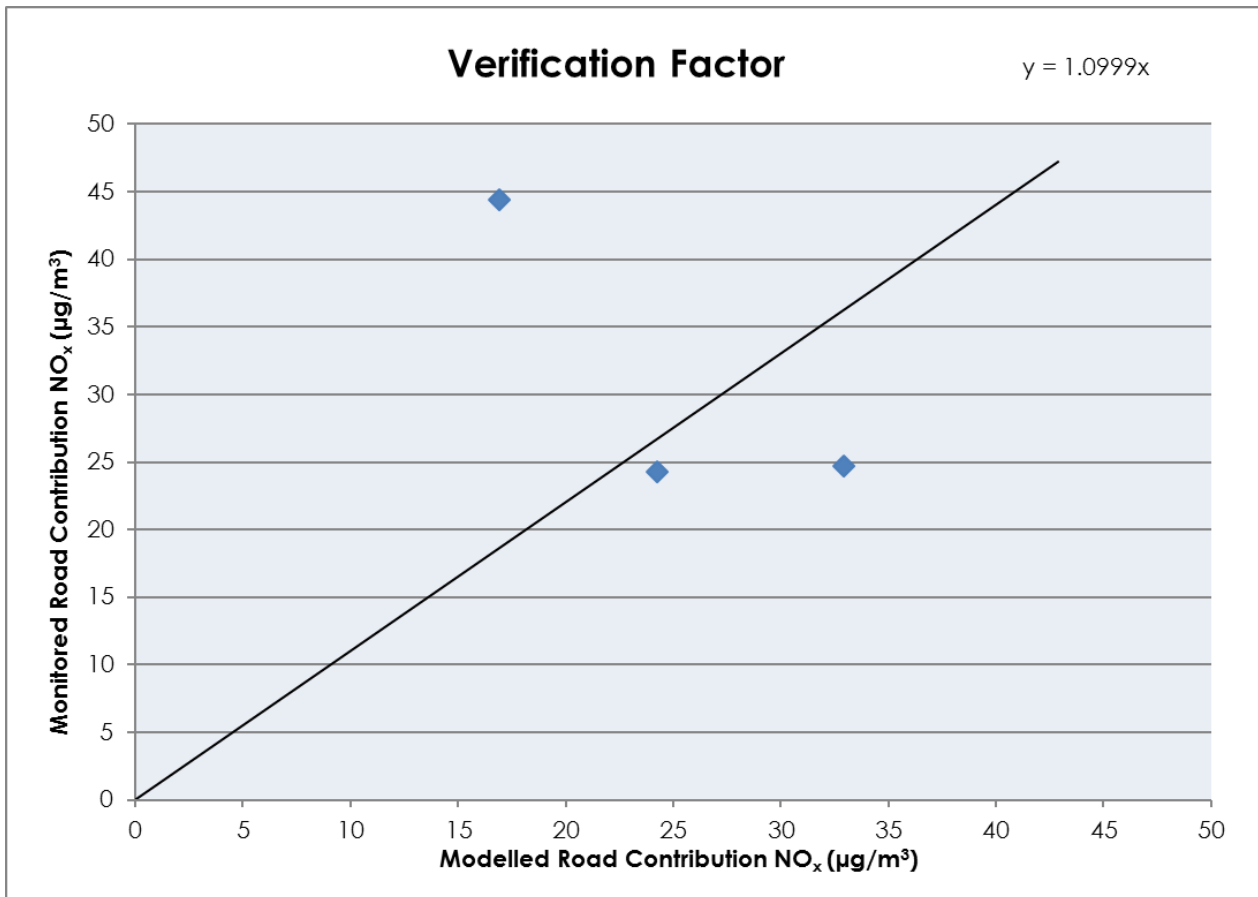
Table A1.4 Verification - Modelling Results

Monitoring Location		Calculated Road NO _x Concentration (µg/m ³)	Modelled Road NO _x Concentration (µg/m ³)
86	A6010 Pottery Lane	24.31	24.26
87	A57 Hyde Road	24.69	32.90
88	A57 Hyde Road and Clowes Street junction	44.37	16.92

²⁹ Local Air Quality Management (TG16), DEFRA, 2016.

The monitored and modelled road NO_x concentrations were graphed and the equation of the trendline based on linear progression through zero calculated. This indicated that a verification factor of 1.0999 was required to be applied to all road NO_x modelling results, as shown in Graph 1.

Graph 1 - Verification Factor



Monitoring of PM₁₀ and PM_{2.5} concentrations is not undertaken within the assessment extents. The NO_x verification factor was therefore used to adjust PM₁₀ and PM_{2.5} model predictions in lieu of more accurate data in accordance with DEFRA guidance³⁰.

³⁰ Local Air Quality Management (TG16), DEFRA, 2016.

Appendix 2 - Curricula Vitae

KEY EXPERIENCE:

Jethro is a Chartered Environmentalist and Director of Redmore Environmental with specialist experience in the air quality and odour sectors. His key capabilities include:

- Production and management of Air Quality, Dust and Odour Assessments for a wide-range of clients from the retail, residential, infrastructure, commercial and industrial sectors.
- Production and co-ordination of Environmental Permit applications for a variety of industrial sectors.
- Detailed dispersion modelling of road vehicle and industrial emissions using ADMS-Roads, ADMS-5, AERMOD-PRIME and BREEZE-ROADS. Studies have included impact assessment of ground level pollutant and odour concentrations and assessment of suitability of development sites for proposed end-use.
- Project management and co-ordination of Environmental Impact Assessments and scoping reports for developments throughout the UK.
- Provision of expert witness services at Planning Inquiries.
- Design and project management of pollutant monitoring campaigns.
- Co-ordination and management of large-scale multi-disciplinary projects and submissions.
- Provision of expert advice to local government and international environmental bodies, as well as involvement in production of industry guidance.

SELECT PROJECTS SUMMARY:

Industrial

Shanks Waste Management - Odour Assessments of two waste management facilities to support Environmental Permit Applications.

Tatweer Petroleum - dispersion modelling of Bahrain oil field.

Doha South Sewage Treatment Works - AQA for works extension in Qatar.

IRIS Environmental Appraisal Report Reviews, Isle of Man Government - odour assessment reviews.

Lankem, Greater Manchester - Environmental Permit Application for chemical manufacturing plant.

Newport Docks Bulk Drying, Pelleting and CHP Facility - air quality EIA for gas CHP.

Springshades, Leicester - Environmental Permit Variation Application for textile manufacturing plant.

Valspar, Chester - Odour Assessment and production of Odour Management Plan for a paint manufacturing plant in response to neighbour complaints.

Agrivert - dispersion modelling of odour and CHP emissions from numerous AD plants.

James Cropper Paper Mill, Cumbria - air quality EIA, Environmental Permit Variation and Human Health Risk Assessment for new biomass boiler adjacent to SSSI.

Rigg Approach, Leyton - Air Quality Assessment in support of waste transfer site.

Lynchford Lane Waste Transfer Station - biomass facility energy recovery plant.

Barnes Wallis Heat and Power, Cobham - biomass facility adjacent to AQMA.

Residential

Wood St Mill, Bury - residential development adjacent to scrap metal yard.

Hyams Lane, Holbrook - Odour Assessment to support residential development adjacent to sewage works.

North Wharf Gardens, London - peer review of EIA undertaken for large residential development.

Loxford Road, Alford - Air Quality EIA for residential development, included consideration of impacts from associated package sewage works

Elephant and Castle Leisure Centre - baseline AQA for redevelopment.

Carr Lodge, Doncaster - EIA for large residential development.

Queensland Road, Highbury - residential scheme including CHP.

Bicester Ecotown - dispersion modelling of energy centre.

Castleford Growth Delivery Plan - baseline air quality constraints assessment for town redevelopment.

York St, Bury - residential development adjacent to AQMA.

Temple Point Leeds - residential development adjacent to M1.

Commercial and Retail

Etihad Stadium - Air Quality EIA for the extension to the capacity of the Etihad Stadium, Manchester.

Wakefield College - redevelopment of city centre campus in AQMA.

Manchester Airport Cargo Shed - commercial development.

Manchester Airport Apron Extension - EIA including aircraft emission modelling.

National Youth Theatre, Islington - redevelopment to provide new arts space and accommodation.

KEY EXPERIENCE:

Pearl is an Environmental Consultant with specialist experience in the air quality sector. Her key capabilities include:

- Production of Air Quality Assessments in accordance with Department for Environment, Food and Rural Affairs (DEFRA) methodologies for a range of residential, commercial and industrial sectors.
- Detailed dispersion modelling of road vehicle exhaust emissions using ADMS-Roads. Studies have included assessment of road traffic exhaust emissions on sensitive receptors and exposure of new residents to poor air quality.
- Assessment of construction dust impacts from a range of development sizes.
- Assessment of fugitive dust impacts from a range of mineral extraction developments.
- Production of air quality mitigation strategies specifically tailored to address issues at individual sites.
- Definition of baseline air quality and identification of sensitive areas across the UK.
- Odour surveys to assess amenity and suitability of sites for potential future development for residential use.
- Odour monitoring at industrial sites to quantify odour emission rates.

SELECT PROJECTS SUMMARY:

Maid Marian House, Nottingham

Air Quality Assessment for a change of use from office units to residential use. Concerns were raised regarding the exposure of future occupants to poor air quality due to road traffic emissions from the A6008 Maid Marian Way. Dispersion modelling took place at several different heights reflective of residential units within the development. Predicted concentrations of NO₂ were found to exceed air quality criteria at numerous levels of the proposed building. Mechanical ventilation was specified in the appropriate units within the development as a form of mitigation.

Victoria Quarter, London

Air Quality Assessment in support of residential development in an AQMA. Dispersion modelling was undertaken to consider the potential impact of development generated vehicles and CHP/Boiler emissions on air quality at sensitive receptor locations within the vicinity of the site. Different heights within the development, reflective of the proposed residential units, were also considered. The assessment identified a range of impacts, as such, a range of mitigation was specified. Mechanical ventilation was also specified in the appropriate units predicted to be exposed to poor levels of air quality.

Monks Farm, Townsend Grove

Air Quality EIA in support of residential development comprising 456 dwellings and primary school. NO₂ and PM₁₀ concentrations were predicted to be below the air quality objectives at the sensitive receptors considered. Air quality effects as a result of the proposals was determined to be not significant.

Stanton Harcourt, West Oxford

Odour Assessment for the redevelopment of the former Stanton Harcourt Airfield to residential properties. Due to the location of the site, being adjacent to a recently capped landfill, odour surveys were required to assess the level of odour across the site. A risk assessment was also undertaken in accordance with appropriate odour guidance. Taking into account the results of the odour surveys, recent odour complaint history and odour risk assessment the potential for odour effects across the site was determined to be not significant.

Hunter Street, Chester

Air Quality Assessment in support of a development for student accommodation. Concerns were raised regarding the exposure of future occupants to poor air quality due to road traffic emissions from the A5268. Dispersion modelling took place at several different heights of the proposed building. Predicted concentrations of NO₂ were found to exceed air quality criteria at ground to first floor level for those apartments facing the A5268. Mechanical ventilation was specified in these units as a form of mitigation.

Botley Road, West End, Southampton

Co-ordination and management of a six month diffusion study in support of a proposed residential development. Concerns were raised regarding the exposure of future residents to poor air quality due to road traffic emissions from the M27. The results of the monitoring study identified NO₂ concentrations across the site to be below the air quality objective and therefore deemed suitable for residential use.