

Air Quality Assessment
Oldham Street, Manchester

Client: The Daylesford Trust

Reference: 3568r1

Date: 1st May 2020



Report Issue

Report Title: Air Quality Assessment - Oldham Street, Manchester

Report Reference: 3568

Field	Report Version			
	1	2	3	4
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Date of Issue	1 st May 2020			
Comments	-			

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Executive Summary

Redmore Environmental Ltd was commissioned by The Daylesford Trust to undertake an Air Quality Assessment in support of a planning application for a residential-led development at 84 to 86 Oldham Street, Manchester.

The proposals involve the redevelopment of the existing building to provide 15 residential apartments and a ground floor retail unit.

The development may lead to the exposure of future residents 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.

Dispersion modelling was undertaken in order to predict pollutant concentrations across the proposed development site as a result of emissions from the local highway network. Outputs were subsequently verified using local monitoring data.

The dispersion modelling assessment indicated pollution levels were above the relevant criteria at locations of potential residential exposure from first to third floor levels. As such, suitable mitigation in the form of mechanical ventilation has been specified for the affected areas. This should ensure future users are not exposed to poor air quality.

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. As the development does not include provision of parking, road vehicle exhaust emission impacts were not predicted to be significant.

Based on the assessment results, air quality issues are not considered a constraint to planning consent for the development, subject to the inclusion of the specified mitigation.

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1.0 INTRODUCTION

1.1 Background

- 1.1.1 Redmore Environmental Ltd was commissioned by The Daylesford Trust to undertake an Air Quality Assessment in support of a planning application for a residential-led development at 84 to 86 Oldham Street, Manchester.
- 1.1.2 The development may lead to the exposure of future residents 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 at 84 to 86 Oldham Street, Manchester, at approximate National Grid Reference (NGR): 384628, 398620. Reference should be made to Figure 1 for a map of the site and surrounding area.
- 1.2.2 The proposals comprise the redevelopment of the existing building with the addition of a single storey extension to provide 15 residential apartments and a ground floor retail unit.
- 1.2.3 Manchester City Council (MCC) has declared an Air Quality Management Area (AQMA) due to exceedences of the annual mean Air Quality Objective (AQO) for nitrogen dioxide (NO₂). The development is located within the AQMA. Subsequently, there are concerns that the proposals will introduce future residents to exceedences of the relevant AQO. As such, an Air Quality Assessment was undertaken in order to determine baseline conditions at the site and consider its suitability for the proposed end-use. Potential impacts associated with the scheme have also been considered as necessary. This is detailed in the following report.
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2.0 LEGISLATION AND POLICY

2.1 Legislation

2.1.1 The Air Quality Standards Regulations (2010) came into force on 11th June 2010 and include Air Quality Limit Values (AQLVs) for the following pollutants:

- NO₂;
- Sulphur dioxide;
- Lead;
- Particulate matter with an aerodynamic diameter of less than 10µm (PM₁₀);
- Particulate matter with an aerodynamic diameter of less than 2.5µm (PM_{2.5});
- Benzene; and,
- Carbon monoxide.

2.1.2 Target Values were also provided for an additional 5 pollutants. These include:

- Ozone;
- Arsenic;
- Cadmium;
- Nickel; and,
- Benzo(a)pyrene.

2.1.3 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.

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

¹ The AQS for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.

Table 1 Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration (µg/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

2.1.5 Table 2 presents the AQTV considered within this assessment.

Table 2 Air Quality Target Values

Pollutant	Air Quality Target Values	
	Concentration (µg/m ³)	Averaging Period
PM _{2.5}	25	Annual mean

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

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

² Local Air Quality Management Technical Guidance (TG16), DEFRA, 2018.

Averaging Period	Objective Should Apply At	Objective Should Not Apply At
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

2.2 Local Air Quality Management

2.2.1 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 AQMA. For each AQMA the LA is required to produce an Air Quality Action Plan, the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.3 National Planning Policy

2.3.1 The revised National Planning Policy Framework³ (NPPF) was published in February 2019 and sets out the Government's planning policies for England and how these are expected to be applied.

³ NPPF, Ministry of Housing, Communities and Local Government, 2019.

2.3.2 The purpose of the planning system is to contribute to the achievement of sustainable development. In order to ensure this, the NPPF recognises three overarching objectives, including the following of relevance to air quality:

"c) An environmental objective - to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."

2.3.3 Chapter 15 of the NPPF details objectives in relation to conserving and enhancing the natural environment. It states that:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

[...]

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality [...]"

2.3.4 The NPPF specifically recognises air quality as part of delivering sustainable development and states that:

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should

ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

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

2.4 National Planning Practice Guidance

2.4.1 The National Planning Practice Guidance⁴ (NPPG) web-based resource was launched by the Department for Communities and Local Government on 6th March 2014 and updated on 1st November 2019 to support the NPPF and make it more accessible. The air quality pages are summarised under the following headings:

1. What air quality considerations does planning need to address?
2. What is the role of plan-making 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 considerations be relevant to the development management process?
6. What specific issues may need to be considered when assessing air quality impacts?
7. How detailed does an air quality assessment need to be?
8. How can an impact on air quality be mitigated?

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

2.5 Local Planning Policy

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

⁴ <https://www.gov.uk/guidance/air-quality--3>.

⁵ Core Strategy, MCC, 2012.

- 2.5.2 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."

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

3.0 BASELINE

3.1 Introduction

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

3.2 Local Air Quality Management

- 3.2.1 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 concentrations of NO₂ 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."

- 3.2.2 The development is located within the AQMA. As such, there is the potential for the exposure of future residents to elevated pollution levels and any emissions associated with the proposals to cause air quality effects within this sensitive area. This has been considered throughout the assessment.
- 3.2.3 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.

3.3 Air Quality Monitoring

- 3.3.1 Monitoring of pollutant concentrations is undertaken by MCC using continuous and periodic methods throughout their area of jurisdiction. Recent annual mean NO₂ results recorded in the vicinity of the development are shown in Table 4. Exceedences of the relevant AQO are shown in **bold**.
-

Table 4 Monitoring Results - NO₂

Monitoring Site		Monitored NO ₂ Concentration (µg/m ³)		
		2016	2017	2018
9	Newton Street	51.9	51.1	45.8
MAN3	Manchester Piccadilly	40	36	35

3.3.2 As shown in Table 4, the annual mean AQO NO₂ concentrations were above the AQO at the 9 - Newton Street monitoring site in recent years and at the Manchester Piccadilly continuous analyser in 2016. As both are situated within an AQMA in Manchester City Centre, elevated concentrations would be expected. It should be noted that concentrations at the MAN3 site fell below the relevant AQO in 2017 and 2018. Reference should be made to Figure 2 for a map of the survey positions.

3.3.3 Recent annual mean PM₁₀ results recorded in the vicinity of the development are shown in Table 5.

Table 5 Monitoring Results - PM₁₀

Monitoring Site		Monitored PM ₁₀ Concentration (µg/m ³)		
		2016	2017	2018
MAN3	Manchester Piccadilly	20	20	21

3.3.4 As shown in Table 5, the annual mean AQO for PM₁₀ was achieved at the Manchester Piccadilly continuous analyser in recent years.

3.3.5 Recent annual mean PM_{2.5} results recorded in the vicinity of the development are shown in Table 6.

Table 6 Monitoring Results - PM_{2.5}

Monitoring Site		Monitored PM _{2.5} Concentration (µg/m ³)		
		2016	2017	2018
MAN3	Manchester Piccadilly	10	8	11

3.3.6 As shown in Table 6, the annual mean AQTV for PM_{2.5} was achieved at the Manchester Piccadilly continuous analyser in recent years.

3.4 **Background Pollutant Concentrations**

3.4.1 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: 384500, 398500. Data for this location was downloaded from the DEFRA website⁶ for the purpose of the assessment and is summarised in Table 7.

Table 7 Background Pollutant Concentration Predictions

Pollutant	Predicted Background Pollutant Concentration (µg/m ³)		
	2018	2020	2022
NO ₂	32.03	29.46	27.24
PM ₁₀	13.37	13.02	12.86
PM _{2.5}	8.78	8.49	8.36

3.4.2 As shown in Table 7, predicted background NO₂, PM₁₀ and PM_{2.5} concentrations are below the relevant AQOs and AQTV at the development site.

⁶ <http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2017>.

4.0 METHODOLOGY

4.1 Introduction

- 4.1.1 The proposed development has the potential to expose future residents to poor air quality and increase pollution levels as a result of operational phase vehicle exhaust emissions. These issues were considered in accordance with the following methodology.

4.2 Potential Exposure

- 4.2.1 Dispersion modelling was undertaken in order to predict NO₂, PM₁₀ and PM_{2.5} concentrations across the site using the ADMS-Roads dispersion model (version 5.0.0.1) in order to assess potential air quality impacts associated with road vehicle exhaust emissions. 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.
- 4.2.2 Modelling was undertaken for 2018 to allow verification against recent monitoring results and 2022 to represent the development opening year.
- 4.2.3 The model requires input data that details the following parameters:
- Assessment area;
 - Traffic flow data;
 - Vehicle emission factors;
 - Spatial co-ordinates of emissions;
 - Street width;
 - Meteorological data;
 - Roughness length (z_0); and,
 - Monin-Obukhov length.
- 4.2.4 Additional options can also be selected within the ADMS-Roads interface to take account of site specific characteristics that may affect model output, such as canyons.
- 4.2.5 The following Sections detail the relevant inputs utilised in the assessment.
-

Assessment Area

- 4.2.6 Ambient concentrations were predicted over the area NGR: 384490, 398520 to 384590, 398620. One Cartesian grid was used within the model to produce data suitable for contour plotting using the Surfer software package.
- 4.2.7 It should be noted that although the grid only covered the proposed site, road links were extended in order to ensure the impact of all relevant vehicle emissions in the vicinity of the development were considered.
- 4.2.8 Reference should be made to Figure 3 for a graphical representation of the assessment grid extents.

Traffic Flow Data

- 4.2.9 Baseline traffic data for use in the assessment, including 24-hour Annual Average Daily Traffic (AADT) flows and fleet composition as Heavy Duty Vehicle (HDV) proportion, was obtained from the Department for Transport (DfT)⁷. The DfT web tool enables the user to view and download traffic flows on every link of the 'A' road and motorway network, as well as selected minor roads, in Great Britain for the years 1999 to 2018. It should be noted that the DfT web tool is referenced in DEFRA guidance⁸ 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.
- 4.2.10 Baseline traffic data for Oldham Street and Tib Street was not available from the DfT website. The DfT data for Lever Street was therefore applied to these roads in order to ensure emission sources closest to the development were included in the model. As these roads are all one-way streets in the Northern Quarter area of Manchester, the data is considered an appropriate representation of traffic movements in lieu of other sources.
- 4.2.11 The baseline traffic data was converted to the verification and opening year of the development utilising factors obtained from TEMPro (Version 7.2). This software package has been developed by the DfT to calculate future traffic growth throughout the UK.

⁷ <http://www.dft.gov.uk/traffic-counts/>.

⁸ Local Air Quality Management Technical Guidance (TG16), DEFRA, 2018.

4.2.12 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 8.

Table 8 Traffic Data

Link		24-hour AADT Flow		HDV Proportion of Fleet (%)	Mean Vehicle Speed (km/h)	Road Width (m)
		2018	2022			
L1	Oldham Road to Adlington Street	19,402	20,838	5.93	45	15.4
L2	Oldham Road to Great Ancoats Street	28,486	30,594	4.60	25	17.8
L3	Swan Street Canyon	15,680	16,840	2.19	45	9.5
L4	Swan Street Slow	15,680	16,840	2.19	25	9.6
L5	Great Ancoats Street to Lever Street	35,357	37,973	3.91	45	20.7
L6	Great Ancoats Street South	35,357	37,973	3.91	45	19.9
L7	Newton Street to Dale Street Canyon	11,659	12,522	3.47	30	12.3
L8	Newton Street Junction with Dale Street	11,659	12,522	3.47	30	10.7
L9	Newton Street to Piccadilly Road Canyon	11,659	12,522	3.47	30	9.3
L10	Piccadilly to Newton Street Canyon	7,331	7,873	11.70	40	13.6
L11	Piccadilly to Aytoun Street	11,430	12,276	27.45	40	13.1
L12	Dale Street Canyon	4,158	4,466	6.33	30	8.9
L13	Lever Street to Dale Street	3,778	4,058	19.22	30	12.4
L14	Lever Street to Dale Street Canyon	3,778	4,058	19.22	30	8.7
L15	Lever Street to Stevenson Square Canyon	3,778	4,058	19.22	30	9.6
L16	Stevenson Square	3,778	4,058	19.22	30	9.6
L17	Lever Street to Great Ancoats Street Canyon	3,778	4,058	19.22	30	9.2
L18	Church Street Canyon	3,998	4,294	25.86	40	8.1
L19	Church Street	3,998	4,294	25.86	40	13.1
L20	Oldham Street Canyon	3,778	4,058	19.22	30	7.6

Link		24-hour AADT Flow		HDV Proportion of Fleet (%)	Mean Vehicle Speed (km/h)	Road Width (m)
		2018	2022			
L21	89-95 Oldham Street Canyon	3,778	4,058	19.22	30	7.5
L22	Oldham Street Canyon, South of Warwick Street	3,778	4,058	19.22	30	7.5
L23	Oldham Street, North of Warwick Street Canyon	3,778	4,058	19.22	30	7.6
L24	64-66 Oldham Street Canyon	3,778	4,058	19.22	30	7.4
L25	Oldham Street Canyon to Great Ancoats	3,778	4,058	19.22	30	7.6
L26	Tib Street Canyon	3,778	4,058	19.22	30	4.3

4.2.13 Reference should be made to Figure 3 for a graphical representation of the road link locations.

Canyons

4.2.14 Where buildings or walls surround roads, pollutant dispersion patterns are altered which can lead to high pollutant concentrations. These street canyons can significantly influence air quality along a road and therefore it is important to take consideration of their effects when undertaking dispersion modelling.

4.2.15 The release of ADMS-Roads version 4.0.1.0 in December 2015 incorporated a number of new features including an advanced street canyon module, which have been retained in version 5.0.0.1. Advanced street canyon modelling allows a number of parameters to be included in the dispersion model in order to predict pollutant dispersion patterns which better reflect air flow within complex urban geometries.

4.2.16 Canyons have five principle effects on dispersion which can influence pollutant concentrations. These are:

- Pollutants are channelled along street canyons;
- Pollutants are dispersed across street canyons by circulating flow at road height;
- Pollutants are trapped in recirculation regions;

- Pollutants leave the canyon through gaps between buildings - as if there was no canyon; and,
- Pollutants leave the canyon from the canyon top.

4.2.17 The combined modelling of these effects will result in concentration patterns unique to each canyon. The parameters used in the assessment are outlined in Table 9.

Table 9 Canyon Parameters

Link	Parameter (m)					
	Canyon Width to Left	Average Height of Buildings to Left	Building Length Left	Canyon Width Right	Average Height of Buildings to Right	Building Length Right
L3	10.3	10.5	123.0	6.0	10.5	96.0
L7	10.3	15.5	229.1	8.8	12.0	248.5
L9	16.8	15.5	67.7	10.3	15.5	72.3
L10	14.0	23.0	85.7	15.1	14.0	82.5
L12	10.3	12.5	71.2	5.8	15.5	51.4
L14	13.9	16.5	82.3	8.6	12.5	92.3
L15	8.6	15.0	65.5	8.8	13.5	54.5
L17	9.0	12.0	169.3	9.5	15.0	169.1
L18	10.1	15.0	99.5	6.2	13.5	109.3
L20	8.0	12.5	108.2	8.0	12.5	108.2
L21	6.3	12.4	21.5	9.0	8.5	21.5
L22	6.3	10.5	38.6	8.7	10.5	38.6
L23	5.9	10.5	36.2	8.2	2.0	36.2
L24	6.8	10.5	11.7	8.2	15.0	11.7
L25	7.8	10.0	78.1	7.8	10.5	78.1
L26	4.2	12.5	159.7	5.4	12.5	265.8

4.2.18 A choice of two modes is provided for use in the advanced canyon module. Standard mode assumes that each road is part of a continuous network of roads with similar canyon properties. Network mode analyses the road network to determine transport of pollutants between adjoining street canyons, allows for varying concentrations along the canyon and accounts for transport of pollutants out of the end of a canyon. Network mode is considered most accurate for detailed local analysis and as such was selected for use in the model.

Emission Factors

4.2.19 In 2016, Air Quality Consultants Ltd (AQC) produced a spreadsheet entitled 'Calculator Using Realistic Emissions for Diesels' (CURED, versions V1A and V2A). This provided an alternative emissions calculator which took account of the large amount of evidence from real-world emissions tests showing that the European Environment Agency's COPERT and DEFRA's Emissions Factor Toolkit (EFT) were incorrect⁹.

4.2.20 DEFRA released the EFT (v8.0.1) in December 2017. This included COPERT 5 vehicle emission factors and fleet information, which now better reflect the predictions made by CURED V1A and V2A. However, AQC noted there remained some uncertainty regarding how well the future vehicle fleet will perform in the real world. As such, in January 2018 AQC released CURED V3A¹⁰. This has been formulated to simulate failure of Euro 6d to provide any benefits over and above those of Euro6c, providing a more pessimistic view of the performance of post-2019 diesel cars and vans.

4.2.21 In May 2019 DEFRA released the EFT (v9.0). Whilst a new version of CURED has not yet been developed, AQC have released a technical note¹¹ providing a comparison of the new EFT (v9.0) with EFT (8.0.1) and CURED V3A. This concluded that the most recent version of CURED provides more pessimistic emission factors than both versions of the EFT. As such, CURED V3A was utilised in the dispersion modelling in order to provide a worst-case representation of future year NO_x emission factors.

⁹ Emissions of Nitrogen Oxides from Modern Diesel Vehicles, AQC, 2016.

¹⁰ Development of the CURED V3A Emissions Model, AQC, 2018.

¹¹ Initial Comparison of EFT v9 with EFT v8 and CURED v3A, AQC, 2019.

- 4.2.22 As PM₁₀ and PM_{2.5} emission factors do not require adjustment, factors were calculated for the relevant traffic flows using the EFT (version 9.0) produced by DEFRA.

Meteorological Data

- 4.2.23 Meteorological data used in the assessment was taken from Manchester Airport meteorological station over the period 1st January 2018 to 31st December 2018 (inclusive). Manchester Airport is located at NGR: 381792, 384116, which is approximately 14.8km 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.
- 4.2.24 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 4 for a wind rose of the utilised meteorological data.

Roughness Length

- 4.2.25 The z_0 is a modelling parameter applied to allow consideration of surface height roughness elements. A z_0 of 1m 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 'cities and woodlands'.
- 4.2.26 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 and is suggested within ADMS-Roads as being suitable for 'agricultural areas (min)'.

Monin-Obukhov Length

- 4.2.27 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 both areas and is suggested within ADMS-Roads as being suitable for 'cities and large towns'.
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Background Concentrations

4.2.28 Annual mean NO₂, PM₁₀ and PM_{2.5} background concentrations for use in the assessment were obtained from the MAN3 - Manchester Piccadilly continuous monitor as shown in Table 4, Table 5 and Table 6 respectively. The values were chosen to represent concentrations throughout the dispersion modelling extents without the contribution from road vehicles as the recorded annual mean NO₂, PM₁₀ and PM_{2.5} concentrations were higher than the DEFRA backgrounds for the grid square containing the site, as shown in Table 7.

4.2.29 The background concentrations from 2018 were utilised in preference to the 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

4.2.30 Predicted annual mean NO_x concentrations were converted to NO₂ concentrations using the spreadsheet (version 7.1) provided by DEFRA, which is the method detailed within DEFRA guidance¹².

Verification

4.2.31 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.

4.2.32 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.

¹² Local Air Quality Management Technical Guidance (TG16), DEFRA, 2018.

4.2.33 For the purpose of the assessment model verification was undertaken for 2017 using traffic data, meteorological data and monitoring results from this year.

4.2.34 Monitoring of NO₂ concentrations was undertaken at one location within the vicinity of roads included within the model in 2018. The result was obtained and the road contribution to total NO_x concentration calculated following the methodology contained within DEFRA guidance¹³. The monitored annual mean NO₂ concentration and calculated road NO_x concentration is summarised in Table 10.

Table 10 Verification - Monitoring Results

Monitoring Location		Monitored NO ₂ Concentration (µg/m ³)	Calculated Road NO _x Concentration (µg/m ³)
9	Newton Street	45.8	23.73

4.2.35 The annual mean road NO_x concentrations predicted from the dispersion model and the calculated 2018 road NO_x monitoring results are summarised in Table 11.

Table 11 Verification - Modelling Results

Monitoring Location		Calculated Road NO _x Concentration (µg/m ³)	Modelled Road NO _x Concentration (µg/m ³)
9	Newton Street	23.73	12.96

4.2.36 The monitored and modelled road NO_x concentrations were compared to calculate the associated ratio. This indicated a verification factor of 1.8693 was required to be applied to all modelling results.

4.2.37 Monitoring of PM₁₀ and PM_{2.5} concentrations is not undertaken within the vicinity of roads included in the assessment. The NO_x verification factor was therefore used to adjust model predictions of these species in accordance with DEFRA guidance¹⁴.

¹³ Local Air Quality Management Technical Guidance (TG16), DEFRA, 2018.

¹⁴ Local Air Quality Management Technical Guidance (TG16), DEFRA, 2018.

4.3 Potential Development Impacts

4.3.1 The proposal 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 Institute of Air Quality Management (IAQM) 'Land-Use Planning & Development Control: Planning for Air Quality'¹⁵ guidance to determine the potential for trips generated by the scheme to affect local air quality.

4.3.2 The following criteria are provided 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.

4.3.3 Should these criteria not be met, then the IAQM guidance¹⁶ considers air quality impacts associated with a scheme to be **negligible** and no further assessment is required.

4.3.4 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 guidance¹⁷.

¹⁵ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

¹⁶ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

¹⁷ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

5.0 ASSESSMENT

5.1 Introduction

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

5.2 Potential Exposure

5.2.1 The proposed development has the potential to cause exposure of future residents 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 Figure 5, 6, 7, 8 and 9 for graphical representations of the results.

5.2.2 It should be noted that the proposals comprise retail land use across the ground floor. This is not a location of relevant exposure for annual mean AQOs in accordance with DEFRA guidance¹⁸, as summarised in Table 3. As such, concentrations have been considered from the first floor upwards where residential apartments are located.

5.2.3 As shown in Figure 5, annual mean NO₂ concentrations were predicted to be above the AQO of 40µg/m³ across a portion of the development at first floor. The maximum level at the site boundary was 45.05µg/m³.

5.2.4 As shown in Figure 6, annual mean NO₂ concentrations were predicted to be above the AQO of 40µg/m³ across a portion of the development at third floor. The maximum level at the site boundary was 40.64µg/m³. Based on these results it can be inferred that exceedences also occur at second floor.

5.2.5 As shown in Figure 7, annual mean NO₂ concentrations were predicted to be below the AQO of 40µg/m³ at all locations across the fourth floor. The maximum level at the site boundary was 39.05µg/m³.

5.2.6 As shown in Figure 8, annual mean PM₁₀ concentrations were predicted to be below the AQO of 40µg/m³ at all locations across the first floor. The maximum level at the site

¹⁸ Local Air Quality Management Technical Guidance (TG16), DEFRA, 2018.

boundary was 23.36µg/m³. As such, future residents are not predicted to be exposed to PM₁₀ concentrations above the AQO.

5.2.7 As shown in Figure 9, annual mean PM_{2.5} concentrations were predicted to be below the AQTV of 25µg/m³ at all locations across the first floor. The maximum level at the site boundary was 11.89µg/m³. As such, future residents are not predicted to be exposed to PM_{2.5} concentrations above the AQTV.

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

5.2.9 Based on the assessment results, it is recommended that mitigation is included within the development to ensure future residents are not exposed to elevated NO₂ concentrations. Specific measures are described in Section 6.0.

5.3 **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. However, the proposals do not include the provision of any car parking spaces. As such, it is unlikely that the development will result in significant traffic generation on the local road network.

5.3.2 Based on the above information, the proposals are not anticipated to result in an increase in 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 IAQM¹⁹ screening criteria shown in Section 4.3.

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

6.0 MITIGATION

- 6.1.1 Predicted annual mean NO₂ concentrations were above the relevant AQO across a portion of the development fronting Oldham Street from first to third floor levels. As such, mitigation is required to ensure a supply of clean air for future residents in these locations. This should be provided in the form of a mechanical ventilation system. The air inlet should be positioned at the rear of the building or at roof level, distanced from Oldham Street. This will ensure the air supply is taken from a location where NO₂ concentrations are below the relevant AQO. Alternatively, if there are design issues associated with providing inlets at the designated locations, a NO₂ absorption filter could be included within the system to reduce pollutant concentrations within the airstream prior to entering the units.
- 6.1.2 The development should also incorporate a high specification of air tightness on the windows fronting Oldham Street, so that when these are closed, the apartments would be ventilated by clean air from the mechanical system. The arrangement will ensure the units are kept under positive pressure by providing air into the rooms, rather than removing it. This will naturally inhibit the movement of air from outside into the units during periods of open windows as well as flushing the internal environment after closure.
- 6.1.3 Mechanical ventilation is suggested within the IAQM 'Land-Use Planning & Development Control: Planning for Air Quality' guidance document²⁰ and as such is considered a suitable solution for a development of this size and nature.
- 6.1.4 A number of mitigation measures have also been included within the development in accordance with the requirements of the IAQM document 'Land-Use Planning & Development Control: Planning for Air Quality'²¹ to encourage the use of sustainable transport modes, manage vehicle flow and reduce pollution around the site. Table 12 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.

²¹ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2015.

Table 12 Good Practice Design Principles

Phase	Principle	Action
Design Phase	New developments should not contravene the Council's Air Quality Action Plan ²² , or render any of the measures unworkable	It is confirmed that the proposals will not contravene MCC's Air Quality Action Plan, or render any of the measures unworkable
	Wherever possible, new developments should not create a new "street canyon", or a building configuration that inhibits effective pollution dispersion	The proposals involve redevelopment of the existing building, with the addition of a single storey extension to provide a consistent height with other properties on Oldham 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 close proximity to local bus routes, Metrolink and train lines, as well as local amenities
	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	The development does not include residential land use at the ground floor which increases the distance between emission sources and sensitive receptors
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	The proposals do not include provision of car parking spaces and therefore 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 may be prepared in support of the development, should it be requested by MCC

Phase	Principle	Action
	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

- 6.1.5 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.

7.0 CONCLUSION

- 7.1.1 Redmore Environmental Ltd was commissioned by The Daylesford Trust to undertake an Air Quality Assessment in support of a planning application for a residential-led development at 84 to 86 Oldham Street, Manchester.
- 7.1.2 The development may lead to the exposure of future residents 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.
- 7.1.3 Dispersion modelling was undertaken in order to predict pollutant concentrations across the proposed development site as a result of emissions from the local highway network. Outputs were subsequently verified using local monitoring data obtained from MCC.
- 7.1.4 The results of the dispersion modelling assessment indicated that predicted annual mean NO₂ concentrations were above the relevant AQO across a portion of the development fronting Oldham Street from first to third floor levels. As such, suitable mitigation in the form of mechanical ventilation has been specified for the affected locations. This is suggested within the IAQM 'Land-Use Planning & Development Control: Planning for Air Quality' guidance²³ and as such is considered a suitable solution for a development of this size and nature. Concentrations of PM₁₀ and PM_{2.5} were below the relevant AQO and AQTV at all locations across the site.
- 7.1.5 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 screening criteria provided within the IAQM²⁴ guidance document. Due to the limited number of anticipated vehicle trips associated with the proposals, road traffic exhaust impacts were predicted to be **negligible**.

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

²⁴ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

- 7.1.6 Based on the assessment results, air quality issues are not considered a constraint to planning consent for the development, subject to the inclusion of the specified mitigation.
-

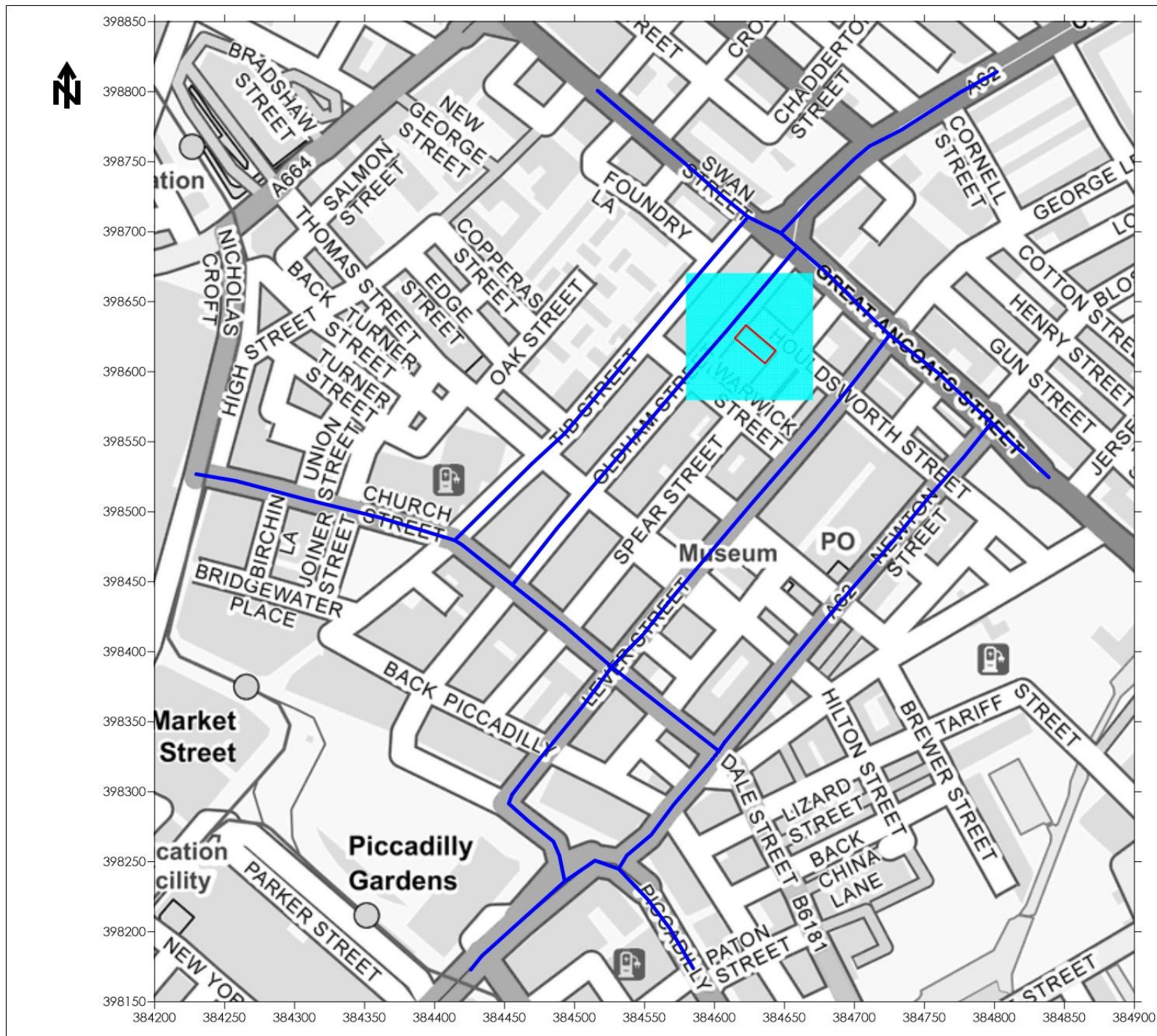
8.0 **ABBREVIATIONS**

AADT	Annual Average Daily Traffic
AQC	Air Quality Consultants
ADM	Atmospheric Dispersion Modelling
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
CURED	Calculator Using Realistic Emissions for Diesels
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EFT	Emissions Factor Toolkit
EV	Electric Vehicle
GMCA	Greater Manchester Combined Authority
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
LDV	Light Duty Vehicle
MCC	Manchester City Council
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
Z ₀	Roughness length

Figures







Legend

-  Site Boundary
-  Road Link
-  Output Grid

Title

Figure 3 - ADMS-Roads Inputs

Project

Air Quality Assessment
Oldham Street, Manchester

Project Reference

3568

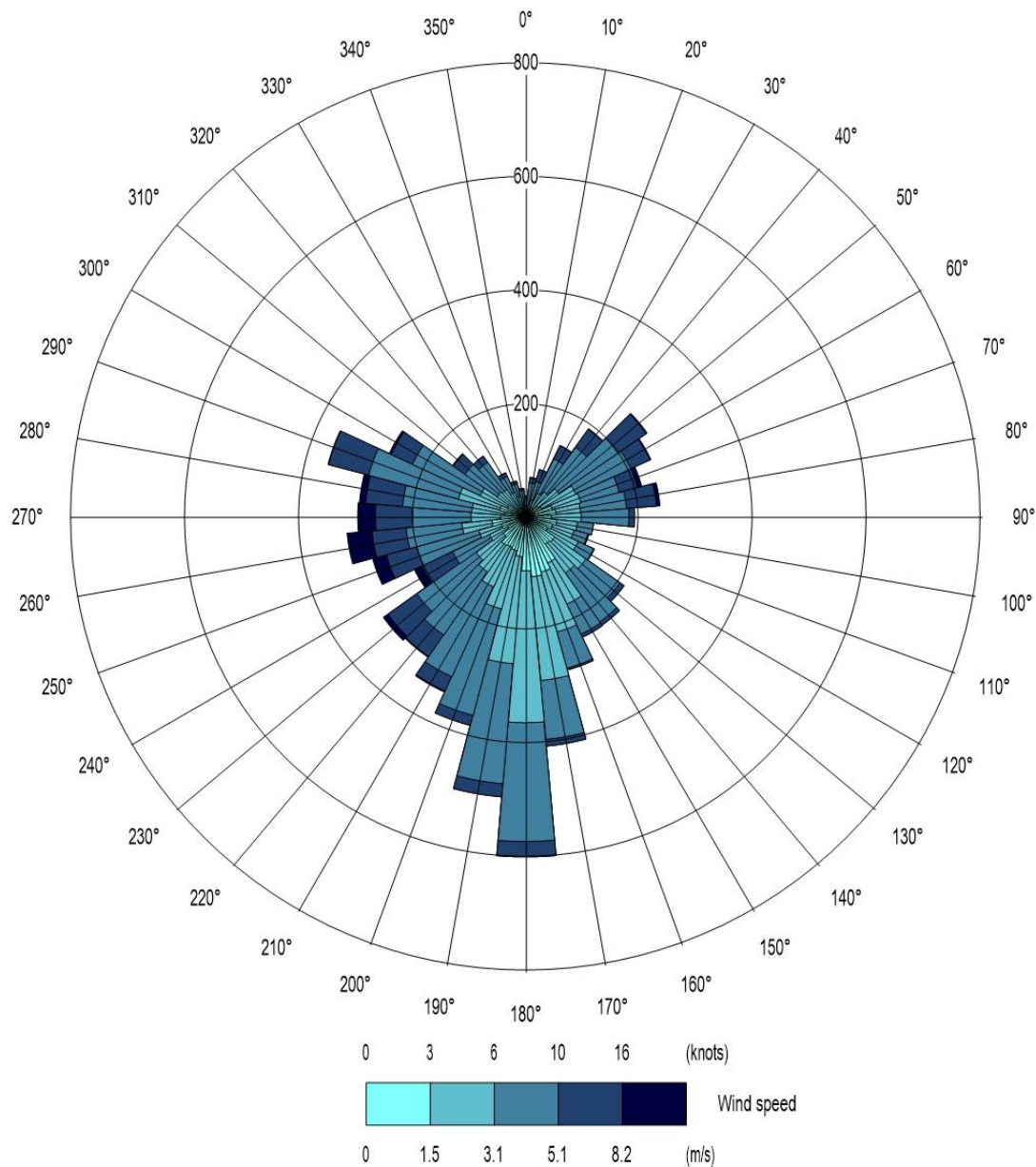
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Title

Figure 4 - Wind Rose of 2018
Manchester Airport
Meteorological Data

Project

Air Quality Assessment
Oldham Street, Manchester

Project Reference

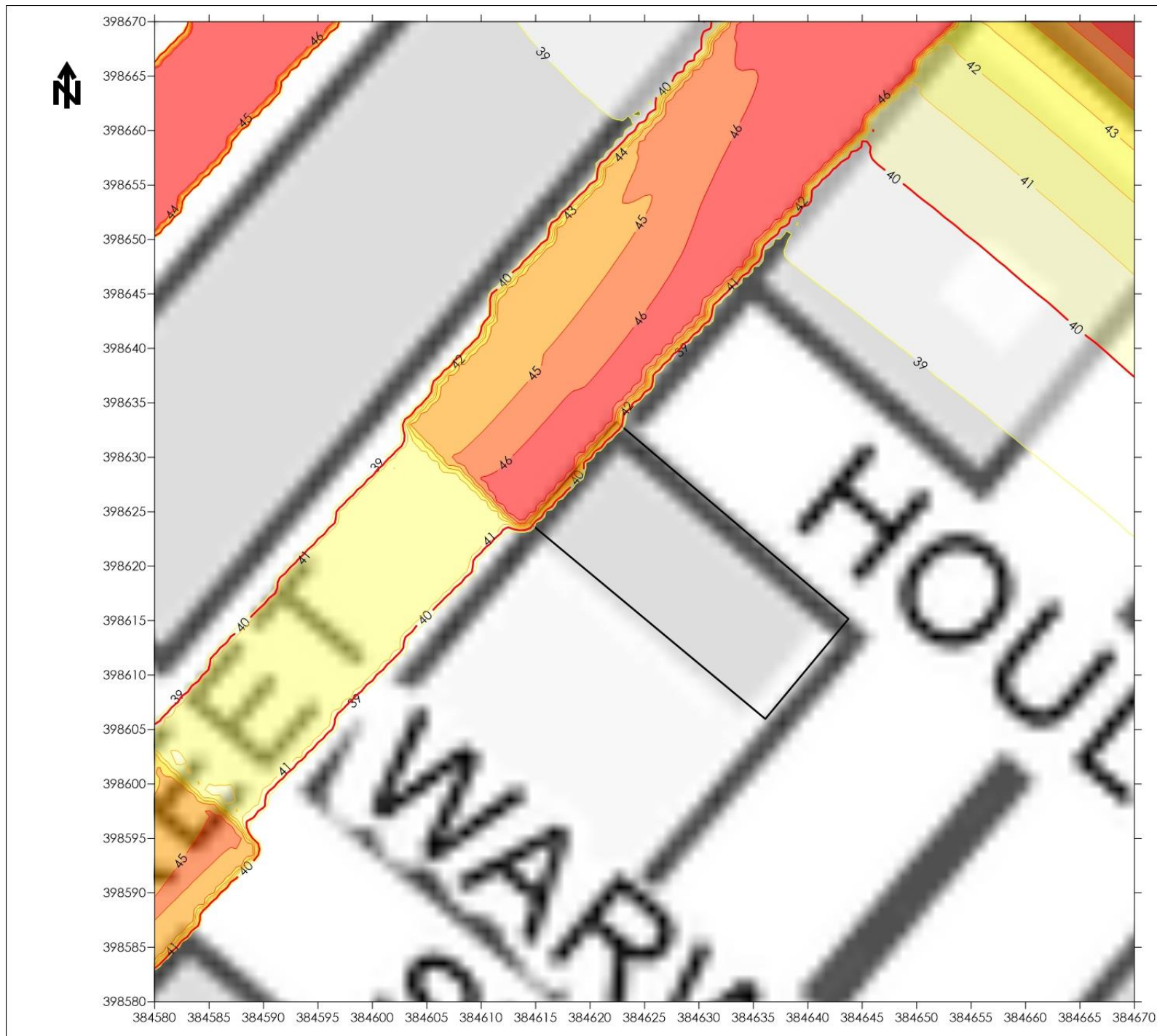
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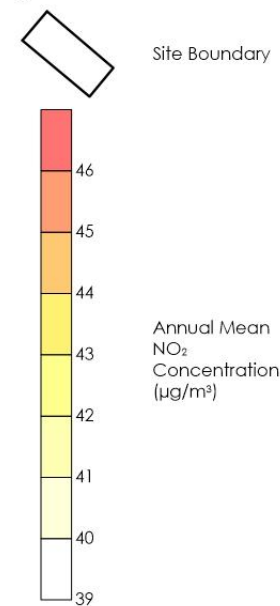
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Title

Figure 5 - Predicted Annual Mean NO₂ Concentrations (µg/m³) First Floor

Project

Air Quality Assessment
Oldham Street, Manchester

Project Reference

3568

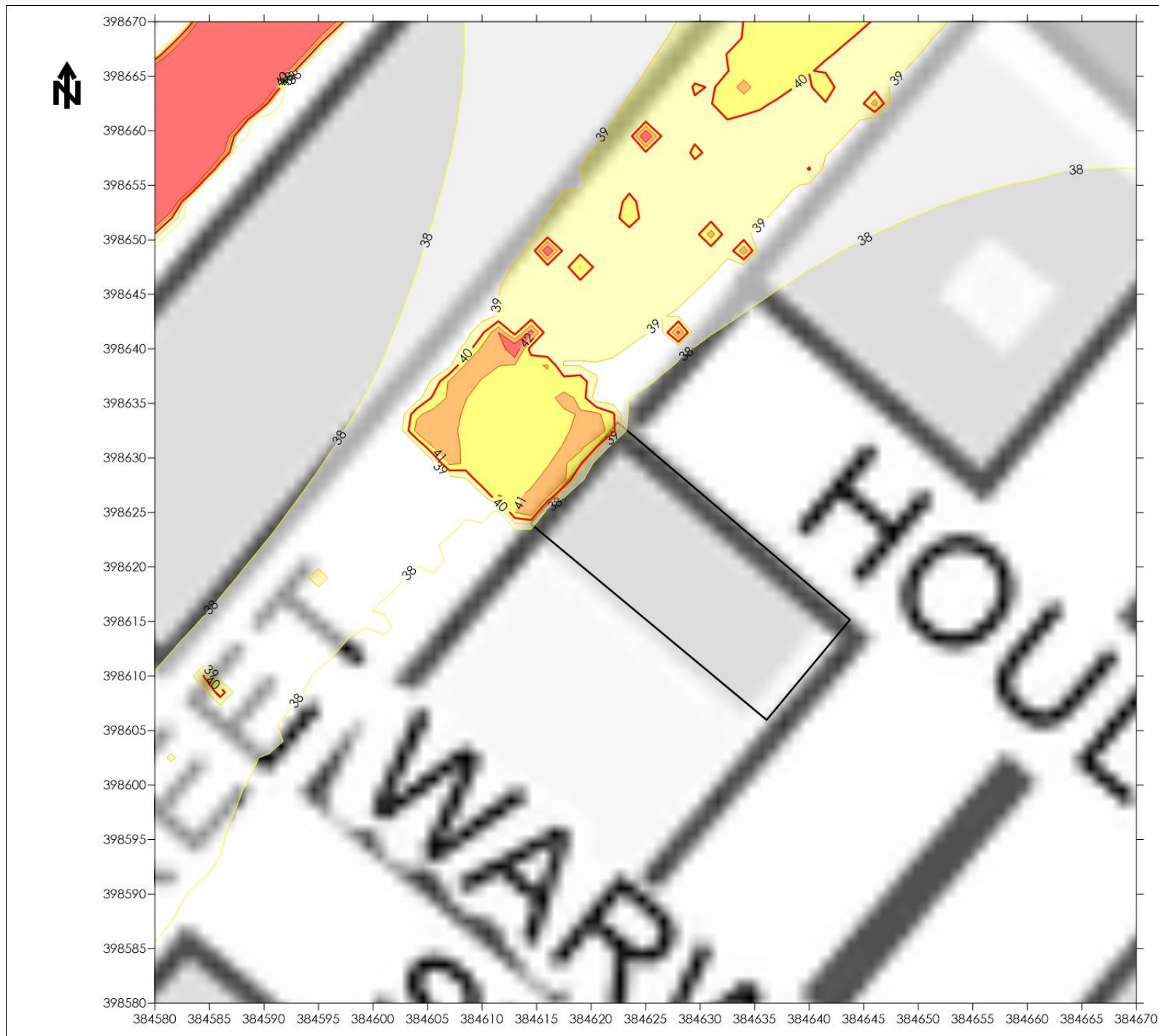
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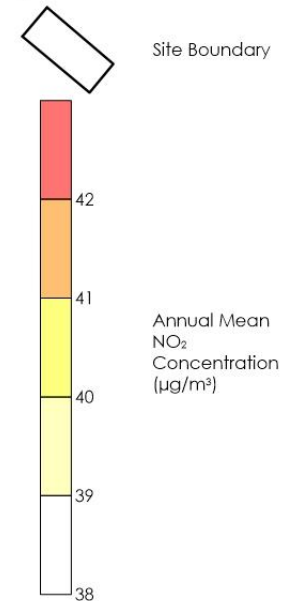
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Title

Figure 6 - Predicted Annual Mean NO₂ Concentrations (µg/m³)
Third Floor

Project

Air Quality Assessment
Oldham Street, Manchester

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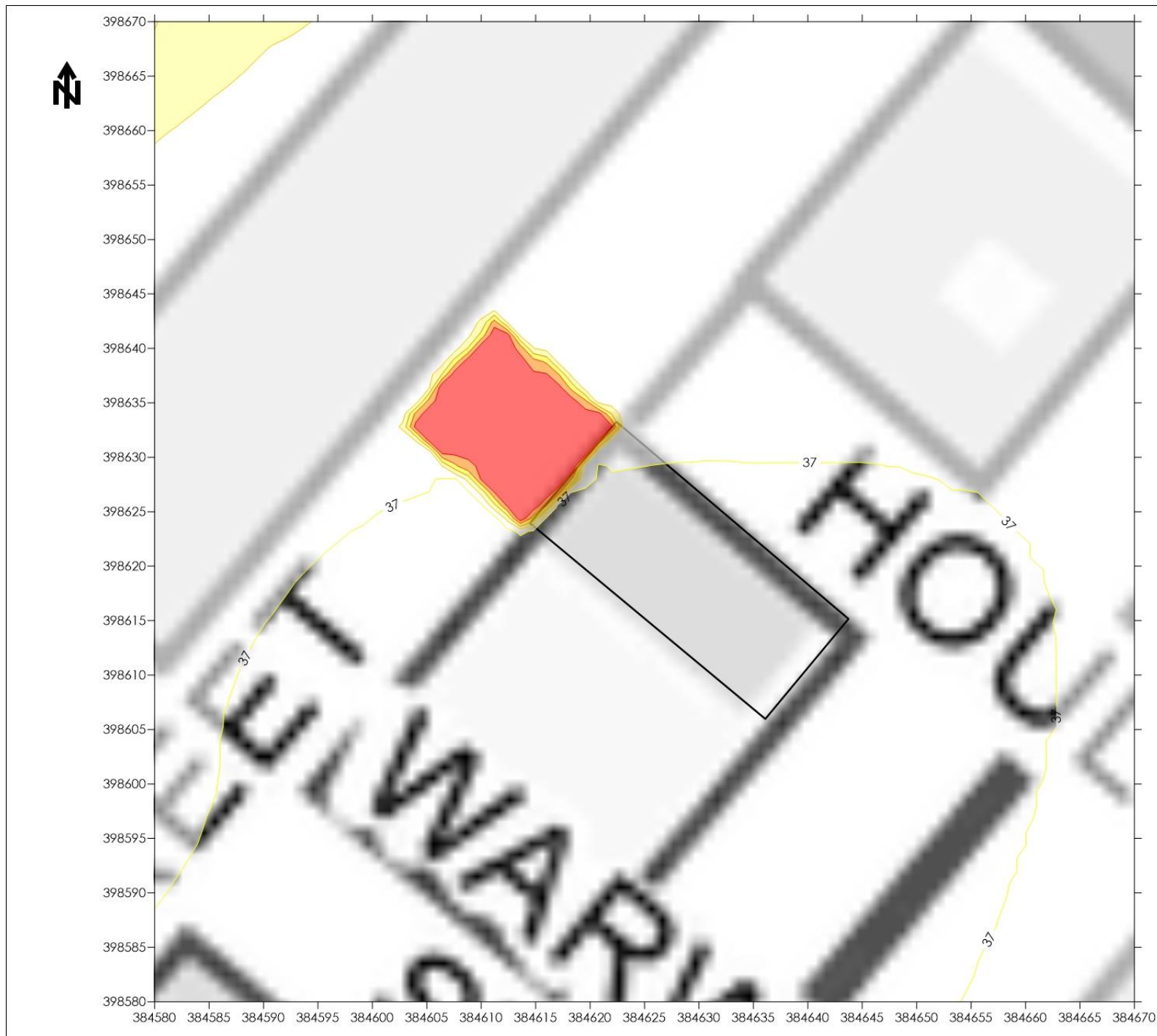
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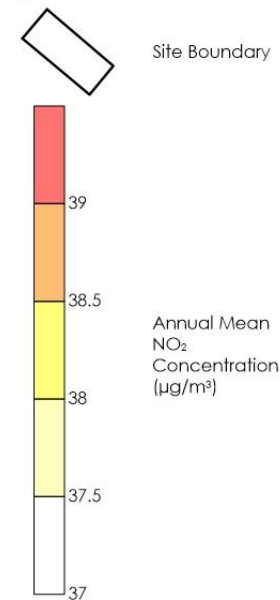
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Title

Figure 7 - Predicted Annual Mean NO₂ Concentrations (µg/m³) Fourth Floor

Project

Air Quality Assessment
Oldham Street, Manchester

Project Reference

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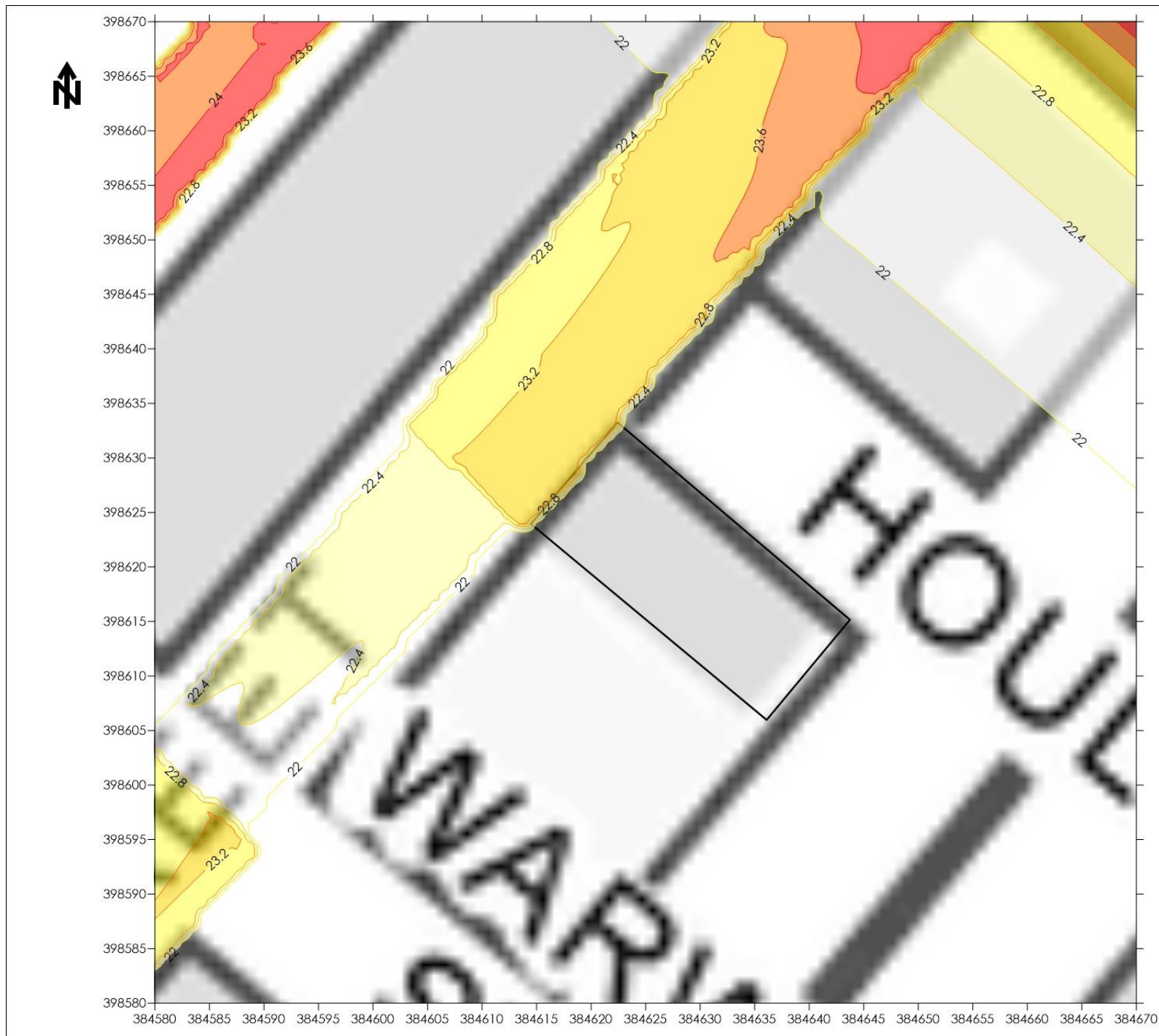
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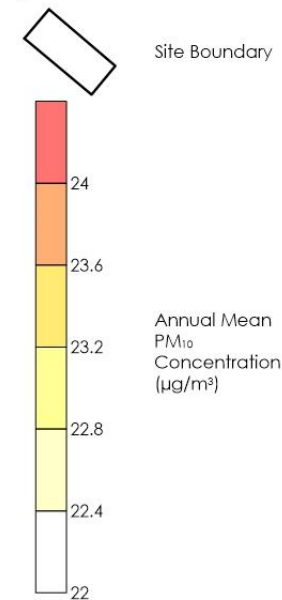
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Figure 8 - Predicted Annual Mean PM₁₀ Concentrations (µg/m³) First Floor

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Oldham Street, Manchester

Project Reference

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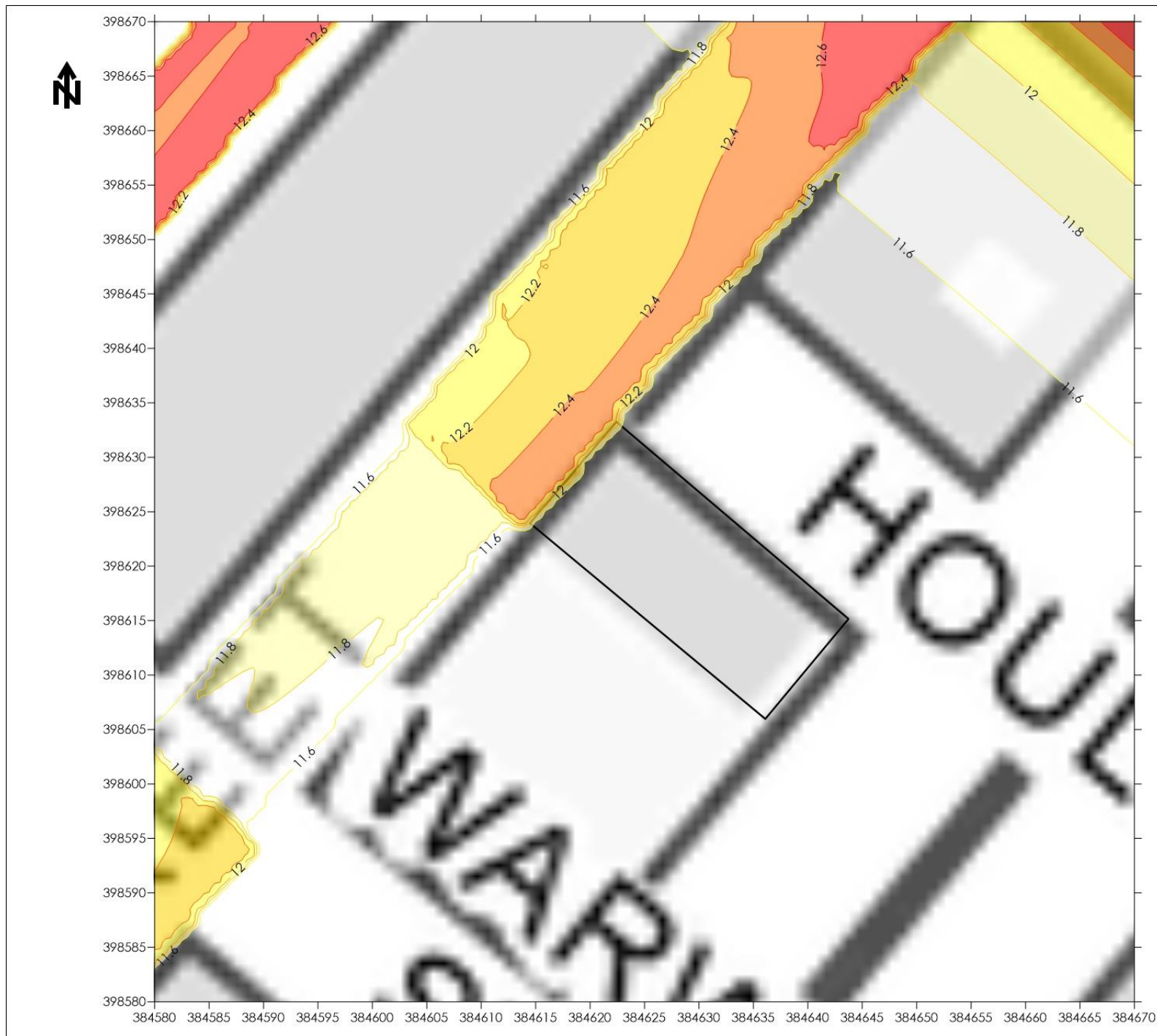
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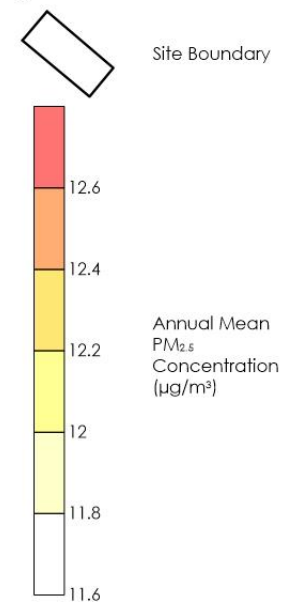
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Title

Figure 9 - Predicted Annual Mean PM_{2.5} Concentrations (µg/m³) First Floor

Project

Air Quality Assessment
Oldham Street, Manchester

Project Reference

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Date: 1st May 2020

Ref: 3568

Appendix 1 - 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:

Amelia 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.
- Advanced canyon modelling to evaluate the impact of altered urban topography on air quality in built up areas.
- Assessment of construction dust impacts from a range of development sizes.
- Definition of baseline air quality and identification of sensitive areas across the UK.
- Production of air quality mitigation strategies specifically tailored to address issues at individual sites.
- Air quality monitoring at industrial sites to quantify pollutant concentrations
- Odour surveys to assess amenity and suitability of sites for potential future development for residential use.

SELECT PROJECTS SUMMARY:

Eagle House, South Ruislip

Air Quality Assessment for the change of use from an office block to a hotel in an Air Quality Management Area (AQMA). Concerns were raised regarding the exposure of future occupants to poor air quality due to road traffic emissions. Detailed dispersion modelling was undertaken using ADMS-roads to assess PM₁₀ and NO₂ concentrations across the site as well as an Air Quality Neutral Assessment in accordance with the London Plan requirements. Results revealed that pollution levels were below the air quality standards across the development.

Parr Bridge, Tyldesley

Air Quality Assessment to support a residential development of 154 units. Dispersion modelling was undertaken due to the proximity of the site to an AQMA. Using sensitive receptors located in areas where increased road traffic may affect NO₂ levels, a comparison was made between concentrations with and without the development in place. Results indicated the impacts were not significant.

St James's Street, Westminster

Air Quality Assessment in support of a mixed-use development in an AQMA. Dispersion modelling was undertaken at several different heights reflective of residential units within the development. Predicted concentrations of NO₂ were found to exceed air quality criteria from ground to third floor level. As such, mitigation was specified for the affected units to ensure future residents would not be exposed to poor air quality.

Rookery Avenue, Whiteley, Farnborough

Odour Impact Assessment in support of a hot food takeaway with a drive thru facility in Whiteley. The assessment considered a number of factors, including the scale and nature of potential emissions, the location of nearest receptors and the proposed cooking type in accordance with the relevant DEFRA guidance. An appropriate ventilation system was identified and described on the basis of the assessment results.

Hoole Way, Chester

Air Quality Assessment in support of an eight-storey student accommodation block to provide circa 373 units on land off Hoole Way, Chester. Concerns had been raised in relation to the potential exposure of future occupants to elevated pollution concentrations. An assessment was therefore undertaken using dispersion modelling in order to quantify air quality conditions across the site. The results revealed that the use of good practice control measures would provide suitable mitigation for the development.

St James Place, Liverpool

Air Quality Assessment in support of a residential-led development located across three different sites in an AQMA on land off St James Place, Liverpool. Detailed dispersion modelling was undertaken with the inclusion of advanced canyon modelling to evaluate the impact of the urban topography within the locality on the dispersion of traffic related pollutants. The results revealed pollutant concentrations were below the relevant standards across the site.