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# AIR QUALITY ASSESSMENT
# WOOLTON ROAD, LIVERPOOL

**REC REFERENCE:** AQ100787R3

**REPORT PREPARED FOR:** REDROW HOMES

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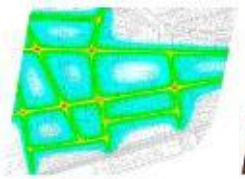

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## EXECUTIVE SUMMARY

Resource and Environmental Consultants Ltd was commissioned by Redrow Homes to undertake an Air Quality Assessment in support of a planning application for a residential development on land off Woolton Road, Liverpool.

The proposals comprise the development of the site to provide approximately 160 residential units and associated infrastructure.

The site is located in close proximity to the B5171, a busy dual carriageway and significant source of road vehicle exhaust emissions, and is also located within an area identified by Liverpool City Council as experiencing elevated pollutant concentrations. Subsequently there are concerns that the proposals will introduce future users to poor air quality. Additionally, the development has the potential to cause air quality impacts at sensitive locations. These may include fugitive dust emissions from construction works and road vehicle exhaust emissions associated with traffic generated by the site during the operational phase. As such, an Air Quality Assessment was required to quantify pollutant levels across the site, consider its suitability for residential use and assess potential impacts as a result of the development.

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.

Dispersion modelling was undertaken in order to quantify existing pollutant concentrations at the site and predict air quality impacts as a result of road vehicle exhaust emissions associated with traffic generated by the development.

The dispersion modelling indicated that pollutant levels across the site were below the relevant air quality standards and, as such, the location is considered suitable for residential use without the inclusion of mitigation methods. Additionally, the assessment concluded that impacts on pollutant levels as a result of operational phase vehicle exhaust emissions were not predicted to be significant at any sensitive location in the vicinity of the site. The use of robust assumptions, where necessary, was considered to provide sufficient results confidence for an assessment of this nature.

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

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# 1.0 INTRODUCTION

## 1.1 Background

Resource and Environmental Consultants (REC) Ltd was commissioned by Redrow Homes to undertake an Air Quality Assessment in support of a planning application for a proposed residential development on land off Woolton Road, Liverpool.

The site is located in close proximity to the B5171, a busy dual carriageway and significant source of road vehicle exhaust emissions, and is also located within an area identified by Liverpool City Council (LCC) as experiencing elevated pollutant concentrations. Subsequently, there are concerns that the proposals will introduce future users to poor air quality. Additionally, the development has the potential to cause air quality impacts at sensitive locations. As such, an Air Quality Assessment was required to quantify baseline conditions, assess suitability for residential use and consider potential effects in the vicinity of the site.

## 1.2 Site Location and Context

The site is located on land off Woolton Road, Liverpool at approximate National Grid Reference (NGR): 341300, 386000. Reference should be made to Figure 1 for a location plan and Figure 2 for a site layout.

The proposals comprise the development of the site to provide approximately 160 residential units and associated infrastructure.

The development is located within an Air Quality Management Area (AQMA), declared by LCC due to exceedences of the annual mean Air Quality Objective (AQO) for nitrogen dioxide ($NO_2$). Additionally, the site is located in close proximity the B5171, a busy dual carriageway and significant source of road vehicle exhaust emissions. As such, there are concerns that the proposals could expose future site users to elevated pollution concentrations. Additionally, the development has the potential to cause air quality impacts at sensitive receptor locations as a result of emissions associated with the construction and operational phases. An Air Quality Assessment was therefore required to determine baseline conditions, consider location suitability for residential use and provide consideration of potential effects as a result of the proposals. This is detailed in the following report.

## 1.3 Limitations

This report has been produced in accordance with REC's standard terms of engagement. REC has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from REC; a charge may be levied against such approval.

# 2.0 LEGISLATION AND POLICY

## 2.1 European Legislation

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 objectives for particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$). The consolidated Directives include:

- Directive 99/30/EC - the First Air Quality "Daughter" Directive - sets ambient Air Quality Limit Values (AQLVs) for $NO_2$, oxides of nitrogen ($NO_x$), sulphur dioxide, lead and particulate matter with an aerodynamic diameter of less than 10µm ($PM_{10}$);
- 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.

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

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

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 2007[1]. The AQS sets out Air Quality Objectives (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 compliance vary slightly.

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

[1] The Air Quality Strategy 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 more than 18 times a year |
| $PM_{10}$ | 40 | Annual mean |
| | 50 | 24-hour mean; not to be exceeded more than 35 times a year |

Table 2 summarises the advice provided in DEFRA guidance LAQM.TG(09)[2] on where the AQOs for pollutants considered within this report apply.

**Table 2 Examples of Where the Air Quality Objectives Apply**

| Averaging Period | Objectives Should Apply At | Objectives Should Not Apply At |
|---|---|---|
| Annual mean | All locations where members of the public might be regularly exposed<br>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<br>Hotels, unless people live there as their permanent residence<br>Gardens of residential properties<br>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-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets)<br>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<br>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] Local Air Quality Management Technical Guidance LAQM.TG(09), DEFRA, 2009.

### 2.3 Local Air Quality Management

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 considering present and likely future air quality against the AQOs. If it is predicted that levels at sensitive locations where members of the public are regularly present for the relevant averaging period 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

The main requirements with respect to dust control from industrial or trade premises not regulated under the Environmental Permitting (England and Wales) Regulations (2010) and subsequent amendments, 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."

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 National Planning Policy Framework

The National Planning Policy Framework[3] (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 this assessment:

> "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"
>
> "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

[3] National Planning Policy Framework, Department for Communities and Local Government, 2012.

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."

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

### 2.5.2 National Planning Practice Guidance

The National Planning Practice Guidance[4] (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?

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

## 2.6 Local Planning Policy

The City of Liverpool Unitary Development Plan[5] (UDP) was formally adopted in 2002 and provides a framework for development within the city. A number of policies contained within the UDP have been saved in accordance with the Planning and Compulsory Purchase Act (2004) and therefore provide the basis for the determination of planning applications prior to the finalisation of the Local Development Framework.

A review of the UDP indicated the following policy in relation to air quality that is relevant to this assessment:

"Policy EP11

1. Planning permissions will not be granted for development which has the potential to create unacceptable air, water, noise or other pollution or nuisance."

Reference has been made to this policy during the undertaking of this Air Quality Assessment by assessing pollutant concentrations across the development and determining potential air quality impacts from the operation of the proposals.

[4] http://planningguidance.planningportal.gov.uk/.
[5] The City of Liverpool Unitary Development Plan, Liverpool City Council, 2002.

## 3.0 METHODOLOGY

The proposed development has the potential to cause air quality impacts during the construction and operational phases in addition to exposing future site users to elevated pollution levels. These issues have been assessed in accordance with the following methodology.

### 3.1 Construction Phase Assessment

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'[6].

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

- Demolition;
- Earthworks;
- Construction; and,
- Trackout.

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 $PM_{10}$.

The assessment steps are detailed below.

#### 3.1.1 Step 1

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

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

#### 3.1.2 Step 2

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

[6] Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management, 2014.

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 defined as low, medium or high sensitivity (Step 2B).

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

Step 2A defines the potential magnitude of dust emission through the construction phase. The relevant criteria are summarised in Table 3.

**Table 3 Construction Dust - Magnitude of Emission**

| Magnitude | Activity | Criteria |
|---|---|---|
| Large | Demolition | • Total building volume greater than 50,000m$^3$<br>• Potentially dusty construction material (e.g. concrete)<br>• On-site crushing and screening<br>• Demolition activities greater than 20m above ground level |
| | Earthworks | • Total site area greater than 10,000m$^2$<br>• Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size)<br>• More than 10 heavy earth moving vehicles active at any one time<br>• Formation of bunds greater than 8m in height<br>• More than 100,000 tonnes of material moved |
| | Construction | • Total building volume greater than 100,000m$^3$<br>• On site concrete batching<br>• Sandblasting |
| | Trackout | • More than 50 Heavy Duty Vehicle (HDV) trips per day<br>• Potentially dusty surface material (e.g. high clay content)<br>• Unpaved road length greater than 100m |
| Medium | Demolition | • Total building volume 20,000m$^3$ to 50,000m$^3$<br>• Potentially dusty construction material<br>• Demolition activities 10m to 20m above ground level |
| | Earthworks | • Total site area 2,500m$^2$ to 10,000m$^2$<br>• Moderately dusty soil type (e.g. silt)<br>• 5 to 10 heavy earth moving vehicles active at any one time<br>• Formation of bunds 4m to 8m in height<br>• Total material moved 20,000 tonnes to 100,000 tonnes |

| Magnitude | Activity | Criteria |
|---|---|---|
| | Construction | • Total building volume 25,000m$^3$ to 100,000m$^3$<br>• Potentially dusty construction material (e.g. concrete)<br>• On site concrete batching |
| | Trackout | • 10 to 50 HDV trips per day<br>• Moderately dusty surface material (e.g. high clay content)<br>• Unpaved road length 50m to 100m |
| Small | Demolition | • Total building volume under 20,000m$^3$<br>• Construction material with low potential for dust release (e.g. metal cladding or timber)<br>• Demolition activities less than 10m above ground level<br>• Demolition during wetter months |
| | Earthworks | • Total site area less than 2,500m$^2$<br>• Soil type with large grain size (e.g. sand)<br>• Less than 5 heavy earth moving vehicles active at any one time<br>• Formation of bunds less than 4m in height<br>• Total material moved less than 20,000 tonnes<br>• Earthworks during wetter months |
| | Construction | • Total building volume less than 25,000m$^3$<br>• Construction material with low potential for dust release (e.g. metal cladding or timber) |
| | Trackout | • Less than 10 HDV trips per day<br>• Surface material with low potential for dust release<br>• Unpaved road length less than 50m |

Step 2B defines the sensitivity of the area around the development site for demolition, construction, earthworks and trackout. The factors influencing the sensitivity of the area are shown in Table 4.

**Table 4 Examples of Factors Defining Sensitivity of an Area**

| Sensitivity | Examples | |
|---|---|---|
| | **Human Receptors** | **Ecological Receptors** |
| High | • Users expect of high levels of amenity<br>• High aesthetic or value property<br>• People expected to be present continuously for extended periods of time<br>• Locations where members of the public are exposed over a time period relevant to the AQO for $PM_{10}$ e.g. residential properties, hospitals, schools and residential care homes | • Internationally or nationally designated site e.g. Special Area of Conservation |

| Sensitivity | Examples | |
|---|---|---|
| | **Human Receptors** | **Ecological Receptors** |
| Medium | • Users would expect to enjoy a reasonable level of amenity<br>• Aesthetics or value of their property could be diminished by soiling<br>• 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<br>• Property would not be expected to be diminished in appearance<br>• 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 |

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

- 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 the 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.

These factors were considered in the undertaking of this assessment.

The sensitivity of the area to dust soiling effects on people and property is shown in Table 5.

**Table 5 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 |

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

Table 6 outlines the sensitivity of the area to human health impacts.

**Table 6 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 |
| | | 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 | - | More than 10 | High | Medium | Low | Low | Low |
| | - | 1 - 10 | Medium | Low | Low | Low | Low |
| Low | - | More than 1 | Low | Low | Low | Low | Low |

Table 7 outlines the sensitivity of the area to ecological impacts.

**Table 7 Sensitivity of the Area to Ecological Impacts**

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

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

Step 2C combines the dust emission magnitude with the sensitivity of the area to determine the risk of unmitigated impacts. Table 8 outlines the risk category from earthworks and construction activities.

**Table 8 Dust Risk Category from Earthworks and Construction**

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

Table 9 outlines the risk category from trackout.

**Table 9 Dust Risk Category from Trackout**

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

### 3.1.3 Step 3

Step 3 requires the identification of site specific mitigation measures within the IAQM guidance 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.

### 3.1.4 Step 4

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'. This has been described as **negligible** within this report to provide continuity between

assessment terminologies.

The determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts. The IAQM[7] guidance suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix III.

### 3.2 Operational Phase Assessment

The development has the potential to impact on existing air quality as a result of road traffic exhaust emissions, such as $NO_2$ and $PM_{10}$, associated with vehicles travelling to and from the site, as well as expose future users to elevated pollutant levels. Potential impacts have been defined by predicting pollutant concentrations at sensitive locations using dispersion modelling for the following scenarios:

- 2013 Verification;
- Opening year do-minimum (DM) (predicted traffic flows in 2021 should the proposals not proceed); and,
- Opening year do-something (DS) (predicted traffic flows in 2021 should the proposals be completed).

Reference should be made to Appendix II for assessment input data and details of the verification process.

Receptors potentially sensitive to changes in $NO_2$ and $PM_{10}$ concentrations were identified within 200m of the affected highway network in accordance with the guidance provided within the Design Manual for Roads and Bridges (DMRB)[8] on the likely limits of pollutant dispersion from road sources. LAQM.TG(09)[9] provides the following examples of where annual mean AQOs should apply:

- Residential properties;
- Schools;
- Hospitals; and,
- Care homes.

The sensitivity impact significance of each receptor was defined in accordance with the criteria shown in Table 10. These are based upon the guidance provided within the Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) guidance 'Land-Use Planning and Development Control: Planning for Air Quality'[10].

7 Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management, 2014.
8 Design Manual for Roads and Bridges Volume 11, Section 3, Part 1, HA207/07, Highways Agency, 2007.
9 Local Air Quality Management Technical Guidance LAQM.TG(09), DEFRA, 2009.
10 Land-Use Planning and Development Control: Planning for Air Quality, Environmental Protection UK and Institute of Air Quality Management, 2015.

**Table 10 Operational Traffic Exhaust Emissions - Significance of Impact**

| Long Term Average Concentration | % Change in Concentration Relative to AQO | | | |
|---|---|---|---|---|
| | 1 | 2-5 | 6-10 | >10 |
| 75% or less of AQO | Negligible | Negligible | Slight | Moderate |
| 76 - 94% of AQO | Negligible | Slight | Moderate | Moderate |
| 95 - 102% of AQO | Slight | Moderate | Moderate | Substantial |
| 103 - 109% of AQO | Moderate | Moderate | Substantial | Substantial |
| 110% or more of AQO | Moderate | Substantial | Substantial | Substantial |

The criteria shown in Table 10 is adapted from the EPUK and IAQM guidance 'Land-Use Planning and Development Control: Planning for Air Quality'[11] with sensitivity descriptors included to allow comparisons of various air quality impacts. It should be noted that changes of 0%, i.e. less than 0.5%, will be described as negligible in accordance with the EPUK and IAQM guidance.

Following the prediction of impacts at discrete receptor locations utilising the criteria in Table 10, the EPUK and IAQM[13] document states that this framework is to be used as a starting point to make a judgement on significance of effect but other influences might need to be accounted for. Whilst impacts might be determined as 'slight', 'moderate' or 'substantial' at individual receptors, overall effect might not necessarily be deemed as significant in some circumstances. The following factors may provide some assistance in determining the overall significance of a development:

- Number of properties affected by significant air quality impacts and a judgement on the overall balance;
- Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective will be relevant;
- The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors;
- Whether or not an exceedence of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease; and,
- The extent to which an objective is exceeded e.g. an annual mean $NO_2$ concentration of 41µg/m$^3$ should attract less significance than an annual mean of 51µg/m$^3$.

These factors were considered and an overall significance determined for the impact of operational phase road traffic emissions. It should be noted that the determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts.

[11] Land-Use Planning and Development Control: Planning for Air Quality, Environmental Protection UK and Institute of Air Quality Management, 2015.

## 4.0 BASELINE

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.

### 4.1 Local Air Quality Management

As required by the Environment Act (1995), LCC has undertaken Review and Assessment of air quality within their area of jurisdiction. This process concluded that concentrations of $NO_2$ are above the AQO within the district. As such, an AQMA has been declared, described as:

> "Liverpool City AQMA - An area encompassing the whole of the City of Liverpool."

The proposed site is located within the Liverpool City AQMA and as such, there is the potential for the development to introduce future site users to elevated pollutant concentrations as well as cause adverse impacts to air quality within this area. This has been considered within this report.

LCC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs and as such no further AQMAs have been designated.

### 4.2 Air Quality Monitoring

Monitoring of pollutant concentrations is undertaken by LCC using continuous and periodic methods throughout their area of jurisdiction. The closest continuous monitor to the proposed development is Speke, located at NGR: 343884, 383601, approximately 3.3km south-east of the development boundary. Due to the distance between the sites, similar pollutant concentrations would not be anticipated and this source of data has not been considered further within this report.

LCC also utilise passive diffusion tubes to monitor $NO_2$ concentrations throughout the city. A review of the 2013 LAQM Air Quality Progress Report[12] indicates that there are two monitoring sites in the vicinity of the proposed development and monitoring results from recent years are summarised in Table 11. Exceedences of the relevant AQO are highlighted in **bold**.

**Table 11 $NO_2$ Monitoring Results**

| Location | | Type | NGR (m) | | Annual Mean Concentration (µg/m$^3$) | | |
|---|---|---|---|---|---|---|---|
| | | | X | Y | 2011 | 2012 | 2013 |
| S54 | Hillfoot Road/Allerton Road Junction Lamp LH p J C2507 | Urban Roadside | 341976 | 386333 | **44** | **54** | **58** |
| S55 | Speke Road 1st Dual Pelican Cross 2672/2673 | Urban Roadside | 340959 | 384247 | **60** | **71** | **71** |

As indicated in Table 11, the annual mean AQO for $NO_2$ was exceeded at both monitoring locations during recent years. This is to be expected due to their urban roadside locations within an AQMA.

[12] 2013 Air Quality Progress Report for Liverpool City Council, 2013.

Reference should be made to Figure 3 for a graphical representation of the monitoring locations.

### 4.3 Background Pollutant Concentrations

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: 341500, 386500. Data for this location was downloaded from the DEFRA website[13] for the purpose of this assessment and is summarised in Table 12 for the verification year (2013) and the predicted development opening year (2021).

**Table 12 Predicted Background Pollutant Concentrations**

| Pollutant | Predicted Background Concentration (µg/m$^3$) | |
|---|---|---|
| | 2013 | 2021 |
| $NO_x$ | 25.26 | 19.42 |
| $NO_2$ | 18.08 | 14.33 |
| $PM_{10}$ | 14.37 | 13.36 |

As shown in Table 12, background concentrations in the vicinity of the site do not exceed the relevant AQOs. Comparison with the monitoring results indicates the significant impact that vehicle exhaust emissions from the highway network have on pollutant concentrations at roadside locations.

### 4.4 Sensitive Receptors

A sensitive receptor is defined as any location which may be affected by changes in air quality as a result of a development. These have been defined for dust and road vehicle exhaust emission impacts in the following Sections.

#### 4.4.1 Construction Phase Sensitive Receptors

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 Demolition, Earthworks and Construction Dust Sensitive Receptors**

| Distance from Site Boundary (m) | Approximate Number of Residential Receptors | Approximate Number of Ecological Receptors |
|---|---|---|
| Less than 20 | 1 - 10 | 0 |
| 20 - 50 | 10 - 100 | 0 |
| 50 - 100 | 10 - 100 | - |

[13] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html.

| Distance from Site Boundary (m) | Approximate Number of Residential Receptors | Approximate Number of Ecological Receptors |
|---|---|---|
| 100 - 350 | More than 100 | - |

Reference should be made to Figure 4 for a graphical representation of demolition, earthworks and construction dust buffer zones.

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. The exact construction vehicle access routes were not available for the purpose of this assessment as they will depend on sourcing of materials. This is likely to be decided by the contractor. However, it was assumed traffic would access the site from Woolton Road and Allerton Road to ensure the maximum potential trackout distance was considered.

**Table 14 Trackout Dust Sensitive Receptors**

| Distance from Site Access Route (m) | Approximate Number of Residential Receptors | Approximate Number of Ecological Receptors |
|---|---|---|
| Less than 20 | 10 - 100 | 0 |
| 20 - 50 | 10 - 100 | 0 |

Reference should be made to Figure 5 for a graphical representation of trackout dust buffer zones.

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.

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 proposals are located in close proximity to Allerton Park Golf Course. As such, historical dust generation may have occurred as a result of wind-blown emissions from this facility |
| The likelihood of concurrent dust generating activity on nearby sites | A review of the LCC planning portal indicated that planning permission has been granted at the former New Heys Community Comprehensive School (LCC ref: 13F/1823) which is located approximately 120m north west of the proposed development. As such, there is a risk of concurrent dust generating activity should the construction phases overlap |

| Guidance | Comment |
|---|---|
| Pre-existing screening between the source and the receptors | Vegetation and a stone boundary wall are present along the entire site boundary. If retained, this will provide a natural protective screen to receptors in these directions |
| Conclusions drawn from analysing local meteorological data which accurately represent the area: and if relevant the season during which works will take place | The wind direction is predominantly from the north-west of the development, as shown in Figure 6. As such, properties to the south-east would be most affected by dust emissions |
| Conclusions drawn from local topography | The topography of the area appears to be predominantly flat. As such, there are no 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 likely 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 |

Based on the criteria shown in Table 4, the sensitivity of the receiving environment to potential dust impacts was considered to be **high**. This was because users would expect to enjoy a reasonable level of amenity, aesthetics or 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.

The sensitivity of the receiving environment to specific potential dust impacts, based on the criteria shown in Section 3.1.2, is shown in Table 16.

**Table 16 Sensitivity of the Surrounding Area**

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

### 4.4.2 Operational Phase Sensitive Receptors

Receptors sensitive to potential operational phase road vehicle exhaust emission impacts were identified from a desk-top study and are summarised in Table 17. All sensitive receptors were modelled at a height of 1.5m to represent ground floor level. It should be noted that R4, the Redrow Homes development at the former New Heys Comprehensive School, is still under construction (planning application reference: 13F/1823). This location has been modelled to predict the future impacts upon this location.

**Table 17 Road Vehicle Exhaust Emission Sensitive Receptors**

| Receptor | | NGR (m) | |
|---|---|---|---|
| | | X | Y |
| R1 | Residential - 434 Allerton Road | 340693.5 | 386628.8 |
| R2 | Residential - 442 Allerton Road | 340748.5 | 386506.4 |
| R3 | Residential - 454 Allerton Road | 340835.7 | 386419.0 |
| R4 | Residential – Redrow Homes Development, Heath Road | 340924.0 | 386221.0 |
| R5 | Residential - Priory Bungalow | 341021.8 | 386087.3 |
| R6 | Residential - The Orchard, Woolton Road | 341599.5 | 386033.8 |
| R7 | Residential - Elm Cottage, Woolton Road | 341796.3 | 386212.1 |
| R8 | Residential - 1-12 Cheddar Close | 341903.2 | 386508.5 |
| R9 | Residential - 50 Springwood Avenue | 341054.4 | 385584.2 |
| R10 | Residential - 491 Springwood Avenue | 340826.0 | 385759.7 |
| R11 | Residential - 674 Mather Avenue | 340889.3 | 385266.3 |
| R12 | Residential - 3 Danefield Terrace | 340912.9 | 385487.2 |
| R13 | Residential - 312 Mather Avenue | 340634.3 | 385922.2 |
| R14 | Residential - 290 Mather Avenue | 340574.6 | 386033.1 |
| R15 | Residential - 266 Mather Avenue | 340512.7 | 386145.4 |
| R16 | Residential - 239 Mather Avenue | 340452.3 | 386362.2 |
| R17 | Residential - 213 Mather Avenue | 340358.3 | 386527.5 |
| R18 | Residential - 166 Woolton Road | 341029.9 | 385184.1 |
| R19 | Residential - 186 Woolton Road | 341108.0 | 385222.7 |
| R20 | Residential - 190 Mather Avenue | 341211.8 | 385329.2 |
| R21 | Residential - 4 Woolton Road | 341559.0 | 385924.3 |

The sensitive receptors identified in Table 17 represent worst-case locations. However, this is not an exhaustive list and there may be other locations within the vicinity of the site that may experience air quality impacts as a result of the proposed development that have not been individually identified above. Reference should be made to Figure 7 for a graphical representation of road vehicle exhaust emission sensitive receptor locations.

Receptor sensitivity was defined based upon the methodology outlined in Table 4 and predicted pollutant concentrations for the development opening year of 2021. These are detailed within Table 18.

**Table 18 Road Vehicle Exhaust Emission Receptor Sensitivity**

| Receptor | $NO_2$ | | $PM_{10}$ | |
|---|---|---|---|---|
| | Predicted Annual Mean Concentration ($\mu g/m^3$) | Long Term Average Concentration | Predicted Annual Mean Concentration ($\mu g/m^3$) | Long Term Average Concentration |
| R1 | 22.78 | 75% or Less of AQO | 15.10 | 75% or Less of AQO |
| R2 | 22.86 | 75% or Less of AQO | 15.11 | 75% or Less of AQO |
| R3 | 22.56 | 75% or Less of AQO | 15.06 | 75% or Less of AQO |
| R4 | 21.23 | 75% or Less of AQO | 14.86 | 75% or Less of AQO |
| R5 | 23.82 | 75% or Less of AQO | 15.28 | 75% or Less of AQO |
| R6 | 22.94 | 75% or Less of AQO | 15.17 | 75% or Less of AQO |
| R7 | 29.28 | 75% or Less of AQO | 16.27 | 75% or Less of AQO |
| R8 | 28.19 | 75% or Less of AQO | 15.90 | 75% or Less of AQO |
| R9 | 23.19 | 75% or Less of AQO | 15.27 | 75% or Less of AQO |
| R10 | 27.28 | 75% or Less of AQO | 15.81 | 75% or Less of AQO |
| R11 | 25.98 | 75% or Less of AQO | 15.67 | 75% or Less of AQO |
| R12 | 27.21 | 75% or Less of AQO | 15.88 | 75% or Less of AQO |
| R13 | 24.61 | 75% or Less of AQO | 15.43 | 75% or Less of AQO |
| R14 | 24.78 | 75% or Less of AQO | 15.46 | 75% or Less of AQO |
| R15 | 24.59 | 75% or Less of AQO | 15.42 | 75% or Less of AQO |
| R16 | 26.49 | 75% or Less of AQO | 15.74 | 75% or Less of AQO |
| R17 | 29.86 | 75% or Less of AQO | 15.90 | 75% or Less of AQO |
| R18 | 23.08 | 75% or Less of AQO | 15.25 | 75% or Less of AQO |
| R19 | 21.86 | 75% or Less of AQO | 15.03 | 75% or Less of AQO |
| R20 | 20.97 | 75% or Less of AQO | 14.86 | 75% or Less of AQO |

| Receptor | $NO_2$ | | $PM_{10}$ | |
|---|---|---|---|---|
| | Predicted Annual Mean Concentration ($\mu g/m^3$) | Long Term Average Concentration | Predicted Annual Mean Concentration ($\mu g/m^3$) | Long Term Average Concentration |
| R21 | 29.29 | 75% or Less of AQO | 16.31 | 75% or Less of AQO |

## 5.0 ASSESSMENT

There is the potential for air quality impacts as a result of the construction and operation of the proposed development in addition to the exposure of future site users to elevated pollution levels. These are assessed in the following Sections.

### 5.1 Construction Phase Assessment

#### 5.1.1 Step 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.

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.

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.

#### 5.1.2 Step 2

**Demolition**

Demolition will involve the removal of existing buildings on the site. It is anticipated that the volume of buildings to be demolished is likely to be less than 20,000m$^3$. As such, the magnitude of potential dust emissions from demolition activities is **small**, in accordance with the criteria outlined in Table 3.

Table 16 indicates the sensitivity of the area to dust soiling effects on people and property is **medium**. In accordance with the criteria outlined in Table 3, the development is considered to be a **low** risk site for dust soiling as a result of demolition activities.

Table 16 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 8, the development is considered to be a **negligible** risk site for human health as a result of demolition activities.

**Earthworks**

Earthworks will primarily involve excavating material, haulage, tipping and stockpiling, as well as site levelling and landscaping. Information on soil type was not available for the purpose of this assessment. As such, the soil type was considered to be potentially dusty in order to provide a worst-case scenario.

The proposed development site is estimated to cover an area greater than 10,000m$^2$. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from earthworks is therefore **large**.

Table 16 indicates the sensitivity of the area to dust soiling effects on people and property is **medium**. In accordance with the criteria outlined in Table 8, the development is considered to be a **medium** risk site for dust soiling as a result of earthworks activities.

Table 16 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 8, the development is considered to be a **low** risk site for human health as a result of earthwork activities.

**Construction**

Due to the size of the development site the total building volume is likely to be greater than 100,000$m^3$. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from construction is therefore **large**.

Table 16 indicates the sensitivity of the area to dust soiling effects on people and property is **medium**. In accordance with the criteria outlined in Table 8, the development is considered to be a **medium** risk site for dust soiling as a result of construction activities.

Table 16 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 8, the development is considered to be a **low** risk site for human health as a result of construction activities.

**Trackout**

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.

Based on the site area, it is anticipated that the unpaved road length is likely to be greater than 100m. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from trackout is therefore **large**.

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 9, the development is considered to be a **high** risk site for dust soiling as a result of trackout activities.

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

**Summary of the Risk of Dust Effects**

A summary of the risk from each dust generating activity is provided in Table 19.

**Table 19 Summary of Potential Unmitigated Dust Risks**

| Potential Impact | Risk | | | |
|---|---|---|---|---|
| | Demolition | Earthworks | Construction | Trackout |
| Dust Soiling | Low | Medium | Medium | High |
| Human Health | Negligible | Low | Low | Low |

As indicated in Table 19, the potential risk of dust soiling is **high** from trackout activities, **medium** from earthworks and construction activities and **low** from demolition activities. The potential risk of human health impacts are **low** from earthworks, construction and trackout activities and **negligible** from demolition activities.

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.

### 5.1.3 Step 3

The IAQM guidance provides a number of potential mitigation measures to reduce impacts during the construction phase. These measures have been adapted for the development site as summarised in Table 20. These may be reviewed prior to the commencement of construction works and incorporated into a Construction Environmental Management Plan if required by the Local Planning Authority.

**Table 20 Fugitive Dust Mitigation Measures**

| Issue | Control Measure |
|---|---|
| Communications | • Develop and implement a Stakeholder Communications Plan that includes community engagement<br>• Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary<br>• Display the head or regional office contact information<br>• 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<br>• Record any exceptional incidents that cause dust/or air emissions, and the action taken to resolve the situation<br>• Make complaints log available to LA when asked |
| Monitoring | • Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust<br>• Carry out regular site inspections to monitor compliance with the DMP<br>• Increase frequency of site inspections when activities with a high potential to produce dust are being carried out |

| Issue | Control Measure |
|---|---|
| Preparing and Maintaining the Site | • Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible<br>• Fully enclose site or specific operations where there is a high potential for dust production and the site as actives for an extensive period<br>• Avoid site runoff of water or mud<br>• Use water as dust suppressant where applicable<br>• Keep site fencing, barriers and scaffolding clean using wet methods.<br>• Remove materials that have a potential to produce dust from site as soon as possible<br>• Cover, seed or fence stockpiles to prevent wind whipping |
| Operating Vehicle/ Machinery and Sustainable Travel | • All vehicles to switch off engines - no idling vehicles<br>• Avoid the use of diesel or petrol powered generators where practicable<br>• Impose and sign-post a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas<br>• Implement a Travel Plan that supports and encourages sustainable travel<br>• Produce a Construction Logistics Plan to manage sustainable deliveries |
| Operations | • Cutting equipment to use water as dust suppressant or suitable local extract ventilation<br>• Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation<br>• Use enclosed chutes and covered skips<br>• Minimise drop heights<br>• Ensure equipment is readily available on site to clean any spillages |
| Waste Management | • No bonfires |
| Earthworks and Construction | • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out |
| Demolition | • Ensure effective water suppression is used during demolitions operations<br>• Avoid explosive blasting<br>• Bag and remove any biological debris or damp down before demolition |
| Earthworks and Construction | • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out |

| Issue | Control Measure |
|---|---|
| Trackout | • Use water-assisted dust sweeper on the access and local roads<br>• Avoid dry sweeping of large areas<br>• Ensure vehicles entering and leaving sites are covered to prevent escape of materials<br>• Inspect on-site routes for integrity, instigate necessary repairs and record in site log book<br>• Install hard surfaced haul routes which are regularly damped down<br>• Implement a wheel washing system at a suitable location near site exit<br>• Access gates 10m from receptors where possible<br>• Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits |

### 5.1.4 Step 4

Assuming the relevant mitigation measures outlined in Table 20 are implemented, the residual effect from all dust generating activities is predicted to be **negligible**, in accordance with the IAQM guidance.

## 5.2 Operational Phase Assessment

Additional vehicle movements associated with the operation of the proposed development will generate exhaust emissions, such as $NO_2$ and $PM_{10}$, on the local and regional road networks. An assessment was therefore undertaken using dispersion modelling in order to quantify potential changes in pollutant concentrations at sensitive locations in the vicinity of the site.

The assessment considered the following scenarios:

- 2013 Verification;
- 2021 DM; and,
- 2021 DS.

The DM (i.e. without development) scenario is representative of anticipated traffic data for 2021. The DS (i.e. with development) scenarios are representative of anticipated traffic data for 2021 with the addition of predicted variations in traffic flow patterns as a result of the proposals.

For the purpose of this assessment traffic data was supplied for 2021, the development opening year. Air quality is predicted to improve in the future. However, in order to provide a robust assessment, emission factors for 2013 were utilised within the dispersion model. The use of 2021 traffic data and 2013 emission factors is considered to provide a worst-case scenario and therefore a sufficient level of confidence can be placed within the predicted pollution concentrations.

Reference should be made to Appendix II for full assessment input details.

### 5.2.1 Nitrogen Dioxide

**Predicted Concentrations at the Development Site**

Annual mean $NO_2$ concentrations were predicted across the development for the DM and DS scenarios, as shown in Figure 8 and Figure 9. Concentrations were predicted to be below the AQO across the entirety of the site both with and without the proposals in place, with levels ranging from 19.49µg/$m^3$ to 31.46µg/$m^3$ in the DS scenario.

Based on the results of the dispersion modelling assessment, the site is considered to be suitable for residential use without the implementation of mitigation techniques to protect future users from elevated $NO_2$ concentrations.

**Predicted Concentrations at Sensitive Receptors**

Annual mean $NO_2$ concentrations were predicted for the 2021 DM and DS scenarios and are summarised in Table 21.

**Table 21 Predicted Annual Mean $NO_2$ Concentrations**

| Sensitive Receptor | | Predicted Annual Mean $NO_2$ Concentration (µg/$m^3$) | | |
|---|---|---|---|---|
| | | DM | DS | Change |
| R1 | Residential - 434 Allerton Road | 22.46 | 22.78 | 0.32 |
| R2 | Residential - 442 Allerton Road | 22.54 | 22.86 | 0.32 |
| R3 | Residential - 454 Allterton Road | 22.26 | 22.56 | 0.30 |
| R4 | Residential - Redrow Homes Development, Heath Road | 21.05 | 21.23 | 0.18 |
| R5 | Residential - Priory Bungalow | 23.44 | 23.82 | 0.38 |
| R6 | Residential - The Orchard, Woolton Road | 22.68 | 22.94 | 0.26 |
| R7 | Residential - Elm Cottage, Woolton Road | 28.67 | 29.28 | 0.61 |
| R8 | Residential - 1-12 Cheddar Close | 27.78 | 28.19 | 0.41 |
| R9 | Residential - 50 Springwood Avenue | 23.08 | 23.19 | 0.11 |
| R10 | Residential - 491 Springwood Avenue | 27.11 | 27.28 | 0.17 |
| R11 | Residential - 674 Mather Avenue | 25.78 | 25.98 | 0.20 |
| R12 | Residential - 3 Danefield Terrace | 26.98 | 27.21 | 0.23 |
| R13 | Residential - 312 Mather Avenue | 24.44 | 24.61 | 0.17 |
| R14 | Residential - 290 Mather Avenue | 24.61 | 24.78 | 0.17 |
| R15 | Residential - 266 Mather Avenue | 24.42 | 24.59 | 0.17 |

| Sensitive Receptor | | Predicted Annual Mean $NO_2$ Concentration ($\mu g/m^3$) | | |
|---|---|---|---|---|
| | | DM | DS | Change |
| R16 | Residential - 239 Mather Avenue | 26.29 | 26.49 | 0.20 |
| R17 | Residential - 213 Mather Avenue | 29.61 | 29.86 | 0.25 |
| R18 | Residential - 166 Woolton Road | 22.93 | 23.08 | 0.15 |
| R19 | Residential - 186 Woolton Road | 21.74 | 21.86 | 0.12 |
| R20 | Residential - 190 Mather Avenue | 20.88 | 20.97 | 0.09 |
| R21 | Residential - 4 Woolton Road | 28.68 | 29.29 | 0.61 |

As indicated in Table 21, predicted annual mean $NO_2$ concentrations did not exceed the AQO at any sensitive receptor locations.

Predicted impacts on annual mean $NO_2$ concentrations at the sensitive receptor locations are summarised in Table 22.

**Table 22 Predicted $NO_2$ Impacts**

| Sensitive Receptor | | % Change in Concentration Relative to AQO | Long Term Average Concentration | Significance of Impact |
|---|---|---|---|---|
| R1 | Residential - 434 Allerton Road | 0.80 | 75% or Less of AQO | Negligible |
| R2 | Residential - 442 Allerton Road | 0.80 | 75% or Less of AQO | Negligible |
| R3 | Residential - 454 Allterton Road | 0.75 | 75% or Less of AQO | Negligible |
| R4 | Residential - Redrow Homes Development, Heath Road | 0.45 | 75% or Less of AQO | Negligible |
| R5 | Residential - Priory Bungalow | 0.95 | 75% or Less of AQO | Negligible |
| R6 | Residential - The Orchard, Woolton Road | 0.65 | 75% or Less of AQO | Negligible |
| R7 | Residential - Elm Cottage, Woolton Road | 1.53 | 75% or Less of AQO | Negligible |
| R8 | Residential - 1-12 Cheddar Close | 1.03 | 75% or Less of AQO | Negligible |
| R9 | Residential - 50 Springwood Avenue | 0.28 | 75% or Less of AQO | Negligible |
| R10 | Residential - 491 Springwood Avenue | 0.43 | 75% or Less of AQO | Negligible |
| R11 | Residential - 674 Mather Avenue | 0.50 | 75% or Less of AQO | Negligible |
| R12 | Residential - 3 Danefield Terrace | 0.58 | 75% or Less of AQO | Negligible |
| R13 | Residential - 312 Mather Avenue | 0.42 | 75% or Less of AQO | Negligible |

| Sensitive Receptor | | % Change in Concentration Relative to AQO | Long Term Average Concentration | Significance of Impact |
|---|---|---|---|---|
| R14 | Residential - 290 Mather Avenue | 0.43 | 75% or Less of AQO | Negligible |
| R15 | Residential - 266 Mather Avenue | 0.42 | 75% or Less of AQO | Negligible |
| R16 | Residential - 239 Mather Avenue | 0.50 | 75% or Less of AQO | Negligible |
| R17 | Residential - 213 Mather Avenue | 0.63 | 75% or Less of AQO | Negligible |
| R18 | Residential - 166 Woolton Road | 0.37 | 76 - 94% of AQO | Negligible |
| R19 | Residential - 186 Woolton Road | 0.30 | 76 - 94% of AQO | Negligible |
| R20 | Residential - 190 Mather Avenue | 0.23 | 76 - 94% of AQO | Negligible |
| R21 | Residential - 4 Woolton Road | 1.53 | 75% or Less of AQO | Negligible |
| R22 | Residential - 105 Leyland Lane | 0.52 | 75% or Less of AQO | Negligible |
| R23 | Education - Golden Hill School | 0.23 | 75% or Less of AQO | Negligible |
| R24 | Residential - 138 Leyland Road | 0.67 | 75% or Less of AQO | Negligible |
| R25 | Residential - 33 Longmeanygate | 0.43 | 75% or Less of AQO | Negligible |
| R26 | Residential - 34 Heatherleigh | 0.40 | 75% or Less of AQO | Negligible |
| R27 | Residential - 17 Heatherleigh | 0.55 | 75% or Less of AQO | Negligible |
| R28 | Residential - 6 Heatherleigh | 0.52 | 75% or Less of AQO | Negligible |

As indicated in Table 22, the significance of impacts on annual mean $NO_2$ concentrations as a result of the development was predicted to be **negligible** at all locations.

### 5.2.2 Particulate Matter

**Predicted Concentrations at the Development Site**

Annual mean $PM_{10}$ concentrations were predicted across the development for the DM and DS scenarios, as shown in Figure 10 and Figure 11. Concentrations were predicted to be below the AQO across the entirety of the site both with and without the proposals in place, with levels ranging from 14.59µg/$m^3$ to 16.30µg/$m^3$ in the DS scenario.

Based on the results of the dispersion modelling assessment, the site is considered to be suitable for residential use without the implementation of mitigation techniques to protect future users from elevated $PM_{10}$ concentrations.

**Predicted Concentrations at Sensitive Receptors**

Annual mean $PM_{10}$ concentrations were predicted for each scenario and are summarised in

Table 23.

**Table 23 Predicted Annual Mean $PM_{10}$ Concentrations**

| Sensitive Receptor | | Predicted Annual Mean $PM_{10}$ Concentration ($\mu g/m^3$) | | |
|---|---|---|---|---|
| | | DM | DS | Change |
| R1 | Residential - 434 Allerton Road | 15.05 | 15.10 | 0.05 |
| R2 | Residential - 442 Allerton Road | 15.06 | 15.11 | 0.05 |
| R3 | Residential - 454 Allterton Road | 15.02 | 15.06 | 0.04 |
| R4 | Residential - Redrow Homes Development, Heath Road | 14.83 | 14.86 | 0.03 |
| R5 | Residential - Priory Bungalow | 15.21 | 15.28 | 0.07 |
| R6 | Residential - The Orchard, Woolton Road | 15.13 | 15.17 | 0.04 |
| R7 | Residential - Elm Cottage, Woolton Road | 16.16 | 16.27 | 0.11 |
| R8 | Residential - 1-12 Cheddar Close | 15.83 | 15.90 | 0.07 |
| R9 | Residential - 50 Springwood Avenue | 15.25 | 15.27 | 0.02 |
| R10 | Residential - 491 Springwood Avenue | 15.77 | 15.81 | 0.04 |
| R11 | Residential - 674 Mather Avenue | 15.63 | 15.67 | 0.04 |
| R12 | Residential - 3 Danefield Terrace | 15.84 | 15.88 | 0.04 |
| R13 | Residential - 312 Mather Avenue | 15.40 | 15.43 | 0.03 |
| R14 | Residential - 290 Mather Avenue | 15.42 | 15.46 | 0.04 |
| R15 | Residential - 266 Mather Avenue | 15.39 | 15.42 | 0.03 |
| R16 | Residential - 239 Mather Avenue | 15.69 | 15.74 | 0.05 |
| R17 | Residential - 213 Mather Avenue | 15.86 | 15.90 | 0.04 |
| R18 | Residential - 166 Woolton Road | 15.22 | 15.25 | 0.03 |
| R19 | Residential - 186 Woolton Road | 15.01 | 15.03 | 0.02 |
| R20 | Residential - 190 Mather Avenue | 14.84 | 14.86 | 0.02 |
| R21 | Residential - 4 Woolton Road | 16.19 | 16.31 | 0.12 |

As indicated in Table 23, annual mean $PM_{10}$ concentrations were below the relevant AQO at all sensitive receptor locations for both scenarios considered.

Predicted impacts on annual mean $PM_{10}$ concentrations are summarised in Table 24.

**Table 24 Predicted $PM_{10}$ Impacts**

| Sensitive Receptor | | % Change in Concentration Relative to AQO | Long Term Average Concentration | Significance of Impact |
|---|---|---|---|---|
| R1 | Residential - 434 Allerton Road | 0.13 | 75% or Less of AQO | Negligible |
| R2 | Residential - 442 Allerton Road | 0.13 | 75% or Less of AQO | Negligible |
| R3 | Residential - 454 Allterton Road | 0.10 | 75% or Less of AQO | Negligible |
| R4 | Residential – Redrow Homes Development, Heath Road | 0.08 | 75% or Less of AQO | Negligible |
| R5 | Residential - Priory Bungalow | 0.18 | 75% or Less of AQO | Negligible |
| R6 | Residential - The Orchard, Woolton Road | 0.10 | 75% or Less of AQO | Negligible |
| R7 | Residential - Elm Cottage, Woolton Road | 0.28 | 75% or Less of AQO | Negligible |
| R8 | Residential - 1-12 Cheddar Close | 0.18 | 75% or Less of AQO | Negligible |
| R9 | Residential - 50 Springwood Avenue | 0.05 | 75% or Less of AQO | Negligible |
| R10 | Residential - 491 Springwood Avenue | 0.10 | 75% or Less of AQO | Negligible |
| R11 | Residential - 674 Mather Avenue | 0.10 | 75% or Less of AQO | Negligible |
| R12 | Residential - 3 Danefield Terrace | 0.10 | 75% or Less of AQO | Negligible |
| R13 | Residential - 312 Mather Avenue | 0.08 | 75% or Less of AQO | Negligible |
| R14 | Residential - 290 Mather Avenue | 0.10 | 75% or Less of AQO | Negligible |
| R15 | Residential - 266 Mather Avenue | 0.08 | 75% or Less of AQO | Negligible |
| R16 | Residential - 239 Mather Avenue | 0.13 | 75% or Less of AQO | Negligible |
| R17 | Residential - 213 Mather Avenue | 0.10 | 75% or Less of AQO | Negligible |
| R18 | Residential - 166 Woolton Road | 0.08 | 75% or Less of AQO | Negligible |
| R19 | Residential - 186 Woolton Road | 0.05 | 75% or Less of AQO | Negligible |
| R20 | Residential - 190 Mather Avenue | 0.05 | 75% or Less of AQO | Negligible |
| R21 | Residential - 4 Woolton Road | 0.30 | 75% or Less of AQO | Negligible |

As indicated in Table 24, impacts on annual mean $PM_{10}$ concentrations as a result of road vehicle exhaust emissions associated with the development were predicted to be **negligible** at all receptor locations.

### 5.2.3 Impact Significance

The overall significance of operational phase road traffic emission impacts was determined as **negligible**. This was based on the predicted impacts at discrete receptor locations and the

considerations outlined in Section 3. Further justification is provided in Table 25.

**Table 25 Overall Road Traffic Exhaust Emission Impact Significance**

| Guidance | Comment |
|---|---|
| Number of properties affected by slight, moderate or substantial air quality impacts and a judgement on the overall balance | Impacts on $NO_2$ and $PM_{10}$ concentrations were predicted to be negligible at all sensitive receptors. These represent worst-case locations and therefore it is unlikely that any other receptors would be significantly affected by the proposed development |
| Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant | The proposed development will not result in any new exposure to pollutant concentrations above the AQOs |
| The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors | The maximum change in $NO_2$ and $PM_{10}$ concentrations relative to the AQO were predicted to be 1.53% and 0.29% respectively. As such, resultant impacts were negligible at all receptor locations |
| Whether or not an exceedence of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease | There were exceedences of the annual mean AQO for $NO_2$ at non-sensitive locations within the modelling extents. There were no exceedences of the annual mean AQO for $PM_{10}$ at any location within the modelling extents |
| The extent to which an objective is exceeded e.g. an annual mean $NO_2$ concentration of 41µg/$m^3$ should attract less significance than an annual mean of 51µg/$m^3$ | There were no exceedences of the annual mean AQO for $NO_2$ or $PM_{10}$ at any sensitive receptor location within the modelling extents |

## 6.0 CONCLUSION

REC Ltd was commissioned by Redrow Homes to undertake an Air Quality Assessment in support of a planning application for a proposed residential development on land off Woolton Road, Liverpool.

The proposals comprise the development of the site to provide approximately 160 residential units and associated infrastructure.

The site is located in close proximity to the B5171, a busy dual carriageway and significant source of road vehicle exhaust emissions, and is also located within an AQMA. As such, an Air Quality Assessment was required to quantify pollutant levels across the site, consider its suitability for residential use and assess potential impacts as a result of the development.

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 **negligible**.

Dispersion modelling was undertaken in order to quantify pollutant concentrations at the site and to predict air quality impacts as a result of road vehicle exhaust emissions associated with traffic generated by the development. Results were subsequently verified using monitoring results obtained from LCC.

The dispersion modelling results indicated that pollutant levels across the site were below the relevant AQOs. The location is therefore considered suitable for residential use without the inclusion of mitigation methods to protect future users from poor air quality. Predicted impacts on $NO_2$ and $PM_{10}$ concentrations as a result of operational phase exhaust emissions were predicted to be **negligible** at all sensitive receptor locations within the vicinity of the site. The overall significance of potential impacts was determined to be **negligible**, in accordance with the EPUK and IAQM guidance.

Based on the assessment results, air quality is not considered a constraint to planning consent for the proposed 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 Objectives |
| AQS | Air Quality Strategy |
| CERC | Cambridge Environmental Research Consultants |
| DEFRA | Department for Environment, Food and Rural Affairs |
| DfT | Department for Transport |
| DM | Do Minimum |
| DMP | Dust Management Plan |
| DMRB | Design Manual for Roads and Bridges |
| DS | Do Something |
| EPUK | Environmental Protection UK |
| EU | European Union |
| HDV | Heavy Duty Vehicle |
| IAQM | Institute of Air Quality Management |
| LA | Local Authority |
| LAQM | Local Air Quality Management |
| LCC | Liverpool City Council |
| NGR | National Grid Reference |
| $NO_2$ | Nitrogen dioxide |
| $NO_x$ | Oxides of nitrogen |
| NPPF | National Planning Policy Framework |
| NPPG | National Planning Practice Guidance |
| $PM_{2.5}$ | Particulate matter with an aerodynamic diameter of less than 2.5µm |
| $PM_{10}$ | Particulate matter with an aerodynamic diameter of less than 10µm |
| REC | Resource and Environmental Consultants |
| TEMPRO | Trip End Model Presentation Program |
| UDP | Unitary Development Plan |
| $z_0$ | Roughness Length |

# APPENDIX I FIGURES


**Legend**

Site Boundary

**Title**

Figure 1

Site Location

**Project**

Air Quality Assessment
Woolton Road, Liverpool

**Project Number**

AQ100787

**Client**

Redrow Homes



REC
Resource & Environmental Consultants Ltd
Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE

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**Title**

Figure 2

Site Layout

**Project**

Air Quality Assessment
Woolton Road, Liverpool

**Project Number**

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**Legend**

Site Boundary

Diffusion Tube Monitoring Location

**Title**

Figure 3

Diffusion Tube Monitoring Locations

**Project**

Air Quality Assessment
Woolton Road, Liverpool

**Project Number**

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**Client**

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**Legend**

- Site Boundary
- 20m from Site Boundary
- 50m from Site Boundary
- 100m from Site Boundary
- 350m from Site Boundary

**Title**

Figure 4

Earthworks and Construction Dust Buffer Zones

**Project**

Air Quality Assessment
Woolton Road, Liverpool

**Project Number**

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**Client**

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**Legend**

Site Boundary

20m from Site Access Route

50m from Site Access Route

**Title**

Figure 5

Trackout Dust Buffer Zones

**Project**

Air Quality Assessment
Woolton Road, Liverpool

**Project Number**

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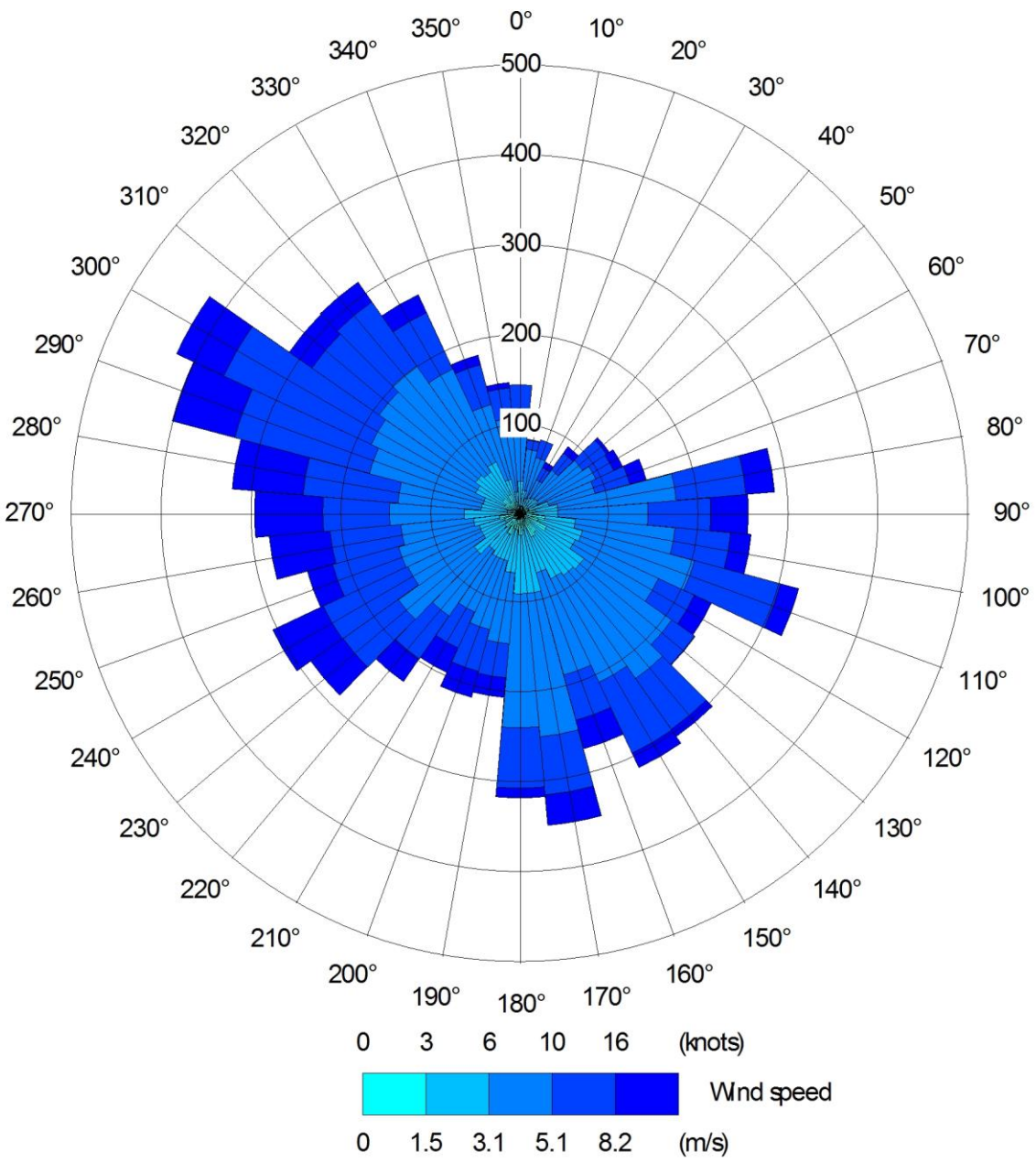


**Legend**

**Title**

Figure 6

Wind Rose of 2013 Liverpool Airport Meteorological Data

**Project**

Air Quality Assessment
Woolton Road, Liverpool

**Project Number**

AQ100787

**Client**

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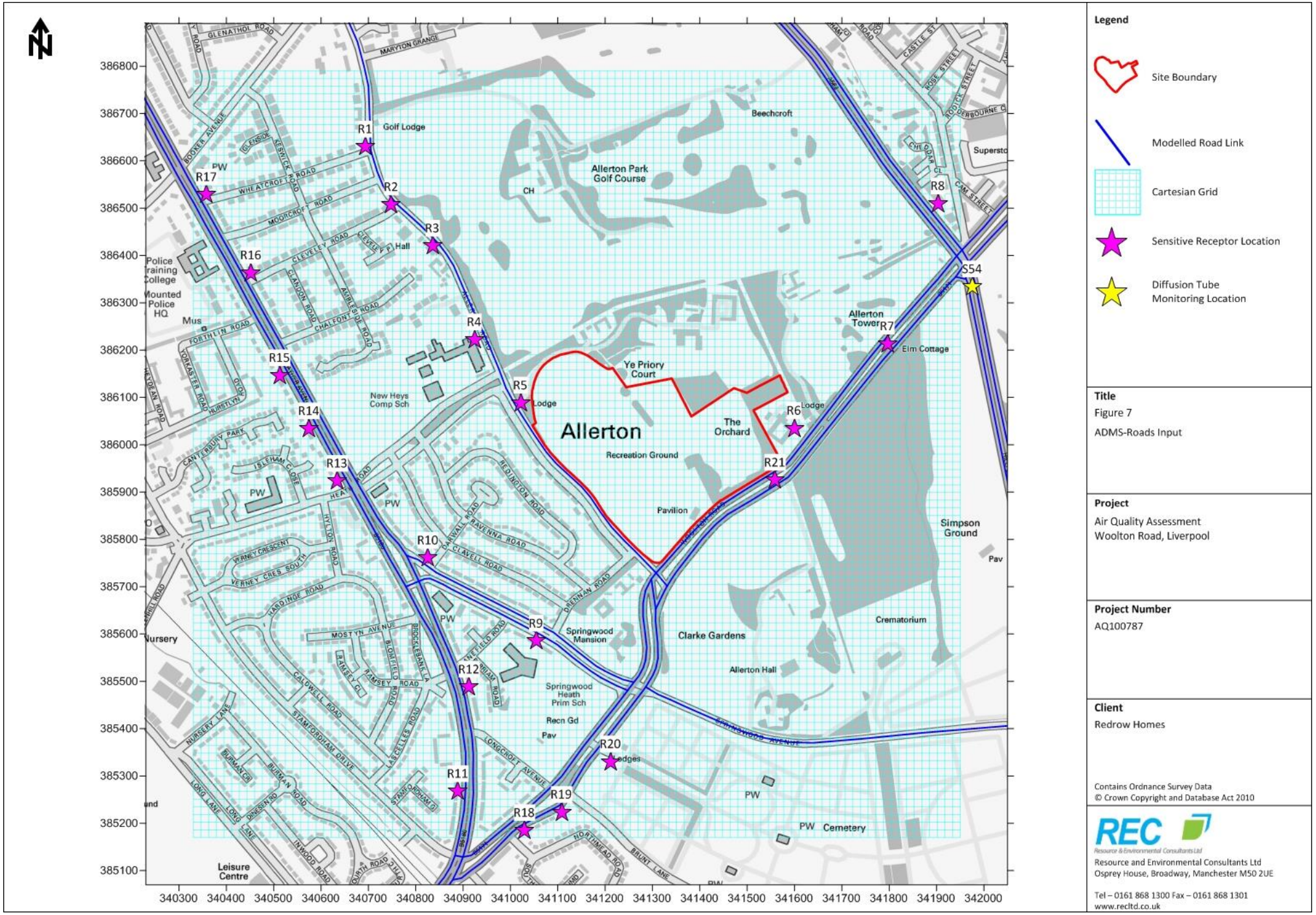


**Legend**

- Site Boundary
- Modelled Road Link
- Cartesian Grid
- Sensitive Receptor Location
- Diffusion Tube Monitoring Location

**Title**

Figure 7

ADMS-Roads Input

**Project**

Air Quality Assessment
Woolton Road, Liverpool

**Project Number**

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**Client**

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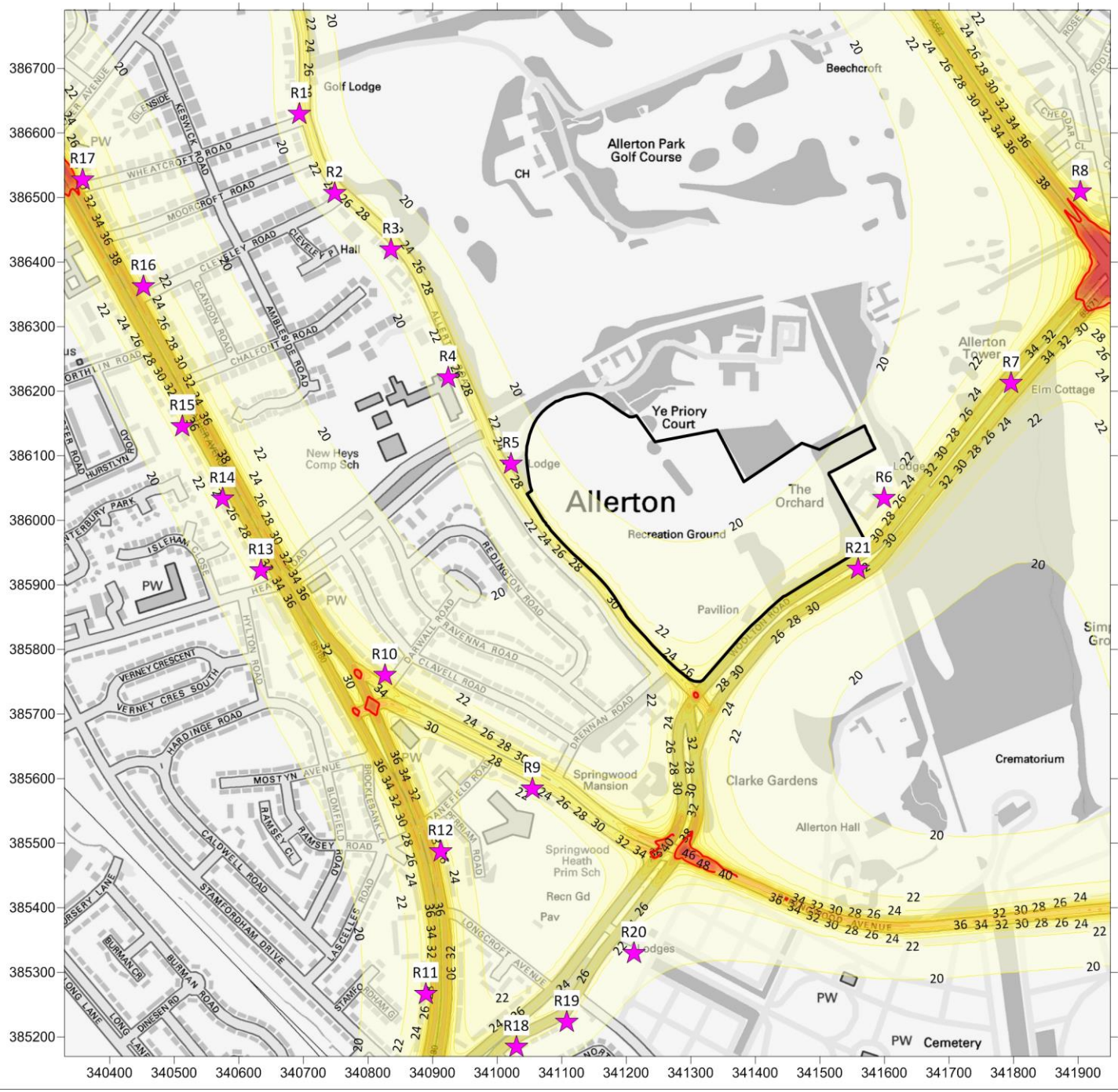


**Legend**

Site Boundary

48
46
44
42
40
38
36
34
32
30
28
26
24
22
20

Predicted Annual Mean $NO_2$ Concentration (µg/m³)

**Title**

Figure 7
Predicted Annual Mean $NO_2$ Concentrations (µg/m³) 2021 DM

**Project**

Air Quality Assessment
Woolton Road, Liverpool

**Project Number**

AQ100787

**Client**

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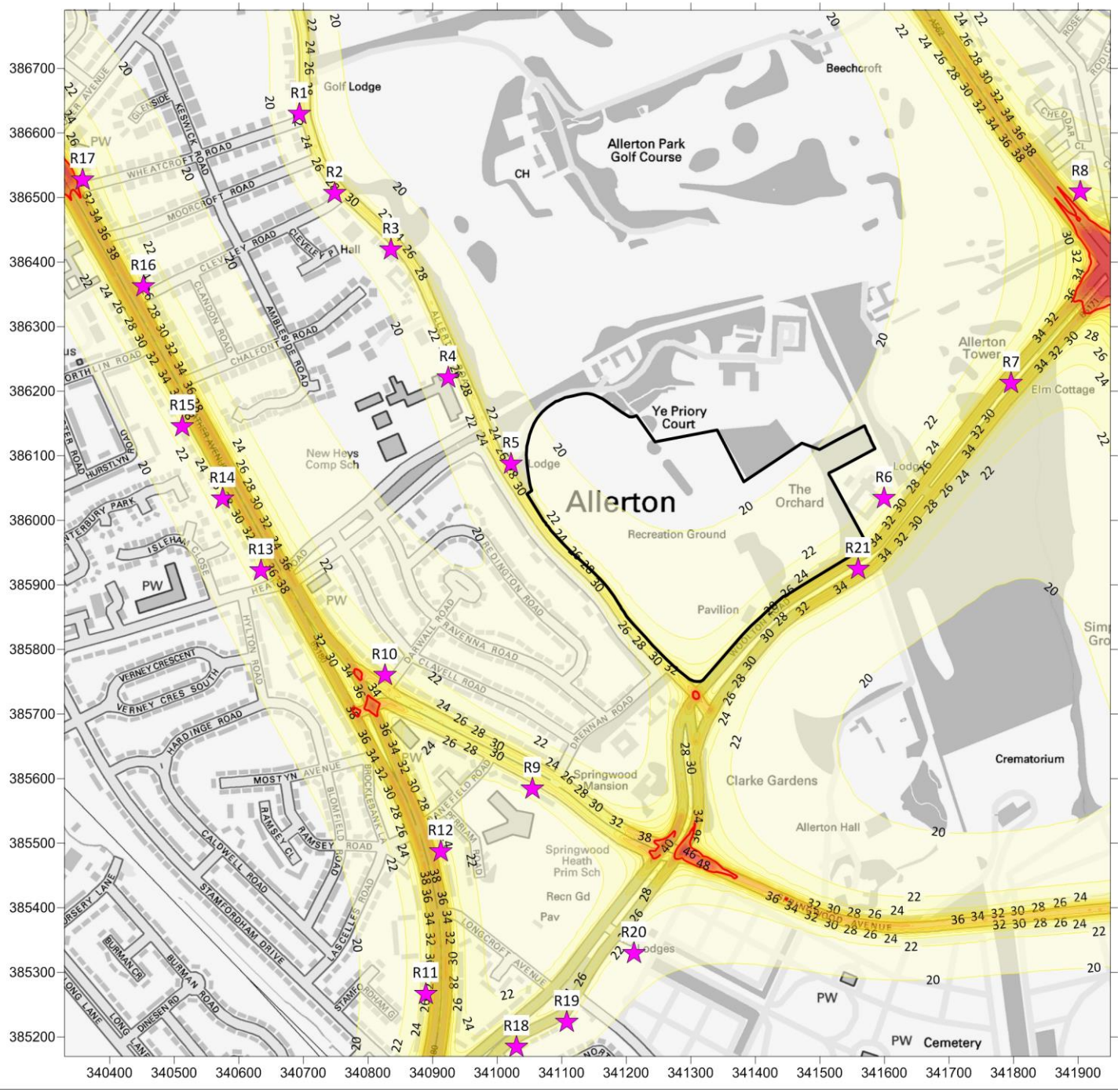


**Legend**

Site Boundary

Predicted Annual Mean $NO_2$ Concentration (µg/m³)

48
46
44
42
40
38
36
34
32
30
28
26
24
22
20

**Title**

Figure 8
Predicted Annual Mean $NO_2$ Concentrations (µg/m³) 2021 DS

**Project**

Air Quality Assessment
Woolton Road, Liverpool

**Project Number**

AQ100787

**Client**

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**Legend**

Site Boundary

Predicted Annual Mean $PM_{10}$ Concentration (µg/m³)

18.0
17.5
17.0
16.5
16.0
15.5
15.0

**Title**

Figure 9
Predicted Annual Mean $PM_{10}$ Concentrations (µg/m³) 2021 DM

**Project**

Air Quality Assessment
Woolton Road, Liverpool

**Project Number**

AQ100787

**Client**

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**Legend**

Site Boundary

Predicted Annual Mean $PM_{10}$ Concentration (µg/m³)

18.5
18.0
17.5
17.0
16.5
16.0
15.5
15.0

**Title**

Figure 10
Predicted Annual Mean $PM_{10}$ Concentrations (µg/m³) 2021 DS

**Project**

Air Quality Assessment
Woolton Road, Liverpool

**Project Number**

AQ100787

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# APPENDIX II ASSESSMENT INPUT DATA

## ASSESSMENT INPUTS

Vehicle trips associated with the development have the potential to result in air quality impacts as a result of increased traffic exhaust emissions. Additionally, the site is located in proximity to an AQMA which has the potential to expose future users to elevated pollution levels. Dispersion modelling using ADMS Roads was therefore undertaken to predict $NO_2$ and $PM_{10}$ concentrations at sensitive locations both with and without the development in order to consider potential changes as a result of the proposals.

The dispersion 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; and,
- Monin-Obukhov length.

Assessment inputs are described in the following subsections.

### Dispersion Model

Dispersion modelling was undertaken using the ADMS Roads dispersion model (version 4.0). 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.

### Assessment Area

Ambient concentrations were predicted over the area NGR: 340330, 385170 to 341950, 386790. One Cartesian grid at a height of 1.5m was used within the model to represent concentrations at ground floor level to produce data suitable for contour plotting using the Surfer software package.

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 development flows, was provided by SCP Transport, the Transport Consultants for the project.

The provided data did not include a number of links in the vicinity of the development. As such, 24-hour Annual Average Daily Traffic (AADT) flows and fleet composition as HDV proportion, was downloaded from the Department for Transport (DfT) Matrix. This 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 2014. It should be noted that the DfT matrix is referenced in DEFRA guidance

LAQM.TG(09)[14] as being a suitable source of data for air quality assessments and is therefore considered to provide a reasonable representation of traffic flows in the vicinity of the site.

Growth factors provided by the Trip End Model Presentation Program (TEMPRO) software package were utilised to allow for conversion from the obtained 2013 traffic flow year to 2021, which was used to represent the development opening year.

Road widths were estimated from aerial photography and UK highway design standards. Reference should be made to Figure 7 for a graphical representation of the road link locations. A summary of the traffic data used in the verification scenarios is provided in Table AII.1.

**Table AII.1 2013 Traffic Data**

| Road Link | | Road Width (m) | 24-hour AADT Flow | HDV Prop. (%) | Mean Vehicle Speed (km/h) |
|---|---|---|---|---|---|
| 1A1 | Woolton Road Northbound - Hillfoot Road Junction | 11.9 | 6,574 | 4.0 | 5 |
| 1B1 | Woolton Road Northbound - North of Site Access | 6.0 | 6,574 | 4.0 | 50 |
| 1C1 | Woolton Road Northbound - South of Site Access | 6.7 | 5,615 | 2.0 | 50 |
| 1D1 | Woolton Road Northbound - South of Allerton Road | 7.5 | 5,615 | 2.0 | 50 |
| 1E1 | Woolton Road Northbound - Springwood Avenue Junction | 7.1 | 5,615 | 2.0 | 15 |
| 1A2 | Woolton Road Southbound - Hillfoot Road Junction | 24.0 | 6,574 | 4.0 | 5 |
| 1B2 | Woolton Road Southbound - North of Site Access | 6.0 | 6,574 | 4.0 | 50 |
| 1C2 | Woolton Road Southbound - South of Site Access | 5.9 | 5,615 | 2.0 | 50 |
| 1D2 | Woolton Road Southbound - South of Allerton Road | 6.0 | 5,615 | 2.0 | 50 |
| 1E2 | Woolton Road Southbound - Springwood Avenue Junction | 5.7 | 5,615 | 2.0 | 15 |
| 2A | Allerton Road - Woolton Road Junction | 8.4 | 4,370 | 1.0 | 15 |
| 2B | Allerton Road - South of Heath Road | 5.9 | 4,370 | 1.0 | 30 |
| 2C | Allerton Road - North of Heath Road | 6.2 | 4,370 | 1.0 | 30 |
| 3A | Springwood Avenue - Woolton Road Junction | 10.2 | 12,859 | 2.0 | 15 |
| 3B | Springwood Avenue - East of Woolton Road | 8.6 | 12,859 | 2.0 | 50 |
| 4A1 | Springwood Avenue Eastbound - Woolton Road Junction | 7.2 | 4,968 | 1.0 | 15 |
| 4B1 | Springwood Avenue Eastbound | 7.7 | 4,968 | 1.0 | 50 |

[14] Local Air Quality Management Guidance LAQM.TG(09), DEFRA, 2009.

| Road Link | | Road Width (m) | 24-hour AADT Flow | HDV Prop. (%) | Mean Vehicle Speed (km/h) |
|---|---|---|---|---|---|
| 4C1 | Springwood Avenue Eastbound - Mather Avenue Junction | 7.8 | 4,968 | 1.0 | 20 |
| 4A2 | Springwood Avenue Westbound - Woolton Road Junction | 7.4 | 4,968 | 1.0 | 15 |
| 4B2 | Springwood Avenue Westbound | 7.6 | 4,968 | 1.0 | 50 |
| 4C2 | Springwood Avenue | 7.3 | 4,968 | 1.0 | 15 |
| 5A1 | Menlove Avenue Southbound | 7.6 | 7,652 | 2.3 | 50 |
| 5B1 | Menlove Avenue Southbound - Woolton Road Junction | 12.4 | 7,652 | 2.3 | 5 |
| 5A2 | Menlove Avenue Northbound | 7.5 | 8,062 | 2.2 | 50 |
| 5B2 | Menlove Avenue Northbound - Woolton Road Junction | 8.6 | 8,062 | 2.2 | 5 |
| 6A1 | Hillfoot Road Southbound - Woolton Road Junction | 10.4 | 8,348 | 3.4 | 5 |
| 6B1 | Hillfoot Road Southbound | 7.1 | 8,348 | 3.4 | 50 |
| 6A2 | Hillfoot Road Northbound - Woolton Road Junction | 11.5 | 7,209 | 3.8 | 5 |
| 6B2 | Hillfoot Road Northbound | 5.8 | 7,209 | 3.8 | 50 |
| 6C | Hillfoot Road - Woolton Road Sliproad | 7.0 | 3,605 | 3.8 | 5 |
| 7A1 | Woolton Road Northbound - Leaving Springwood Avenue | 7.1 | 4,224 | 1.5 | 15 |
| 7B1 | Woolton Road Northbound - South of Springwood Avenue | 7.0 | 4,224 | 1.5 | 50 |
| 7C1 | Woolton Road Northbound - Mather Avenue Junction | 6.6 | 4,224 | 1.5 | 15 |
| 7A2 | Woolton Road Southbound - Approaching Springwood Avenue | 5.6 | 4,224 | 1.5 | 15 |
| 7B2 | Woolton Road Southbound - South of Springwood Avenue | 6.1 | 4,224 | 1.5 | 50 |
| 7C2 | Woolton Road Southbound - Mather Avenue Junction | 14.6 | 4,224 | 1.5 | 15 |
| 8A1 | Mather Avenue Northbound - North of Woolton Road | 7.4 | 6,955 | 5.1 | 50 |
| 8B1 | Mather Avenue Northbound - Booker Avenue Junction | 6.7 | 6,955 | 5.1 | 15 |
| 8C1 | Mather Avenue Northbound - North of Booker Avenue | 7.5 | 6,955 | 5.1 | 50 |
| 8A2 | Mather Avenue Southbound - North of Woolton Road | 7.8 | 6,955 | 5.1 | 50 |
| 8B2 | Mather Avenue Southbound - Booker Avenue Junction | 6.7 | 6,955 | 5.1 | 15 |
| 8C2 | Mather Avenue Southbound - North of Booker Avenue | 7.8 | 6,955 | 5.1 | 50 |
| 9A | Woolton Road Sliproad | 8.8 | 2,808 | 2.0 | 15 |

| Road Link | | Road Width (m) | 24-hour AADT Flow | HDV Prop. (%) | Mean Vehicle Speed (km/h) |
|---|---|---|---|---|---|
| 10A1 | High Street Northbound - Menlove Avenue Junction | 14.0 | 6,574 | 4.0 | 5 |
| 10B1 | High Street Northbound - North of Menlove Avenue | 7.0 | 6,574 | 4.0 | 30 |
| 10A2 | High Street Southbound - Menlove Avenue Junction | 13.5 | 6,574 | 4.0 | 5 |
| 10B2 | High Street Southbound - North of Menlove Avenue | 7.4 | 6,574 | 4.0 | 30 |

The road width and mean vehicle speed shown in Table AII.1 remained the same for the DM and DS scenarios. A summary of the 2021 traffic data is shown in Table AII.2.

**Table AII.2 2021 Traffic Data**

| Road Link | | DM | | DS | |
|---|---|---|---|---|---|
| | | 24-hour AADT Flow | HDV Prop. (%) | 24-hour AADT Flow | HDV Prop. (%) |
| 1A1 | Woolton Road Northbound - Hillfoot Road Junction | 7,065 | 4.0 | 7,526 | 4.0 |
| 1B1 | Woolton Road Northbound - North of Site Access | 7,065 | 4.0 | 7,526 | 4.0 |
| 1C1 | Woolton Road Northbound - South of Site Access | 6,046 | 2.0 | 6,251 | 2.0 |
| 1D1 | Woolton Road Northbound - South of Allerton Road | 6,046 | 2.0 | 6,251 | 2.0 |
| 1E1 | Woolton Road Northbound - Springwood Avenue Junction | 6,046 | 2.0 | 6,251 | 2.0 |
| 1A2 | Woolton Road Southbound - Hillfoot Road Junction | 7,065 | 4.0 | 7,526 | 4.0 |
| 1B2 | Woolton Road Southbound - North of Site Access | 7,065 | 4.0 | 7,526 | 4.0 |
| 1C2 | Woolton Road Southbound - South of Site Access | 6,046 | 2.0 | 6,251 | 2.0 |
| 1D2 | Woolton Road Southbound - South of Allerton Road | 6,046 | 2.0 | 6,251 | 2.0 |
| 1E2 | Woolton Road Southbound - Springwood Avenue Junction | 6,046 | 2.0 | 6,251 | 2.0 |
| 2A | Allerton Road - Woolton Road Junction | 4,971 | 1.0 | 5,390 | 1.0 |
| 2B | Allerton Road - South of Heath Road | 4,971 | 1.0 | 5,390 | 1.0 |
| 2C | Allerton Road - North of Heath Road | 4,971 | 1.0 | 5,390 | 1.0 |
| 3A | Springwood Avenue - Woolton Road Junction | 13,417 | 2.0 | 13,417 | 2.0 |
| 3B | Springwood Avenue - East of Woolton Road | 13,417 | 2.0 | 13,417 | 2.0 |

| Road Link | | DM | | DS | |
|---|---|---|---|---|---|
| | | 24-hour AADT Flow | HDV Prop. (%) | 24-hour AADT Flow | HDV Prop. (%) |
| 4A1 | Springwood Avenue Eastbound - Woolton Road Junction | 5,184 | 1.0 | 5,266 | 1.0 |
| 4B1 | Springwood Avenue Eastbound | 5,184 | 1.0 | 5,266 | 1.0 |
| 4C1 | Springwood Avenue Eastbound - Mather Avenue Junction | 5,184 | 1.0 | 5,266 | 1.0 |
| 4A2 | Springwood Avenue Westbound - Woolton Road Junction | 5,184 | 1.0 | 5,266 | 1.0 |
| 4B2 | Springwood Avenue Westbound | 5,184 | 1.0 | 5,266 | 1.0 |
| 4C2 | Springwood Avenue | 5,184 | 1.0 | 5,266 | 1.0 |
| 5A1 | Menlove Avenue Southbound | 8,143 | 2.3 | 8,604 | 2.2 |
| 5B1 | Menlove Avenue Southbound - Woolton Road Junction | 8,143 | 2.3 | 8,604 | 2.2 |
| 5A2 | Menlove Avenue Northbound | 8,580 | 2.2 | 9,040 | 2.1 |
| 5B2 | Menlove Avenue Northbound - Woolton Road Junction | 8,580 | 2.2 | 9,040 | 2.1 |
| 6A1 | Hillfoot Road Southbound - Woolton Road Junction | 8,884 | 3.4 | 9,344 | 3.2 |
| 6B1 | Hillfoot Road Southbound | 8,884 | 3.4 | 9,344 | 3.2 |
| 6A2 | Hillfoot Road Northbound - Woolton Road Junction | 7,672 | 3.8 | 8,132 | 3.6 |
| 6B2 | Hillfoot Road Northbound | 7,672 | 3.8 | 8,132 | 3.6 |
| 6C | Hillfoot Road - Woolton Road Sliproad | 3,836 | 3.8 | 4,296 | 3.4 |
| 7A1 | Woolton Road Northbound - Leaving Springwood Avenue | 4,495 | 1.5 | 4,700 | 1.4 |
| 7B1 | Woolton Road Northbound - South of Springwood Avenue | 4,495 | 1.5 | 4,700 | 1.4 |
| 7C1 | Woolton Road Northbound - Mather Avenue Junction | 4,495 | 1.5 | 4,700 | 1.4 |
| 7A2 | Woolton Road Southbound - Approaching Springwood Avenue | 4,495 | 1.5 | 4,700 | 1.4 |
| 7B2 | Woolton Road Southbound - South of Springwood Avenue | 4,495 | 1.5 | 4,700 | 1.4 |
| 7C2 | Woolton Road Southbound - Mather Avenue Junction | 4,495 | 1.5 | 4,700 | 1.4 |
| 8A1 | Mather Avenue Northbound - North of Woolton Road | 7,402 | 5.1 | 7,689 | 4.9 |
| 8B1 | Mather Avenue Northbound - Booker Avenue Junction | 7,402 | 5.1 | 7,689 | 4.9 |

| Road Link | | DM | | DS | |
|---|---|---|---|---|---|
| | | 24-hour AADT Flow | HDV Prop. (%) | 24-hour AADT Flow | HDV Prop. (%) |
| 8C1 | Mather Avenue Northbound - North of Booker Avenue | 7,402 | 5.1 | 7,689 | 4.9 |
| 8A2 | Mather Avenue Southbound - North of Woolton Road | 7,402 | 5.1 | 7,689 | 4.9 |
| 8B2 | Mather Avenue Southbound - Booker Avenue Junction | 7,402 | 5.1 | 7,689 | 4.9 |
| 8C2 | Mather Avenue Southbound - North of Booker Avenue | 7,402 | 5.1 | 7,689 | 4.9 |
| 9A | Woolton Road Sliproad | 2,988 | 2.0 | 3,090 | 1.9 |
| 10A1 | High Street Northbound - Menlove Avenue Junction | 7,065 | 4.0 | 7,526 | 3.8 |
| 10B1 | High Street Northbound - North of Menlove Avenue | 7,065 | 4.0 | 7,526 | 3.8 |
| 10A2 | High Street Southbound - Menlove Avenue Junction | 7,065 | 4.0 | 7,526 | 3.8 |
| 10B2 | High Street Southbound - North of Menlove Avenue | 7,065 | 4.0 | 7,526 | 3.8 |

**Emission Factors**

Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 6.0.2) released in November 2014, which incorporates updated COPERT4v10 vehicle emissions factors for $NO_x$ and vehicle fleet information.

There is current uncertainty over $NO_2$ concentrations within the UK, with roadside levels not reducing as previously expected due to the implementation of new vehicle emission standards. Therefore, 2013 emission factors have been utilised for the prediction of pollution levels for all scenarios in preference to the development opening year in order to provide a robust assessment.

**Meteorological Data**

Meteorological data used in this assessment was taken from Liverpool Airport meteorological station over the period 1st January 2013 to 31st December 2013 (inclusive). Liverpool Airport meteorological station is located at approximate NGR: 343595, 382055, which is approximately 4.9km north-west of the proposed development. DEFRA guidance LAQM.TG(09)[15] recommends meteorological stations within 30km of an assessment area as being suitable for detailed modelling.

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 6 for a wind rose of utilised meteorological data.

[15] Local Air Quality Management Technical Guidance LAQM.TG(09), DEFRA, 2009.

**Roughness Length**

A roughness length ($z_0$) of 0.5m was used in this dispersion modelling study. This value of $z_0$ is considered appropriate for the morphology of the assessment area and is suggested within ADMS-Roads as being suitable for 'parkland, open suburbia'.

A $z_0$ of 0.2m was utilised to represent the morphology of the meteorological station location and is suggested 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 in this dispersion modelling study. This value is considered appropriate for the nature of the assessment area and meteorological station location and is suggested within ADMS-Roads as being suitable for 'cities and large towns'.

**Background Concentrations**

An annual mean $NO_2$ concentration of 18.08µg/m$^3$ and $PM_{10}$ concentration of 14.37µg/m$^3$, as predicted by DEFRA, were used to represent background levels in the vicinity of the site.

Similarly to emission factors, background concentrations for 2013 were utilised in preference to the development opening year. This provided a robust assessment and is likely to overestimate actual pollutant concentrations during the operation of the proposal.

**$NO_x$ to $NO_2$ Conversion**

Predicted annual mean $NO_x$ concentrations from the dispersion model were converted to $NO_2$ concentrations using the spreadsheet provided by DEFRA, which is the method detailed within LAQM.TG(09)[16].

**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.

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.

[16] Local Air Quality Management Guidance LAQM.TG(09), DEFRA, 2009.

For the purpose of this assessment model verification was undertaken for 2013, using traffic data, meteorological data and monitoring results from this year.

LCC undertakes monitoring of $NO_2$ concentrations at one roadside location within the assessment extents. The road contribution to total $NO_x$ concentration was calculated from the monitored $NO_2$ results for use in the verification process. This was undertaken following the methodology contained within DEFRA guidance LAQM.TG(09)[17]. The monitored annual mean $NO_2$ concentrations and calculated road $NO_x$ concentrations are summarised in Table AII.3.

**Table AII.3 2013 Monitoring Results**

| Monitoring Location | | Monitored $NO_2$ Concentration (µg/m$^3$) | Calculated Road $NO_x$ Concentration (µg/m$^3$) |
|---|---|---|---|
| S54 | Hillfoot Road/Allerton Road J Lamp LH p J C2507 | 58.00 | 102.86 |

The dispersion model was run with the traffic input data previously detailed for 2013 to predict the $NO_x$ concentration at the monitoring locations. The results are shown in Table AII.4.

**Table AII.4 Verification Results**

| Monitoring Location | | Modelled Road $NO_x$ Concentration (µg/m$^3$) |
|---|---|---|
| S54 | Hillfoot Road/Allerton Road J Lamp LH p J C2507 | 37.6 |

The monitored and modelled $NO_x$ road contribution concentrations were graphed and the equation of the trendline based on the linear progression through zero calculated. This indicated a verification factor of **2.7356** was required to be applied to all modelling results.

As $PM_{10}$ monitoring is not undertaken within the assessment extents, a verification factor of **2.7356** was also used to adjust model predictions of this pollutant in accordance with the guidance provided within LAQM.TG(09)[17].

[17] Local Air Quality Management Technical Guidance LAQM.TG(09), DEFRA, 2009.

# APPENDIX III ASSESSOR'S CURRICULUM VITAE

# GABOR ANTONY

## Principal Air Quality Consultant

MSc, MIAQM, MIEnvSc

### KEY EXPERIENCE:

Gabor is a Principal Consultant with specialist experience in the air quality and odour sector. His key capabilities include:

- Advanced atmospheric air dispersion modelling of road vehicle and industrial emissions using ADMS-ROADS, ADMS-5, AERMOD-PRIME and BREEZE-ROADS.
- Preparation of factual and interpretative Air Quality Assessment reports and Air Quality Environmental Statement chapters in the vicinity of proposed schemes and developments in accordance with DEFRA, Environment Agency and EPUK methodologies.
- Management and delivery of project work on key, land development and urban regeneration projects.
- Multi-source industrial air emissions and stack emissions assessments using AERMOD-PRIME modelling software for IPPC Permit applications and stand-alone technical reports.
- Co-ordination and management of different emission and immission related measurements, and various monitoring programmes including construction dust; diffusion tube surveys and odour assessments in accordance with DEFRA and Environment Agency guidance.

### QUALIFICATIONS:

Master of Science degree

Member, Institution of Environmental Sciences (MIEnvSc);

Member, Institute of Air Quality Management (MIAQM).

### SELECT PROJECTS SUMMARY:

#### Residential Developments

Boorley Green - EIA undertaken for mixed use scheme.

Vauxhall - AQA for mixed use scheme within AQMA in London.

Mapplewell - AQA for residential development.

Catford Stadium - Low Emission Transport Strategy for mixed use development in London

Lambeth Road - AQA for mixed use scheme in AQMA in London.

Thurmaston NEoLSUE - EIA for Suburban extension.

Westferry Print works - EIA for large mixed use development.

Grange Farm, Doncaster - AQA for residential development.

Wadi Al Asla - AQA as part of EIA for proposed urban extension in Saudi Arabia.

Horndean - AQA for residential development adjacent to A3.

Derby - Fire and Smoke assessment for residential development.

Kirkby Muxloe - AQA for residential development adjacent to M1.

Ushaw Moor - AQA for residential development in proximity of AQMA.

#### Commercial and Retail Developments

Horfield, Bristol - EIA for Mixed- use development in AQMA.

Nottingham - Biomass boiler assessment for retail facility.

South Woodham Ferrers - Biomass boiler and road traffic assessment.

Widnes - AQA for Shopping Centre Extension, adjacent to AQMA.

Lancaster Science Park - AQA for commercial development in proximity of AQMA.

Haymarket - AQA for Bus Station Redevelopment.

Bath Western Riverside East - AQA as part of EIA for mixed use development.

Irvine, North Ayrshire - AQA for Hospital redevelopment

Derby - biomass boiler emission assessment.

Bristol & Bath Science Park - AQA as part of EIA for commercial development.

Sheffield Superstore - AQA in support of new food superstore.

Nuneaton - AQA for mixed use development with biomass boiler.

Thorp Arch, - EIA for Urban extension.

Reading Station - AQA Highway Implementation Scheme.

Ebbsfleet International Railway Station - AQA for mixed use development.

M4 Junction 11 - AQA for Motorway Scheme.

Hook - Biomass Boiler and road transport assessment for proposed food store.

#### Industrial Developments

University of Birmingham - Environmental Permit Variation Application for existing CHP facility.

Southampton - AQA for Sulphur Plant.

Sedalcol - Environmental Permit Application for Alcohol and Starch production facility.

Cotesbach - AQA for Fully enclosed Waste composting Facility.

Wagg Foods - Environmental Permit application.

Trent Foundry - Environmental Permit Application for Existing foundry in Scunthorpe.

Beddington - AQA for Energy from Waste Plant.

Thakeham - AQA for mushroom production facility.

Partington - EIA for Liquid Natural Gas storage site demolition works in Trafford.

South View Farm - Ammonia dispersion modelling of broiler farm.

Blackwater - AQA for Asphalt plant Permit Application.

# JASMINE RHOADES

## Air Quality Consultant

BSc (Hons), MSc, AMIEnvSc

### KEY EXPERIENCE:

Jasmine is a Graduate Environmental Consultant with specialist experience in the air quality sector. Her key capabilities include:

- Production of Air Quality Assessments to the Department for Environment, Food and Rural Affairs (DEFRA), Environment Agency and Environmental Protection UK (EPUK) methodologies for clients from the residential, retail and commercial sectors.
- Detailed dispersion modelling of road vehicle emissions using ADMS-Roads. Studies have included impact assessment of pollutant concentrations at various floor levels and assessment of suitability of development sites for proposed end-use.
- Assessment of road vehicle exhaust emissions using the Design Manual for Roads and Bridges (DMRB) calculation spreadsheet.
- Assessment of dust impacts from construction sites to the Institute of Air Quality Management (IAQM) methodology.
- Production of air quality mitigation strategies for developments throughout the UK.
- Defining baseline air quality conditions and identification of sensitive areas.

### QUALIFICATIONS:

- Bachelor of Science
- Master of Science
- Associate Member of the Institute of Environmental Science (AMIEnvSc)

### SELECT PROJECTS SUMMARY:

**Residential Development: High Street, Fenstanton**

Air Quality Assessment in support of a residential development consisting of eighty one residential units. Construction phase assessment of fugitive dust emissions in accordance with IAQM methodology was undertaken. Additionally, dispersion modelling of road vehicle exhaust emissions was undertaken using ADMS-Roads to quantify pollutant levels across the site and provide consideration of potential impacts of the surrounding area as a result of the proposals. Impacts were not predicted to be significant at any sensitive receptors in the vicinity of the site and no mitigation was required.

**Residential Development: Field Close, Southmoor**

Air Quality Assessment in support of a proposed development consisting of seventy three residential units. Concerns were raised as the site was located in close proximity to the A420, a significant source of road traffic exhaust emissions with the potential to expose future users to poor air quality. Dispersion modelling of road vehicle exhaust emissions was completed using ADMS-Roads to consider site suitability for the proposed end-use. Pollutant concentrations were predicted to be below the relevant AQO across the site and as such, air quality was not a planning constraint.

**Commercial Development: Eridge Road, Tunbridge Wells**

Air Quality Constraints Assessment in support of the development of an ALDI foodstore located within an AQMA. Construction phase assessment of fugitive dust emissions in accordance with IAQM methodology was undertaken. In addition, dispersion modelling was also conducted using ADMS-Roads to consider the impact of the proposals on sensitive locations. Impacts were not predicted to be significant at any sensitive receptors in the vicinity of the site and no mitigation was required.

**Residential Development: Farrier Close, Uxbridge**

Air Quality Assessment in support of a residential development consisting of sixty extra-care apartments. The site was located in an area identified by the London Borough of Hillingdon as experiencing elevated pollutant concentrations and subsequently there were concerns the proposals would introduce future users to poor air quality. Dispersion modelling was undertaken at all floors in order to quantify pollutant concentrations at the site and assess the potential for future exposure. The results of the dispersion modelling indicated that pollutant concentrations were predicted to exceed the relevant air quality criteria for the proposed land-use. As such, mitigation was recommended in the form of mechanical ventilation at first floor level.

**Industrial development: Snape Lane, Harworth**

Air Quality Assessment in support of an industrial redevelopment of a former glassworks site to provide three manufacturing plants (brick, roof tile and timber frame). The development had the potential to cause air quality impacts at sensitive locations associated with fugitive dust emissions from manufacturing activities. A qualitative fugitive dust assessment was undertaken in accordance with EPUK and IAQM guidance alongside relevant data on dust emissions and dispersion derived from the Mineral Policy Statement 2. In addition, dispersion modelling was undertaken using ADMS-Roads to quantify pollutant concentrations at sensitive locations. Mitigation was recommended in order protect sensitive locations from fugitive dust emissions. The dispersion modelling indicated that pollutant concentrations were predicted to be below the relevant AQOs at all sensitive locations. Air quality was therefore not a planning constraint.