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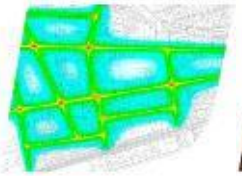
# AIR QUALITY ASSESSMENT
# PARK AVENUE, LIVERPOOL

**REC REFERENCE:** 34127R2

**REPORT PREPARED FOR:** REDROW HOMES LIMITED

**DATE:** 9TH DECEMBER 2014





## REPORT ISSUE

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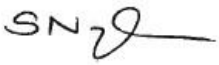
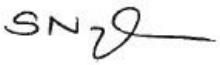
| Signature |  |  | |
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## EXECUTIVE SUMMARY

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

The proposals comprise 34 residential units and associated infrastructure.

The site is located in an area identified by Liverpool City Council as experiencing elevated pollutant concentrations and subsequently there are concerns that the proposals will introduce future users into an area of 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 pollution levels across the site, consider its suitability for the proposed 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 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 assessment indicated pollution levels at the development were below the relevant air quality standards and the location is considered suitable for residential use without the inclusion of mitigation methods. Additionally, the dispersion modelling 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 development.

## TABLE OF CONTENTS

## APPENDICES

# 1.0 INTRODUCTION

## 1.1 Background

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

The site is located in an area identified by Liverpool City Council (LCC) as experiencing elevated pollutant concentrations and subsequently there are concerns that the proposals will introduce future users into an area of 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 potential effects in the vicinity of the site.

## 1.2 Site Location and Context

The site is located on land at Park Avenue, Liverpool, at approximate National Grid Reference (NGR): 338197, 387410. Reference should be made to Figure 1 for a location plan and Figure 2 for a site layout plan.

The proposals comprise 34 residential units and associated infrastructure.

The development is located within an Air Quality Management Area (AQMA), declared by LCC due to exceedences of the Air Quality Objectives (AQOs) for nitrogen dioxide ($NO_2$). As such, there are concerns that the proposals could expose future site users to elevated pollution levels. Additionally, the proposals have the potential to cause air quality impacts at sensitive receptor locations as a result of emissions associated with the construction and operational phases. As such, an Air Quality Assessment was 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 Value (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. AQOs 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 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 and 8-hour mean | All locations where the annual mean objective would apply, together with hotels<br>Gardens of residential properties | Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term |

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

| Averaging Period | Objectives Should Apply At | Objectives Should Not Apply At |
|---|---|---|
| 1-hour mean | All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets)<br><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><br>Any outdoor locations where members of the public might reasonably expected to spend one hour or longer | Kerbside sites where the public would not be expected to have regular access |

## 2.3 Local Air Quality Management

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 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 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.

[3] National Planning Policy Framework, Department for Communities and Local Government, 2012.
[4] http://planningguidance.planningportal.gov.uk/.

## 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."

This policy has been considered throughout this report by considering potential air quality impacts as a result of the proposed development.

[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, agreed with Paul Farrell, Principal Officer of Environmental Protection at LCC, on 13th October via email.

### 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 three types to reflect their different potential impacts. These are:

- 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 | 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 | 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 |
| | 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 |

| Magnitude | Activity | Criteria |
|---|---|---|
| Small | 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 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 |
| 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 |

| Sensitivity | Examples | |
|---|---|---|
| | **Human Receptors** | **Ecological Receptors** |
| 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 |
| 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 | Medium | Low | 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 |
| 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

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

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:

- Verification;
- Opening year do-minimum (DM) (predicted traffic flows in 2015 should the proposals not proceed); and,
- Opening year do-something (DS) (predicted traffic flows in 2015 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 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) Development Control: Planning for Air Quality (2010 update)[10].

**Table 10 Operational Traffic Exhaust Emissions - Receptor Sensitivity**

| Sensitivity | Description |
|---|---|
| Very high | Pollutant levels above environmental assessment criteria e.g.<br>• $NO_2$ or $PM_{10}$ annual mean greater than 40µg/m$^3$ |
| High | Pollutant levels between 90% and 100% of environmental assessment criteria e.g.<br>• $NO_2$ or $PM_{10}$ annual mean 36 - 40µg/m$^3$ |
| Medium | Pollutant levels between 75% and 90% of environmental assessment criteria e.g.<br>• $NO_2$ and $PM_{10}$ annual mean 30 - 36µg/m$^3$ |

[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] Development Control: Planning for Air Quality (2010 update), Environmental Protection UK, 2010.

| Sensitivity | Description |
|---|---|
| Low | Pollutant levels below 75% of environmental assessment criteria e.g.<br>• $NO_2$ or $PM_{10}$ annual mean below 30µg/$m^3$ |

The magnitude of change in pollutant concentrations was defined based on the criteria outlined in Table 11.

**Table 11 Operational Traffic Exhaust Emissions - Magnitude of Change**

| Magnitude of Change | Change in Pollutant Level as Proportion of Assessment Criteria (%) |
|---|---|
| Large | Greater than 10 |
| Medium | 5 - 10 |
| Small | 1 - 5 |
| Imperceptible | Less than 1 |

Impact significance was defined based on the interaction between the sensitivity of the affected receptor and the magnitude of change, as outlined in Table 12.

**Table 12 Operational Traffic Exhaust Emissions - Significance of Impact**

| Sensitivity | Magnitude of Change | | | |
|---|---|---|---|---|
| | Imperceptible | Small | Medium | Large |
| Very high | Negligible | Slight | Moderate | Substantial |
| High | Negligible | Slight | Moderate | Moderate |
| Medium | Negligible | Negligible | Slight | Slight |
| Low | Negligible | Negligible | Negligible | Slight |

It should be noted that the criteria shown in Table 10 and Table 11 and the matrix shown in Table 12 are adapted from the EPUK Development Control: Planning for Air Quality (2010 update)[11] guidance document with sensitivity descriptors included to allow comparisons of various air quality impacts.

Following the prediction of impacts at discrete receptor locations, the EPUK[12] document provides guidance on determining the overall air quality impact significance of the operation of a development. The following factors are identified for consideration by the assessor:

- Number of properties affected by significant air quality impacts and a judgement on the overall balance;

[11] Development Control: Planning for Air Quality (2010 update), Environmental Protection UK, 2010.
[12] Development Control: Planning for Air Quality (2010 update), Environmental Protection UK, 2010.

- 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 magnitude of changes and the descriptions of the impacts at the receptors;
- Whether or not an exceedence of an objective or limit value is predicted to arise in the study area where none existed before or an exceedence area is substantially increased;
- Whether or not the study area exceeds an objective or limit value and this exceedence is removed or the exceedence area is reduced; and,
- The extent to which an objective or limit value 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. The EPUK[13] guidance suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix III.

[13] Development Control: Planning for Air Quality (2010 update), Environmental Protection UK, 2010.

## 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 AQOs within the city. As such, an AQMA has been declared, which is described as:

> "An area encompassing the whole City of Liverpool"

The site is located with the City of Liverpool AQMA. 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 sensitive 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 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 Old Haymarket at NGR: 334762, 390686. This is approximately 4.7km north-west of the boundary. Due to the distance between the site and the monitoring location similar pollutant concentrations would not be anticipated. As such, this source of data has not been considered further in the context of this assessment.

LCC also utilise passive diffusion tubes to monitor $NO_2$ concentrations throughout the city. There are three sites in the vicinity of the proposed development and recent monitoring results are shown in Table 13. Exceedences of the AQO are shown in **bold** text.

**Table 13 $NO_2$ Monitoring Results**

| Location | NGR (m) | | Annual Mean Concentration (µg/m$^3$) | | |
|---|---|---|---|---|---|
| | X | Y | 2010 | 2011 | 2012 |
| Smithdown Road Lamp outside Costcutter | 338170 | 388629 | **67** | **63** | **67** |
| Smithdown Road info sign outside Sefton Park pharmacy (by Asda) | 337881 | 388939 | -[a] | **59** | **63** |
| Smithdown Road Lamp in central Res. opp. Budget exhaust | 338977 | 388485 | -[a] | **49** | **52** |

[a] Monitoring not undertaken in 2011

As indicated in Table 13, the annual mean AQO for $NO_2$ was exceeded at all monitoring locations

within the vicinity of the site in recent years. This is to be expected as the diffusion tubes are located at roadside locations in the LCC AQMA. Reference should be made to Figure 3 for a graphical representation of the diffusion tube 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: 338500, 387500. Data for this location was downloaded from the DEFRA website[14] for the purpose of this assessment and is summarised in Table 14.

**Table 14 Predicted Background Pollutant Concentrations**

| Pollutant | Predicted Background Concentration (µg/m$^3$) | | |
|---|---|---|---|
| | 2012 | 2013 | 2014 |
| $NO_x$ | 26.46 | 25.92 | 25.38 |
| $NO_2$ | 18.68 | 18.37 | 18.05 |
| $PM_{10}$ | 14.37 | 14.17 | 13.98 |

As shown in Table 14, background concentrations in the vicinity of the site are predicted to be relatively low. Comparison with monitoring results shows the influence of the highway network on local pollutant concentrations.

### 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 15.

**Table 15 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 |

[14] http://laqm.defra.gov.uk/maps/maps2011.html.

| Distance from Site Boundary (m) | Approximate Number of Residential Receptors | Approximate Number of Ecological Receptors |
|---|---|---|
| 50 - 100 | More than 100 | - |
| 100 - 350 | More than 100 | - |

Reference should be made to Figure 4 for a graphical representation of demolition, earthworks and construction dust receptors. The proposed development is located in a predominantly residential area and adjacent to a large park with the majority of receptors located to the east.

Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 100m from the road network within 500m of the site access. These are summarised in Table 16. 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 a number of different routes to ensure the maximum potential trackout distance was considered.

**Table 16 Trackout Dust Sensitive Receptors**

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

Reference should be made to Figure 5 for a graphical representation of trackout dust sensitive receptor locations.

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 17.

**Table 17 Additional Area Sensitivity Factors**

| Guidance | Comment |
|---|---|
| Whether there is any history of dust generating activities in the area | There is no history of dust generating activities in the area |
| The likelihood of concurrent dust generating activity on nearby sites | Currently there are no proposed large scale developments in close proximity to the site which could lead to cumulative dust generating effects |
| Pre-existing screening between the source and the receptors | The proposed development is surrounded by vegetation which will act as screening between the source and existing receptors in all directions |

| Guidance | Comment |
|---|---|
| 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 south and west of the development, as shown in Figure 6. As such, properties to the north-east of the development would be most affected by dust emissions |
| Conclusions drawn from local topography | Although the terrain is predominantly flat, the large areas of woodland within the vicinity of the site provide a natural barrier 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 18.

**Table 18 Sensitivity of the Surrounding Area**

| Potential Impact | Sensitivity of the Surrounding Area | | |
|---|---|---|---|
| | Earthworks | Construction | Trackout |
| Dust Soiling | Medium | Medium | High |
| Human Health | 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 19.

**Table 19 Road Vehicle Exhaust Emission Sensitive Receptors**

| Receptor | | NGR (m) | |
|---|---|---|---|
| | | X | Y |
| R1 | Greenback Primary School | 338539 | 388396 |
| R2 | Residential - Greenbank Road | 338534 | 388311 |
| R3 | Spire Liverpool Hospital | 338644 | 387958 |

| Receptor | | NGR (m) | |
|---|---|---|---|
| | | X | Y |
| R4 | Student Accommodation - Derby and Rathbone Hall | 338611 | 387809 |
| R5 | Liverpool College | 338777 | 387651 |
| R6 | Residential - Mossley Hill Drive | 338079 | 387909 |
| R7 | Residential - Mossley Hill Drive | 338141 | 387647 |
| R8 | Liverpool College | 338512 | 387599 |
| R9 | St Anthony of Padua RC Primary School | 338987 | 387690 |
| R10 | Residential - Queens Drive Mossley Hill | 339172 | 387954 |
| R11 | Residential - Queens Drive Mossley Hill | 339452 | 388159 |
| R12 | Fernlea Care Home | 338725 | 387441 |
| R13 | Residential Park Avenue | 338507 | 387388 |
| R14 | Residential - North Mossley Hill Road | 338789 | 387321 |
| R15 | Residential - Mossley Hill Road | 338783 | 386969 |
| R16 | Residential - Aigburth Vale | 338233 | 387326 |
| R17 | Residential - Victoria Road | 338274 | 387246 |
| R18 | Residential - Victoria Road | 338219 | 387137 |
| R19 | Residential - Victoria Road | 338120 | 386960 |
| R20 | Residential - Victoria Road | 338008 | 386744 |
| R21 | Residential - Mossley Hill Drive | 338125 | 387267 |
| R22 | Residential - Mossley Hill Drive | 337951 | 386950 |
| R23 | Residential - Ullet Road | 337899 | 388457 |
| R24 | Residential - Ullet Road | 338193 | 388561 |
| R25 | Residential - Brookdale Road | 338201 | 388650 |
| R26 | Residential - Russell Road | 338813 | 388474 |
| R27 | Residential - Kenyon Road | 339122 | 388449 |
| R28 | Residential - Kingsdale Road | 339481 | 388278 |

The sensitive receptors identified in Table 19 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 10 and predicted pollutant concentrations for the development opening year of 2015. These are detailed within Table 20.

**Table 20 Road Vehicle Exhaust Emission Receptor Sensitivity**

| Receptor | $NO_2$ | | $PM_{10}$ | |
|---|---|---|---|---|
| | Predicted Annual Mean Concentration (µg/m$^3$) | Sensitivity | Predicted Annual Mean Concentration (µg/m$^3$) | Sensitivity |
| R1 | 30.90 | Medium | 13.90 | Low |
| R2 | 32.70 | Medium | 14.34 | Low |
| R3 | 28.14 | Low | 13.52 | Low |
| R4 | 30.78 | Medium | 14.02 | Low |
| R5 | 33.65 | Medium | 14.19 | Low |
| R6 | 27.33 | Low | 13.38 | Low |
| R7 | 28.23 | Low | 13.59 | Low |
| R8 | 28.16 | Low | 13.53 | Low |
| R9 | 28.20 | Low | 13.42 | Low |
| R10 | 32.87 | Medium | 14.08 | Low |
| R11 | 31.01 | Medium | 14.00 | Low |
| R12 | 30.02 | Medium | 13.85 | Low |
| R13 | 26.58 | Low | 13.25 | Low |
| R14 | 29.27 | Low | 13.75 | Low |
| R15 | 28.73 | Low | 13.58 | Low |
| R16 | 29.32 | Low | 13.71 | Low |
| R17 | 29.42 | Low | 13.71 | Low |
| R18 | 29.26 | Low | 13.71 | Low |
| R19 | 31.24 | Medium | 13.77 | Low |
| R20 | 29.75 | Low | 13.73 | Low |
| R21 | 27.92 | Low | 13.53 | Low |
| R22 | 27.82 | Low | 13.51 | Low |
| R23 | 28.30 | Low | 13.51 | Low |

| Receptor | $NO_2$ | | $PM_{10}$ | |
|---|---|---|---|---|
| | Predicted Annual Mean Concentration (µg/m$^3$) | Sensitivity | Predicted Annual Mean Concentration (µg/m$^3$) | Sensitivity |
| R24 | 43.52 | Very High | 15.23 | Low |
| R25 | 36.78 | High | 14.37 | Low |
| R26 | 34.19 | Medium | 14.00 | Low |
| R27 | 32.90 | Medium | 14.10 | Low |
| R28 | 34.48 | Medium | 14.21 | Low |

As indicated in Table 20, receptor sensitivity to changes in annual mean $NO_2$ concentrations was **low** at fifteen locations, **medium** at eleven locations, **high** at one location and **very high** at one location. Receptor sensitivity to changes in annual mean $PM_{10}$ concentrations was **low** at all locations.

## 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

**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 18 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 18 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 100,000m$^3$. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from construction is therefore **large**.

Table 18 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 18 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 between 50m and 100m. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from trackout is therefore **medium**.

Table 18 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 **medium** risk site for dust soiling as a result of trackout activities.

Table 18 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 21.

**Table 21 Summary of Potential Unmitigated Dust Risks**

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

As indicated in Table 21, the potential risk of dust soiling is **medium** from earthworks, construction activities and trackout activities. The potential risk of human health impacts is **low** from earthworks, construction and trackout 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 22. 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 22 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 |
| Monitoring | • Undertake daily on-site and off-site inspection to monitor dust. This should include regular dust soiling checks of surfaces within 100m of site boundary. Cleaning to be provided if necessary<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 |
| 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>• 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 a maximum-speed-limit of 15mph on surfaced and 10mph on un-surfaced haul roads and work areas<br>• Produce a Construction Logistics Plan to manage sustainable deliveries<br>• Implement a Travel Plan that supports and encourages sustainable travel |

| Issue | Control Measure |
|---|---|
| Operations | • Cutting equipment to use water as dust suppressant or suitable local extract ventilation<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 | • Re-vegetate earthworks and exposed areas<br>• Use Hessian, mulches or trackifiers where it is not possible to re-vegetate<br>• Only remove the cover in small areas during work and not all at once<br>• Avoid scabbling<br>• Ensure sand and other aggregates are stored and not able to dry out<br>• Ensure bulk cement and other fine power materials are delivered and stored to prevent escape |
| 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 Implement a wheel washing system at a suitable location near site exit<br>• Access gates 10m from receptors where possible |

### 5.1.4 Step 4

Assuming the relevant mitigation measures outlined in Table 22 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:

- 2012 Verification;
- 2015 DM; and,
- 2015 DS.

The DM (i.e. without development) scenario is representative of anticipated traffic data for 2015. The DS (i.e. with development) scenario is representative of anticipated traffic data for 2015 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 2015, the development opening year. Air quality is predicted to improve in the future. However, in order to provide a robust assessment, emission factors for 2012 were utilised within the dispersion model. The use of 2015 traffic data and 2012 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 for each scenario. Reference should be made to Figure 8, Figure 9 and Figure 10 for graphical representations of predicted levels throughout the assessment extents. This indicates exceedences of the AQO of 40µg/m$^3$ across a very small part of the north-west of the site, adjacent to the roundabout. Vegetation is proposed for this area. As such, it is not considered a location of relevant exposure for annual mean concentrations in accordance with DEFRA guidance LAQM.TG(09)[15]. It should be noted that the predicted level at the façade of the closest residential receptor was 31.7µg/m$^3$, which is below the relevant AQO.

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

**Predicted Concentrations at Sensitive Receptors**

Annual mean $NO_2$ concentrations were predicted for each scenario and are summarised in Table 23.

**Table 23 Predicted Annual Mean $NO_2$ Concentrations**

| Sensitive Receptor | | Predicted Annual Mean $NO_2$ Concentration (µg/m$^3$) | | |
|---|---|---|---|---|
| | | DM | DS | Change |
| R1 | Greenback Primary School | 30.87 | 30.90 | 0.03 |
| R2 | Residential - Greenbank Road | 32.65 | 32.70 | 0.05 |
| R3 | Spire Liverpool Hospital | 28.12 | 28.14 | 0.02 |
| R4 | Student Accommodation - Derby and Rathbone Hall | 30.75 | 30.78 | 0.03 |
| R5 | Liverpool College | 33.60 | 33.65 | 0.05 |

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

| Sensitive Receptor | | Predicted Annual Mean $NO_2$ Concentration (µg/m$^3$) | | |
|---|---|---|---|---|
| | | DM | DS | Change |
| R6 | Residential - Mossley Hill Drive | 27.32 | 27.33 | 0.01 |
| R7 | Residential - Mossley Hill Drive | 28.21 | 28.23 | 0.02 |
| R8 | Liverpool College | 28.14 | 28.16 | 0.02 |
| R9 | St Anthony of Padua RC Primary School | 28.18 | 28.20 | 0.02 |
| R10 | Residential - Queens Drive Mossley Hill | 32.82 | 32.87 | 0.05 |
| R11 | Residential - Queens Drive Mossley Hill | 30.98 | 31.01 | 0.03 |
| R12 | Fernlea Care Home | 29.99 | 30.02 | 0.03 |
| R13 | Residential Park Avenue | 26.57 | 26.58 | 0.01 |
| R14 | Residential - North Mossley Hill Road | 29.24 | 29.27 | 0.03 |
| R15 | Residential - Mossley Hill Road | 28.71 | 28.73 | 0.02 |
| R16 | Residential - Aigburth Vale | 29.28 | 29.32 | 0.04 |
| R17 | Residential - Victoria Road | 29.38 | 29.42 | 0.04 |
| R18 | Residential - Victoria Road | 29.22 | 29.26 | 0.04 |
| R19 | Residential - Victoria Road | 31.19 | 31.24 | 0.05 |
| R20 | Residential - Victoria Road | 29.72 | 29.75 | 0.03 |
| R21 | Residential - Mossley Hill Drive | 27.90 | 27.92 | 0.02 |
| R22 | Residential - Mossley Hill Drive | 27.80 | 27.82 | 0.02 |
| R23 | Residential - Ullet Road | 28.29 | 28.30 | 0.01 |
| R24 | Residential - Ullet Road | 43.47 | 43.52 | 0.05 |
| R25 | Residential - Brookdale Road | 36.75 | 36.78 | 0.03 |
| R26 | Residential - Russell Road | 34.15 | 34.19 | 0.04 |
| R27 | Residential - Kenyon Road | 32.86 | 32.90 | 0.04 |
| R28 | Residential - Kingsdale Road | 34.44 | 34.48 | 0.04 |

As indicated in Table 23, predicted annual mean $NO_2$ concentrations were below the relevant AQO at all sensitive receptors, with the exception of R24, for both scenarios considered. It should be noted that there are no new predicted exceedences of the annual mean AQO for $NO_2$ at receptor locations as a result of the proposed development.

Predicted impacts on annual mean $NO_2$ concentrations at the sensitive receptor locations are summarised in Table 24.

**Table 24 Predicted $NO_2$ Impacts**

| Sensitive Receptor | | Magnitude of Change | Receptor Sensitivity | Significance of Impact |
|---|---|---|---|---|
| R1 | Greenback Primary School | Imperceptible | Medium | Negligible |
| R2 | Residential - Greenbank Road | Imperceptible | Medium | Negligible |
| R3 | Spire Liverpool Hospital | Imperceptible | Low | Negligible |
| R4 | Student Accommodation - Derby and Rathbone Hall | Imperceptible | Medium | Negligible |
| R5 | Liverpool College | Imperceptible | Medium | Negligible |
| R6 | Residential - Mossley Hill Drive | Imperceptible | Low | Negligible |
| R7 | Residential - Mossley Hill Drive | Imperceptible | Low | Negligible |
| R8 | Liverpool College | Imperceptible | Low | Negligible |
| R9 | St Anthony of Padua RC Primary School | Imperceptible | Low | Negligible |
| R10 | Residential - Queens Drive Mossley Hill | Imperceptible | Medium | Negligible |
| R11 | Residential - Queens Drive Mossley Hill | Imperceptible | Medium | Negligible |
| R12 | Fernlea Care Home | Imperceptible | Medium | Negligible |
| R13 | Residential Park Avenue | Imperceptible | Low | Negligible |
| R14 | Residential - North Mossley Hill Road | Imperceptible | Low | Negligible |
| R15 | Residential - Mossley Hill Road | Imperceptible | Low | Negligible |
| R16 | Residential - Aigburth Vale | Imperceptible | Low | Negligible |
| R17 | Residential - Victoria Road | Imperceptible | Low | Negligible |
| R18 | Residential - Victoria Road | Imperceptible | Low | Negligible |
| R19 | Residential - Victoria Road | Imperceptible | Medium | Negligible |
| R20 | Residential - Victoria Road | Imperceptible | Low | Negligible |
| R21 | Residential - Mossley Hill Drive | Imperceptible | Low | Negligible |
| R22 | Residential - Mossley Hill Drive | Imperceptible | Low | Negligible |
| R23 | Residential - Ullet Road | Imperceptible | Low | Negligible |
| R24 | Residential - Ullet Road | Imperceptible | Very High | Negligible |
| R25 | Residential - Brookdale Road | Imperceptible | High | Negligible |
| R26 | Residential - Russell Road | Imperceptible | Medium | Negligible |
| R27 | Residential - Kenyon Road | Imperceptible | Medium | Negligible |

| Sensitive Receptor | | Magnitude of Change | Receptor Sensitivity | Significance of Impact |
|---|---|---|---|---|
| R28 | Residential - Kingsdale Road | Imperceptible | Medium | Negligible |

As indicated in Table 24, 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 for each scenario. Reference should be made to Figure 11, Figure 12 and Figure 13 for graphical representations of predicted levels throughout the assessment extents with and without the development. Concentrations were predicted to be below the AQO at all locations across the development with concentrations ranging from 13.3µg/$m^3$ to 15.35µg/$m^3$ 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 residents 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 25.

**Table 25 Predicted Annual Mean $PM_{10}$ Concentrations**

| Sensitive Receptor | | Predicted Annual Mean $PM_{10}$ Concentration (µg/$m^3$) | | |
|---|---|---|---|---|
| | | DM | DS | Change |
| R1 | Greenback Primary School | 13.89 | 13.90 | 0.01 |
| R2 | Residential - Greenbank Road | 14.33 | 14.34 | 0.01 |
| R3 | Spire Liverpool Hospital | 13.52 | 13.52 | 0.00 |
| R4 | Student Accommodation - Derby and Rathbone Hall | 14.01 | 14.02 | 0.01 |
| R5 | Liverpool College | 14.18 | 14.19 | 0.01 |
| R6 | Residential - Mossley Hill Drive | 13.38 | 13.38 | 0.00 |
| R7 | Residential - Mossley Hill Drive | 13.59 | 13.59 | 0.00 |
| R8 | Liverpool College | 13.53 | 13.53 | 0.00 |
| R9 | St Anthony of Padua RC Primary School | 13.42 | 13.42 | 0.00 |
| R10 | Residential - Queens Drive Mossley Hill | 14.07 | 14.08 | 0.01 |

| Sensitive Receptor | | Predicted Annual Mean $PM_{10}$ Concentration (µg/$m^3$) | | |
|---|---|---|---|---|
| | | DM | DS | Change |
| R11 | Residential - Queens Drive Mossley Hill | 13.99 | 14.00 | 0.01 |
| R12 | Fernlea Care Home | 13.84 | 13.85 | 0.01 |
| R13 | Residential Park Avenue | 13.25 | 13.25 | 0.00 |
| R14 | Residential - North Mossley Hill Road | 13.75 | 13.75 | 0.01 |
| R15 | Residential - Mossley Hill Road | 13.57 | 13.58 | 0.00 |
| R16 | Residential - Aigburth Vale | 13.71 | 13.71 | 0.01 |
| R17 | Residential - Victoria Road | 13.71 | 13.71 | 0.01 |
| R18 | Residential - Victoria Road | 13.70 | 13.71 | 0.01 |
| R19 | Residential - Victoria Road | 13.76 | 13.77 | 0.01 |
| R20 | Residential - Victoria Road | 13.73 | 13.73 | 0.00 |
| R21 | Residential - Mossley Hill Drive | 13.53 | 13.53 | 0.00 |
| R22 | Residential - Mossley Hill Drive | 13.50 | 13.51 | 0.00 |
| R23 | Residential - Ullet Road | 13.51 | 13.51 | 0.00 |
| R24 | Residential - Ullet Road | 15.23 | 15.23 | 0.01 |
| R25 | Residential - Brookdale Road | 14.36 | 14.37 | 0.00 |
| R26 | Residential - Russell Road | 13.99 | 14.00 | 0.00 |
| R27 | Residential - Kenyon Road | 14.10 | 14.10 | 0.01 |
| R28 | Residential - Kingsdale Road | 14.21 | 14.21 | 0.01 |

As indicated in Table 25, 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 26.

**Table 26 Predicted $PM_{10}$ Impacts**

| Sensitive Receptor | | Magnitude of Change | Receptor Sensitivity | Significance of Impact |
|---|---|---|---|---|
| R1 | Greenback Primary School | Imperceptible | Low | Negligible |
| R2 | Residential - Greenbank Road | Imperceptible | Low | Negligible |
| R3 | Spire Liverpool Hospital | Imperceptible | Low | Negligible |

| Sensitive Receptor | | Magnitude of Change | Receptor Sensitivity | Significance of Impact |
|---|---|---|---|---|
| R4 | Student Accommodation - Derby and Rathbone Hall | Imperceptible | Low | Negligible |
| R5 | Liverpool College | Imperceptible | Low | Negligible |
| R6 | Residential - Mossley Hill Drive | Imperceptible | Low | Negligible |
| R7 | Residential - Mossley Hill Drive | Imperceptible | Low | Negligible |
| R8 | Liverpool College | Imperceptible | Low | Negligible |
| R9 | St Anthony of Padua RC Primary School | Imperceptible | Low | Negligible |
| R10 | Residential - Queens Drive Mossley Hill | Imperceptible | Low | Negligible |
| R11 | Residential - Queens Drive Mossley Hill | Imperceptible | Low | Negligible |
| R12 | Fernlea Care Home | Imperceptible | Low | Negligible |
| R13 | Residential Park Avenue | Imperceptible | Low | Negligible |
| R14 | Residential - North Mossley Hill Road | Imperceptible | Low | Negligible |
| R15 | Residential - Mossley Hill Road | Imperceptible | Low | Negligible |
| R16 | Residential - Aigburth Vale | Imperceptible | Low | Negligible |
| R17 | Residential - Victoria Road | Imperceptible | Low | Negligible |
| R18 | Residential - Victoria Road | Imperceptible | Low | Negligible |
| R19 | Residential - Victoria Road | Imperceptible | Low | Negligible |
| R20 | Residential - Victoria Road | Imperceptible | Low | Negligible |
| R21 | Residential - Mossley Hill Drive | Imperceptible | Low | Negligible |
| R22 | Residential - Mossley Hill Drive | Imperceptible | Low | Negligible |
| R23 | Residential - Ullet Road | Imperceptible | Low | Negligible |
| R24 | Residential - Ullet Road | Imperceptible | Low | Negligible |
| R25 | Residential - Brookdale Road | Imperceptible | Low | Negligible |
| R26 | Residential - Russell Road | Imperceptible | Low | Negligible |
| R27 | Residential - Kenyon Road | Imperceptible | Low | Negligible |
| R28 | Residential - Kingsdale Road | Imperceptible | Low | Negligible |

As indicated in Table 26, predicted 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 27.

**Table 27 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 | Air quality impacts on both $NO_2$ 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 | Pollutant concentrations across the site were assessed and results indicate that future users will not be exposed to elevated $NO_2$ or $PM_{10}$ levels |
| The magnitude of changes and the descriptions of the impacts at the receptors | Imperceptible changes in $NO_2$ and $PM_{10}$ were predicted at all sensitive receptors. As such, impacts were negligible |
| Whether or not an exceedence of an objective or limit value is predicted to arise in the study area where none existed before or an exceedence area is substantially increased | There were exceedences of the annual mean AQLV for $NO_2$ within non-sensitive areas of the local highway network for scenarios considered. The area of exceedence is not predicted to substantially increase as a result of the development |
| Whether or not the study area exceeds an objective or limit value and this exceedence is removed or the exceedence area is reduced | The area of exceedence will not be removed or reduced as a result of the development |
| The extent to which an objective or limit value 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 predicted AQO exceedences at any sensitive locations in either scenario for $PM_{10}$. One sensitive receptor, R24, was above the annual mean AQO for $NO_2$ in both the DM and DS scenarios. It should be noted that the resultant impact was negligible at all locations |

## 6.0 CONCLUSION

REC Ltd was commissioned by Redrow Homes Limited to undertake an Air Quality Assessment in support of a planning application for a residential development on land at Park Avenue, Liverpool.

The proposals comprise 34 residential units and associated infrastructure.

The site is located in an area identified by LCC as experiencing elevated pollutant concentrations and subsequently there are concerns that the proposals will introduce future users into an area of 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 pollution levels across the site, consider its suitability for the proposed 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 existing 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.

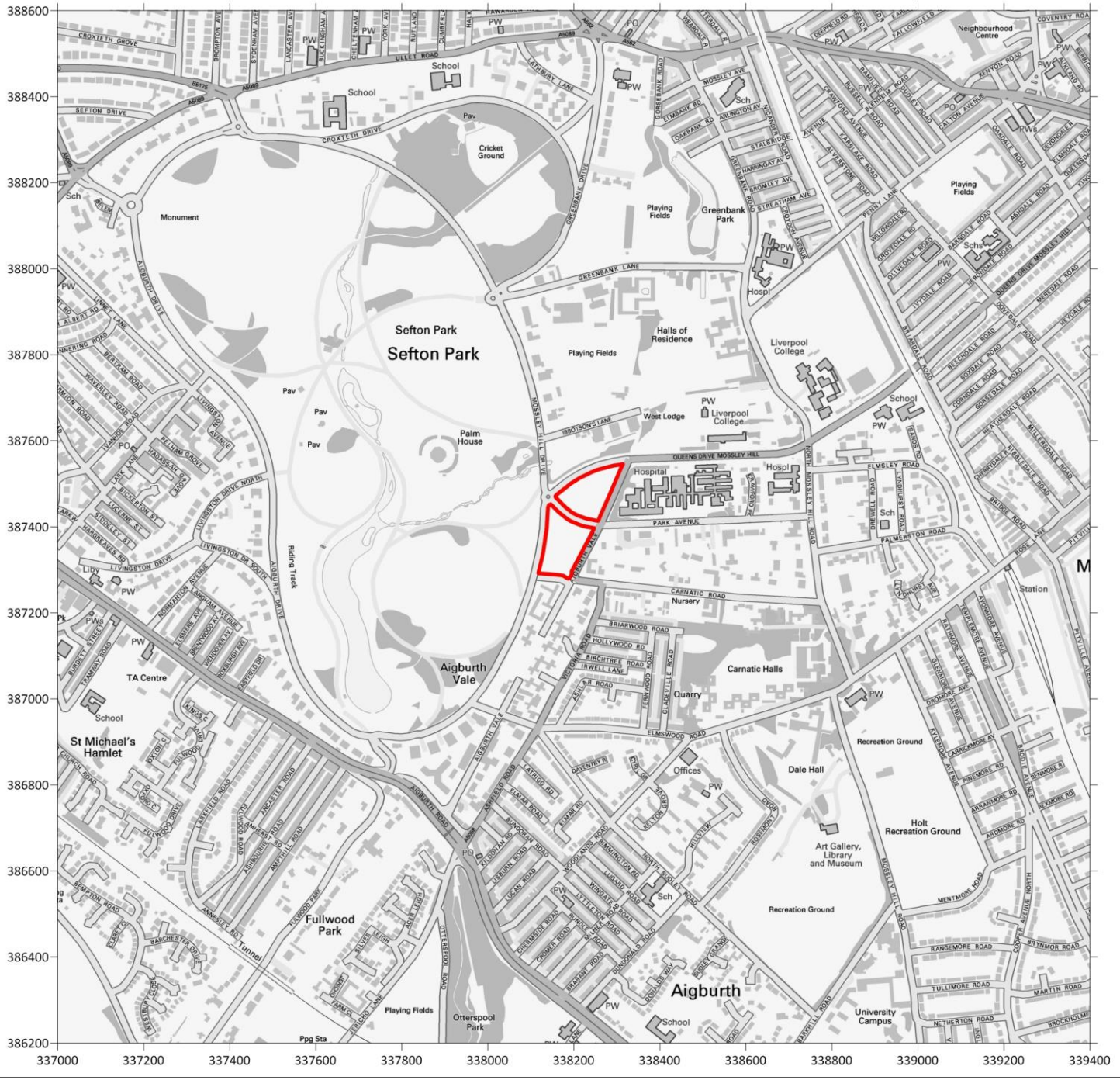
The dispersion modelling results indicated that pollution levels at the development were below the relevant AQOs. The location is therefore considered suitable for residential use without the inclusion of mitigation methods. Predicted impacts on $NO_2$ and $PM_{10}$ concentrations as a result of operational 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 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 |
| 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 |
| DMP | Dust Management Plan |
| DMRB | Design Manual for Roads and Bridges |
| 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 |
| $z_0$ | Roughness Length |

# APPENDIX I FIGURES




**Legend**

Site Boundary

**Title**

Figure 1

Site Location

**Project**

Air Quality Assessment
Park Avenue, Liverpool

**Project Number**

34127

**Client**

Redrow Homes Limited

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**Legend**

**Title**
Figure 2
Site Layout

**Project**
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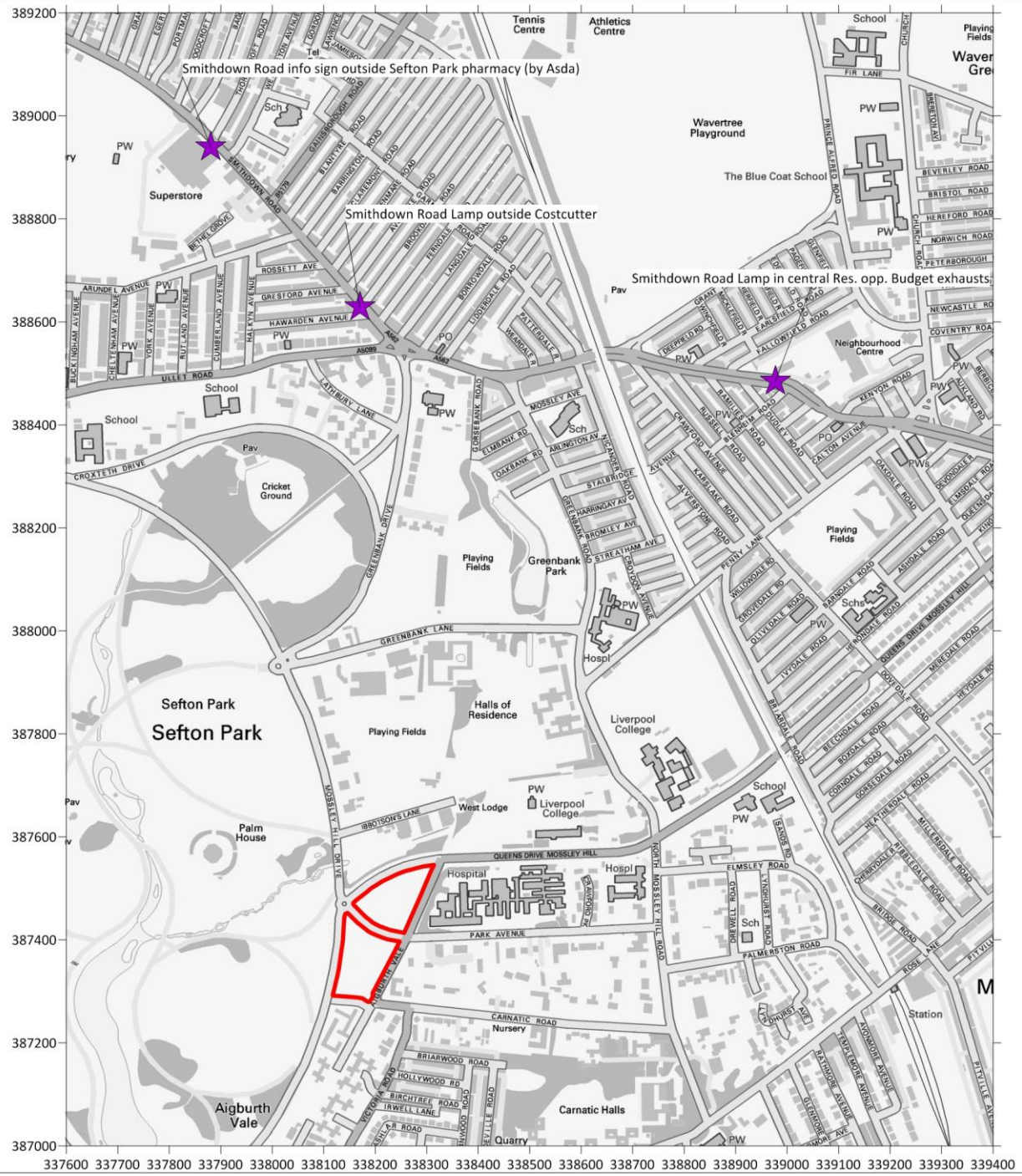


**Legend**

Site Boundary

Diffusion Tube Monitoring Location

**Title**

Figure 3

Diffusion Tube Monitoring Locations

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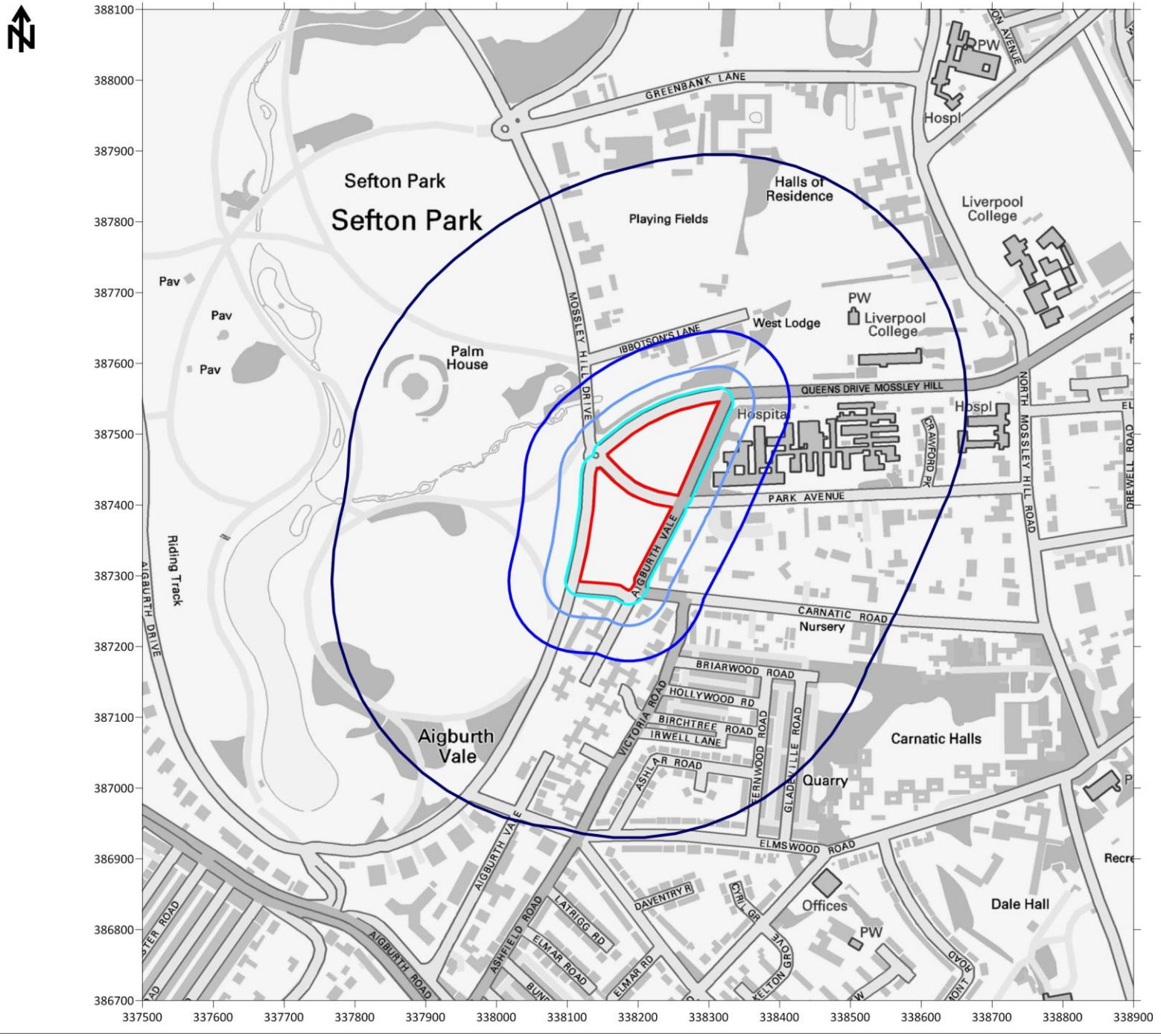


**Legend**

- 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

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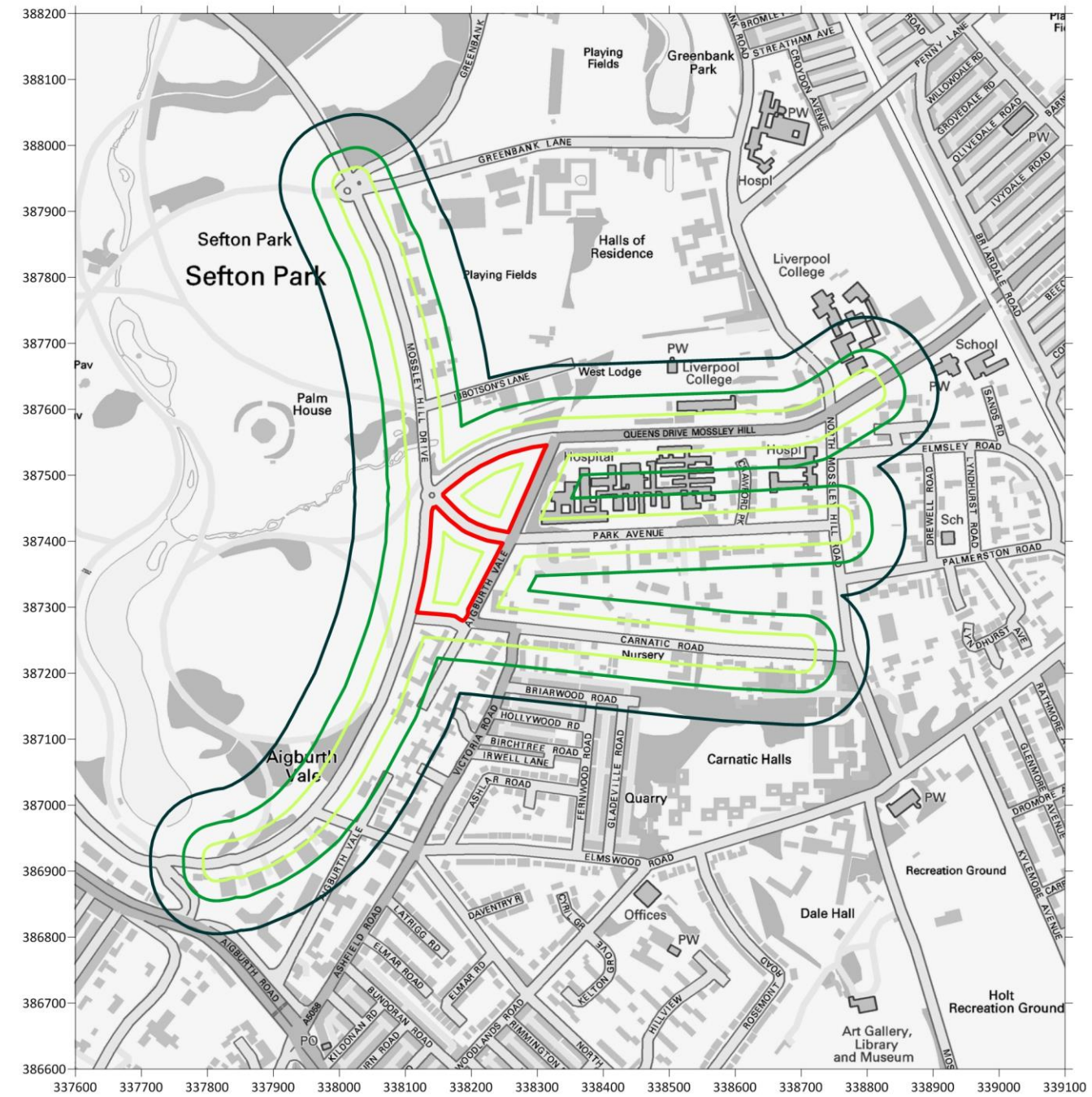


**Legend**

- Site Boundary
- 20m from Site Access Point
- 50m from Site Access Point
- 100m from Site Access Point

**Title**

Figure 5

Trackout Dust Buffer Zones

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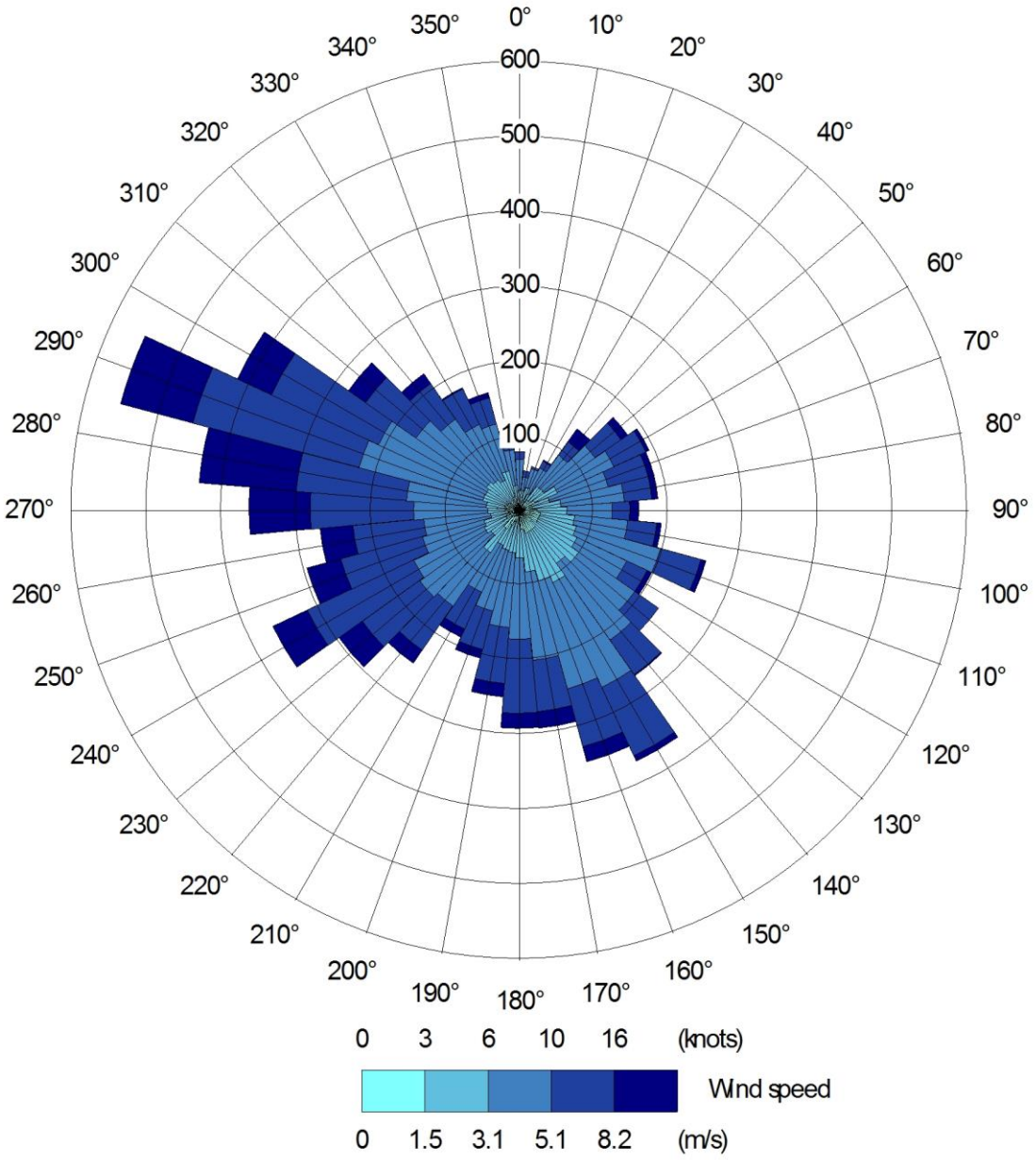


**Legend**

**Title**

Figure 6

Wind Rose of 2012 Liverpool Airport Meteorological Data

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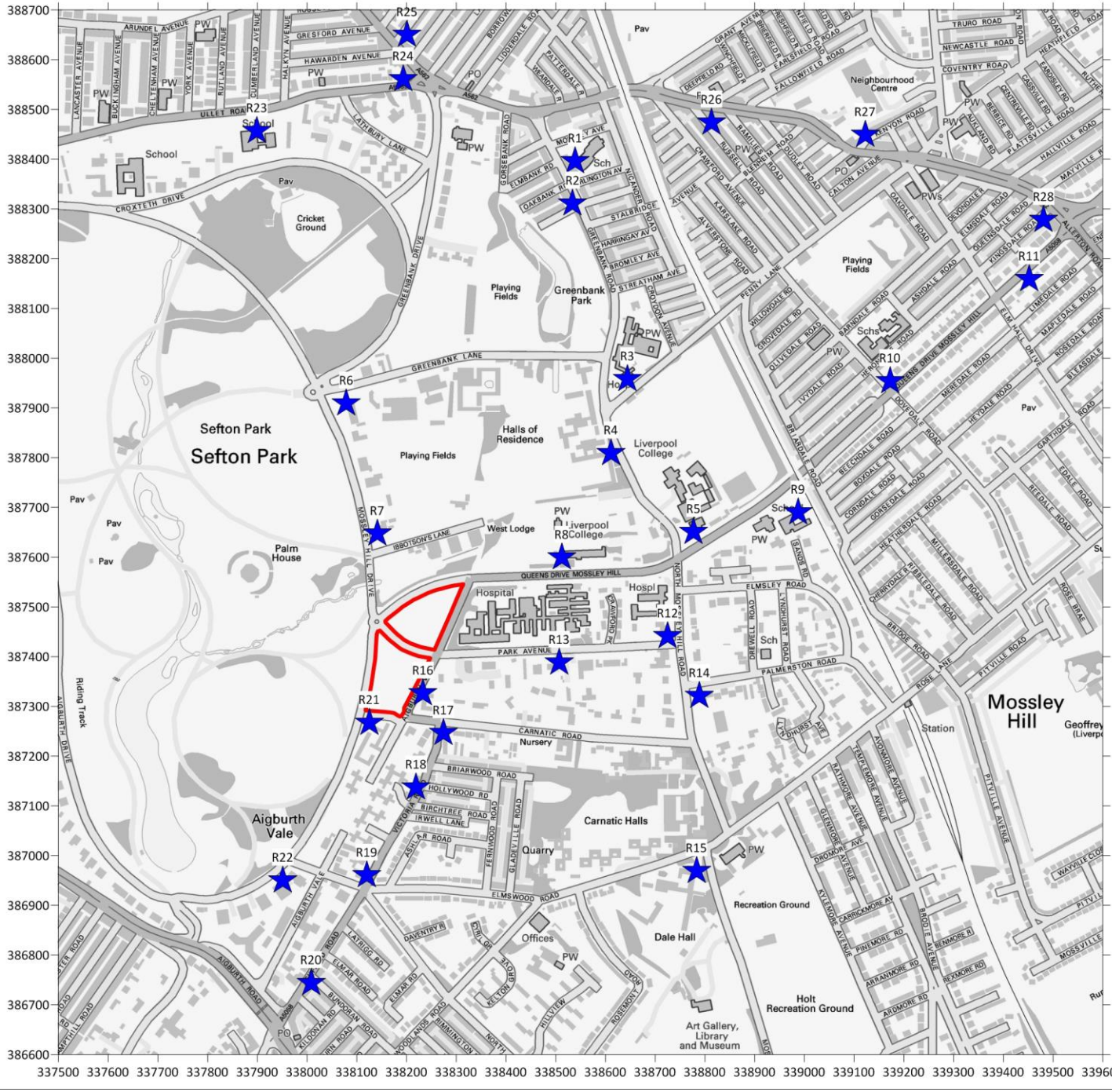


**Legend**

Site Boundary

Sensitive Receptor Location

**Title**

Figure 7

Traffic Exhaust Emissions
Sensitive Receptor Locations

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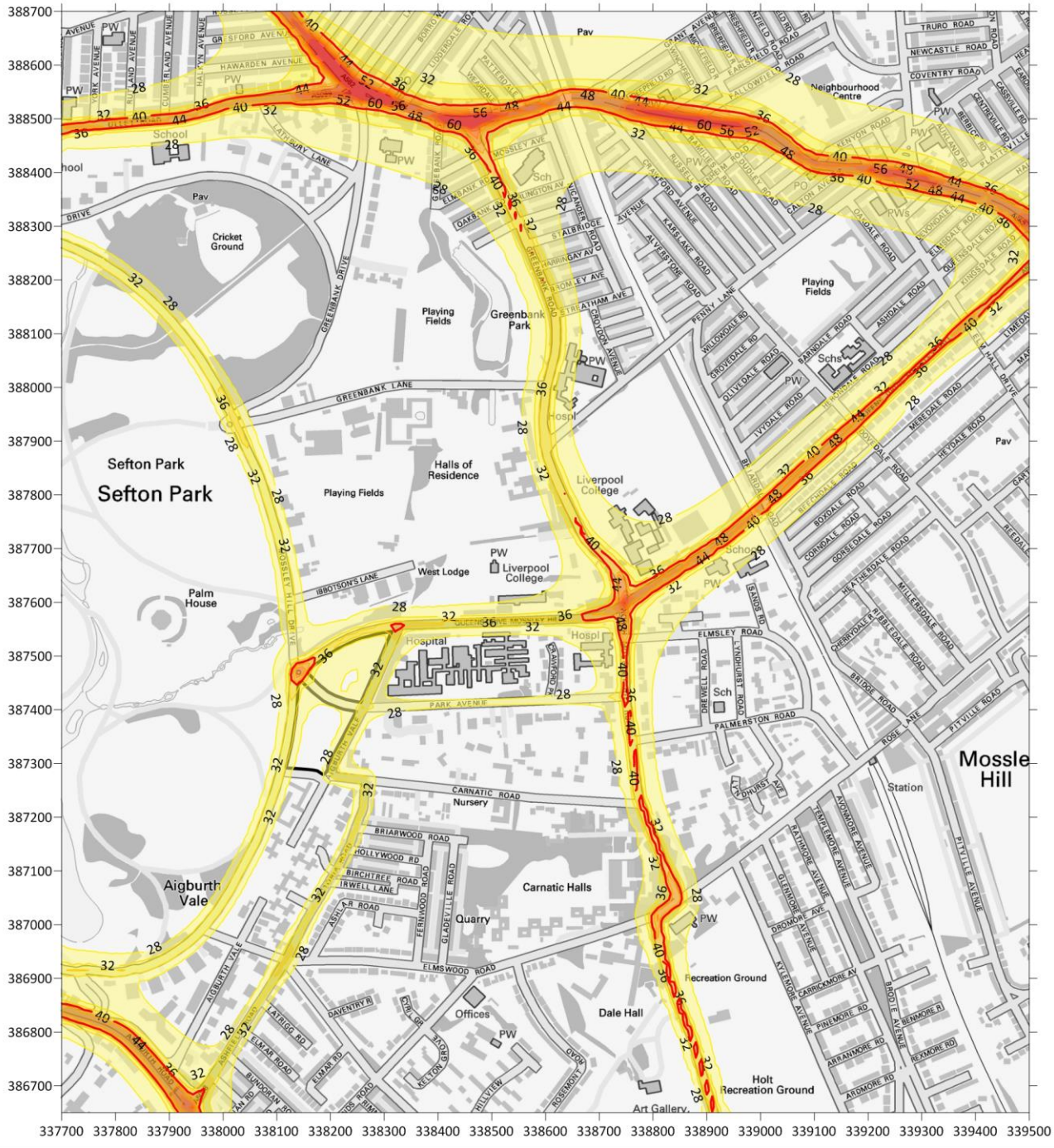


**Legend**

Site Boundary

Predicted Annual Mean $NO_2$ Concentrations ($\mu g/m^3$)

60
56
52
48
44
40
36
32
28

**Title**

Figure 8
Predicted Annual Mean $NO_2$ Concentration ($\mu g/m^3$) 2015 DM

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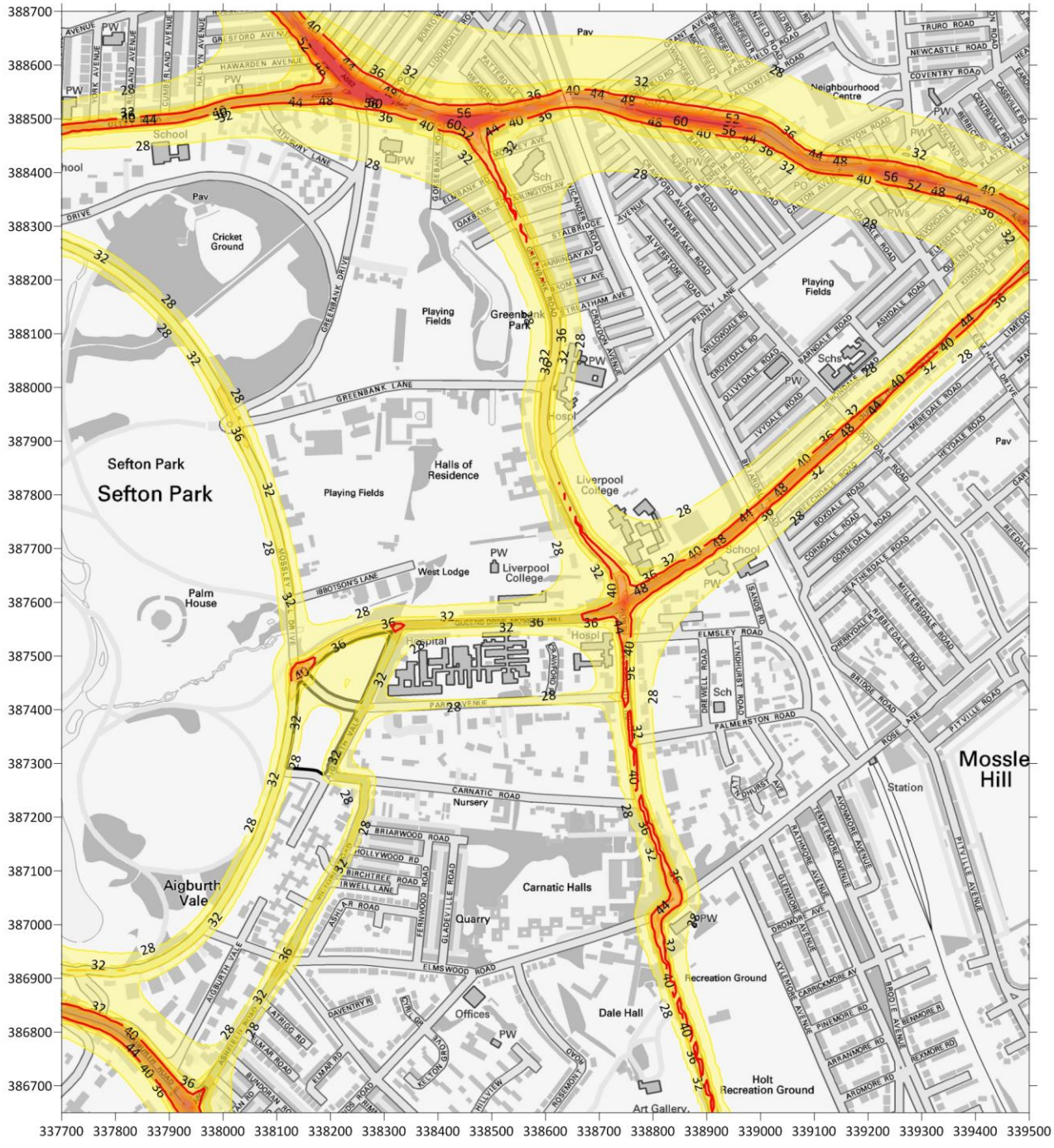


**Legend**

Site Boundary

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

60
56
52
48
44
40
36
32
28

**Title**

Figure 9
Predicted Annual Mean $NO_2$ Concentration (µg/m³) 2015 DS

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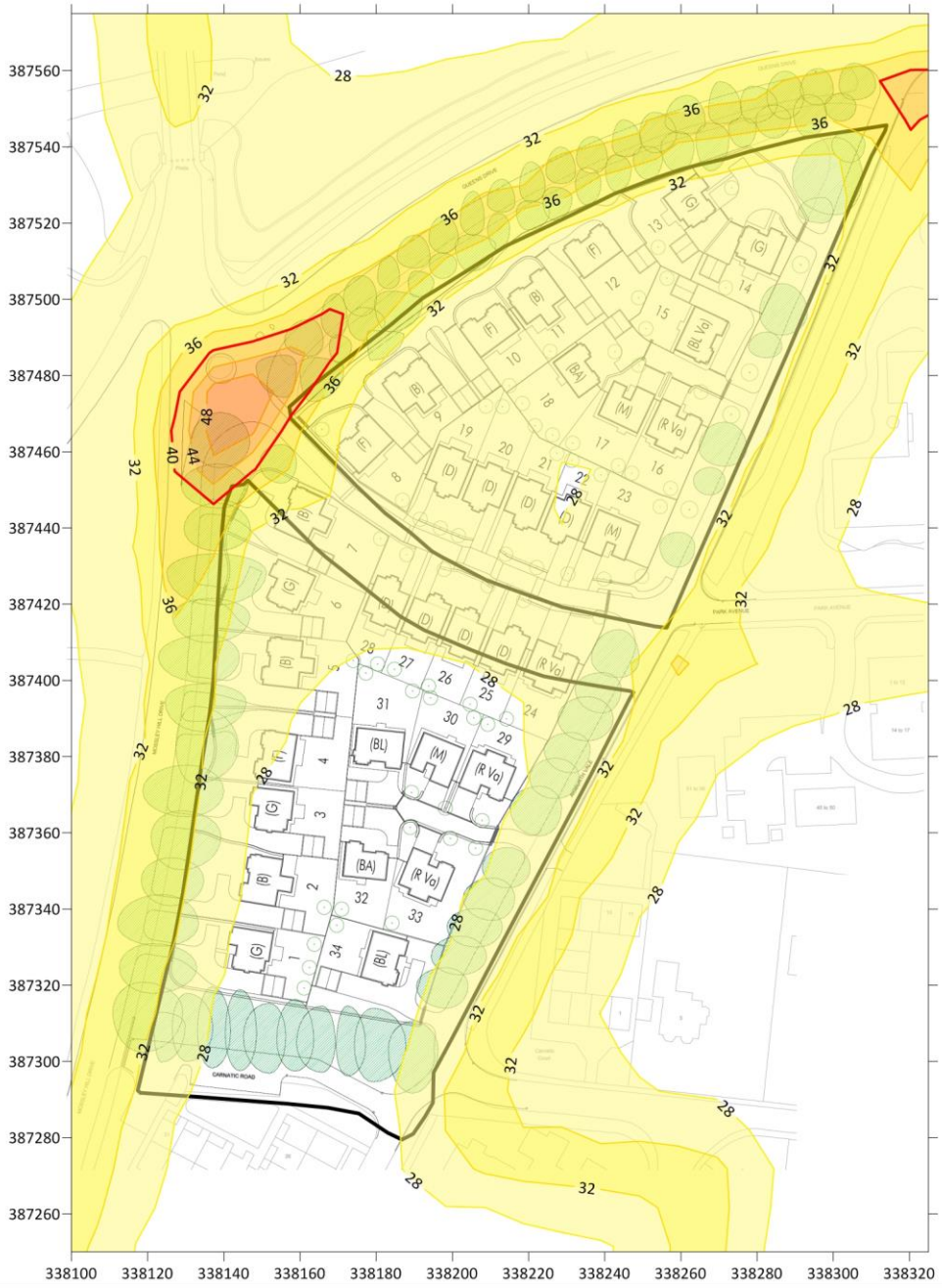


**Legend**

Site Boundary

48
44
40
36
32
28

Predicted Annual Mean $NO_2$ Concentrations ($\mu g/m^3$)

**Title**

Figure 10
Predicted Annual Mean $NO_2$ Concentration ($\mu g/m^3$) 2015 DS
Site Location

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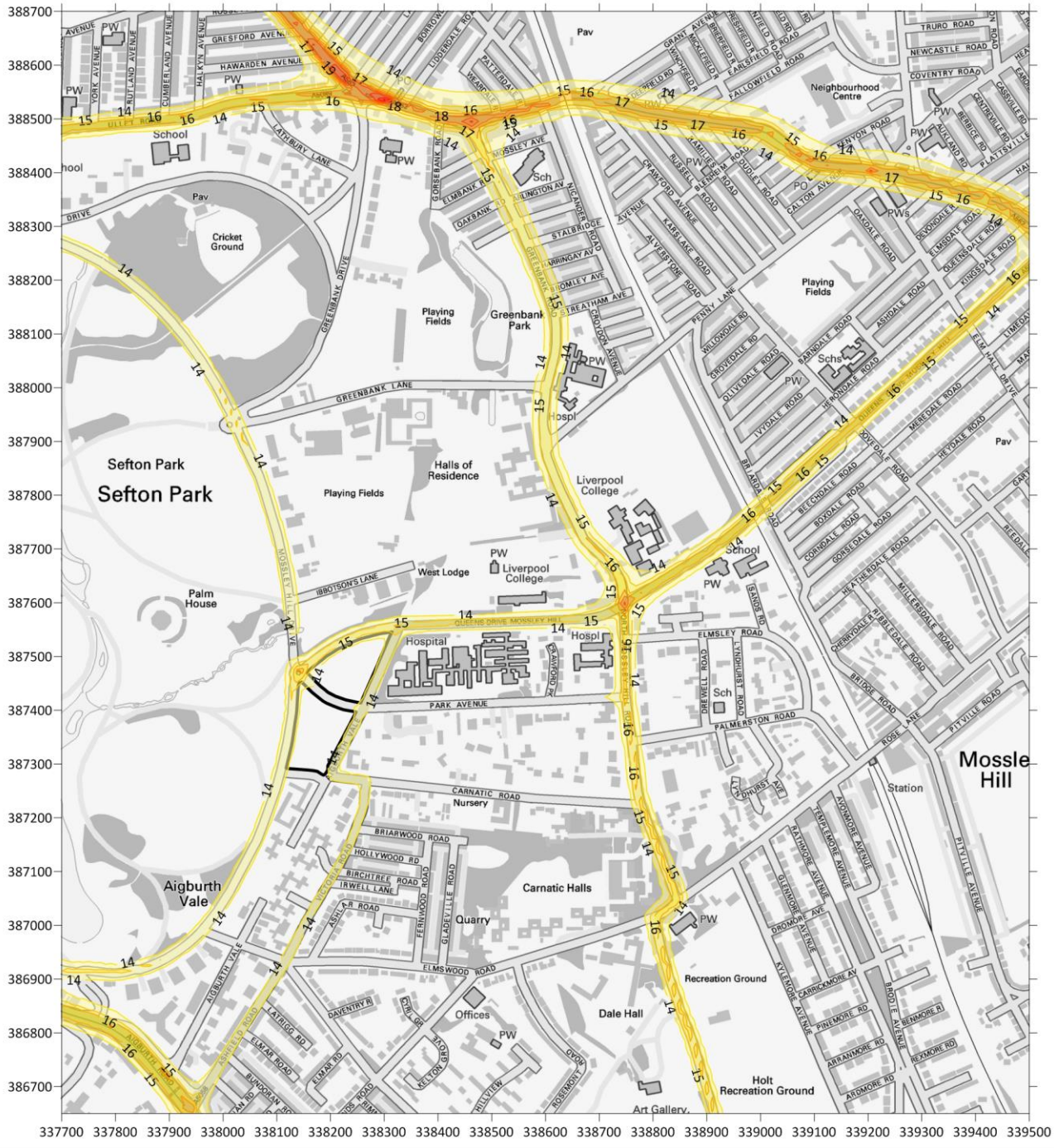


**Legend**

Site Boundary

22
21
20
19
18
17
16
15
14

Predicted Annual Mean $PM_{10}$ Concentrations ($\mu g/m^3$)

**Title**

Figure 11

Predicted Annual Mean $PM_{10}$ Concentration ($\mu g/m^3$) 2015 DM

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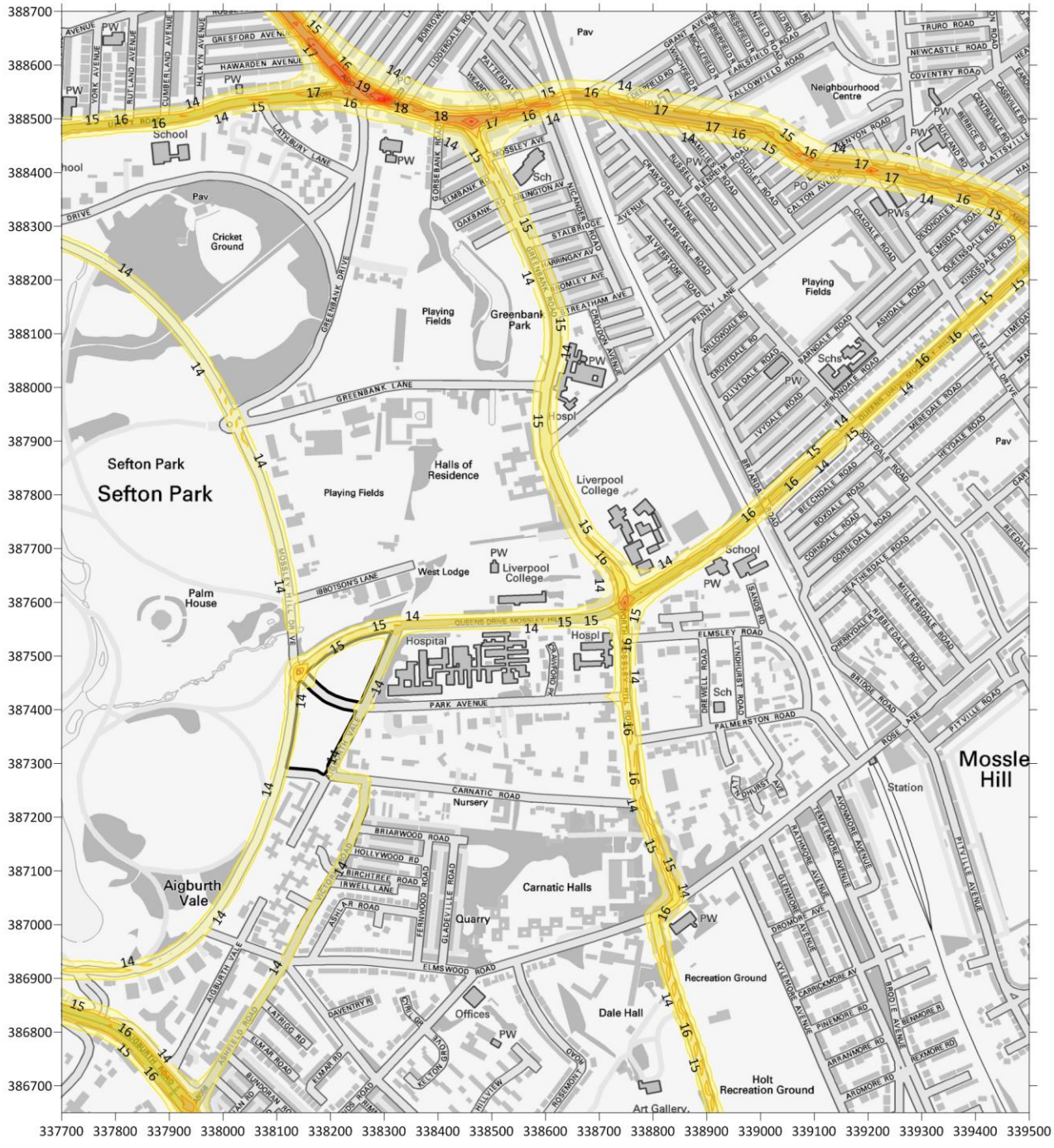


**Legend**

Site Boundary

22
21
20
19
18
17
16
15
14

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

**Title**

Figure 12
Predicted Annual Mean $PM_{10}$ Concentration (µg/m³) 2015 DS

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**Legend**

Site Boundary

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

22
21
20
19
18
17
16
15
14

**Title**

Figure 13
Predicted Annual Mean $PM_{10}$ Concentration (µg/m³) 2015 DS
Site Location

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Air Quality Assessment
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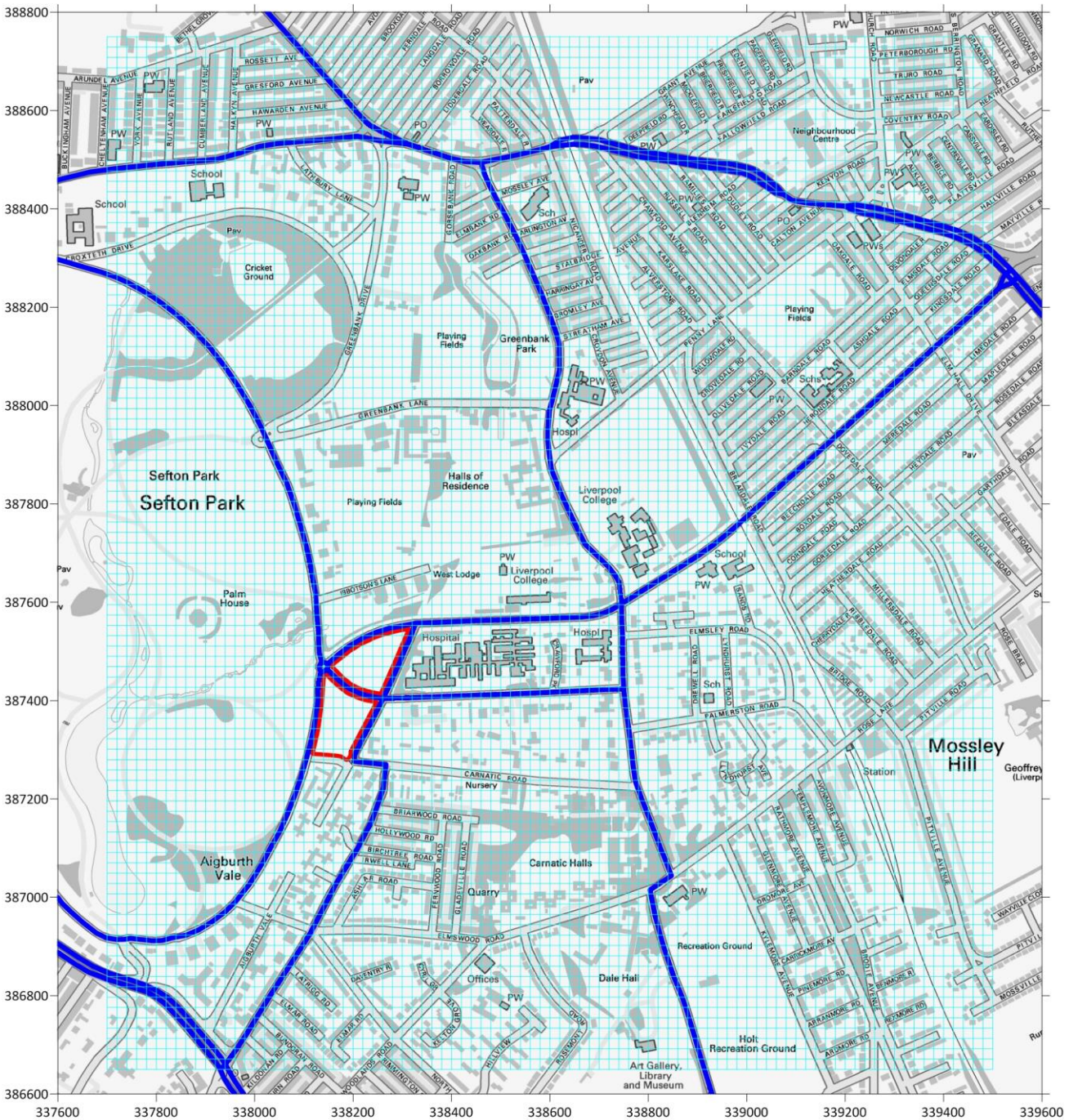


**Legend**

Site Boundary

Modelled Road Link

Cartesian Grid

**Title**

Figure 14

ADMS-Roads Input

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Air Quality Assessment
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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 within an AQMA and the development may result in exposure of 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 3.2). 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: 337700, 339500 to 386650, 388750. One Cartesian grid at a height of 1.5m was used within the model to produce data suitable for contour plotting using the Surfer software package.

Reference should be made to Figure 14 for a graphical representation of the assessment grid extents.

### Traffic Flow Data

Traffic data for use in the assessment, including 24-hour Annual Average Daily Traffic (AADT) flows and fleet composition as HDV proportion, was provided by SCP Transportation Planning, the Transport Consultants for the project. Additional traffic data for the surrounding road network was downloaded from the Department for Transport (DfT) Matrix[16] for links not provided by the

[16] www.dft.gov.uk/matrix.

transport consultants. 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 2012. It should be noted that the DfT matrix is referenced in DEFRA guidance LAQM.TG(09)[17] 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.

Road widths were estimated from aerial photography and UK highway design standards. Reference should be made to Figure 14 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 2012 Traffic Data**

| Road Link | | Road Width (m) | 24-hour AADT Flow | HDV Prop. (%) | Mean Vehicle Speed (km/h) |
|---|---|---|---|---|---|
| L1 | Smithdown Road | 12.4 | 17,593 | 5.8 | 45 |
| L2 | Smithdown Road/ Thornycroft Road junction | 16.4 | 17,593 | 5.8 | 10 |
| L3 | Smithdown Road | 13.0 | 17,593 | 5.8 | 25 |
| L4 | Smithdown Road/ Gainsborough Road junction | 11.6 | 17,593 | 5.8 | 15 |
| L5 | Smithdown Road | 11.6 | 17,593 | 5.8 | 45 |
| L6 | Smithdown Road/ Ullet Road junction approach | 18.0 | 17,593 | 5.8 | 10 |
| L7 | Smithdown Road/ Ullet Road junction | 9.8 | 17,593 | 5.8 | 15 |
| L8 | Smithdown Road/ Ullet Road junction depart | 12.3 | 19,179 | 7.4 | 40 |
| L9 | Smithdown Road/ Greenback Road junction | 16.9 | 19,179 | 7.4 | 15 |
| L10 | Smithdown Road | 9.5 | 19,179 | 7.4 | 40 |
| L11 | Smithdown Road Bypass split/ Grant Avenue junction | 6.8 | 9,590 | 7.4 | 45 |
| L12 | Smithdown Road Bypass split/ Grant Avenue junction | 7.0 | 9,590 | 7.4 | 45 |
| L13 | Smithdown Road Bypass split | 9.0 | 9,590 | 7.4 | 15 |
| L14 | Smithdown Road Bypass split | 9.0 | 9,590 | 7.4 | 15 |
| L15 | Smithdown Road Bypass split depart | 5.9 | 9,590 | 7.4 | 40 |
| L16 | Smithdown Road Bypass split depart | 6.1 | 9,590 | 7.4 | 40 |
| L17 | Smithdown Road | 12.9 | 19,179 | 7.4 | 45 |
| L18 | Smithdown Road Bypass split/ Church Road junction | 6.3 | 9,590 | 7.4 | 20 |

[17] 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) |
|---|---|---|---|---|---|
| L19 | Smithdown Road Bypass split/ Church Road junction | 9.3 | 9,590 | 7.4 | 20 |
| L20 | Smithdown Road Bypass split depart | 6.4 | 9,590 | 7.4 | 45 |
| L21 | Smithdown Road Bypass split depart | 6.8 | 9,590 | 7.4 | 45 |
| L22 | Smithdown Road Bypass split depart/ Queens Drive | 7.3 | 9,590 | 7.4 | 20 |
| L23 | Smithdown Road Bypass split depart/ Queens Drive | 8.7 | 9,590 | 7.4 | 20 |
| L24 | Allerton Road | 7.3 | 9,590 | 7.4 | 45 |
| L25 | Allerton Road | 8.7 | 9,590 | 7.4 | 45 |
| L26 | Ullet Road | 7.8 | 14,462 | 4.7 | 45 |
| L27 | Ullet Road/ Smithdown Road junction | 9.1 | 14,462 | 4.7 | 15 |
| L28 | Greenbank Road/ Smithdown junction | 13.2 | 12,697 | 2.4 | 15 |
| L29 | Greenbank Road | 12.5 | 12,697 | 2.4 | 45 |
| L30 | Greenbank Road/ Queens Drive Mossley Hill junction | 10.3 | 12,697 | 2.4 | 15 |
| L31 | North Mossley Hill Road / Queens Drive Mossley Hill junction | 10.3 | 12,697 | 2.4 | 15 |
| L32 | North Mossley Hill Road/ Park Avenue junction | 7.4 | 12,697 | 2.4 | 45 |
| L33 | North Mossley Hill Road | 6.9 | 12,697 | 2.4 | 45 |
| L34 | Rose Lane | 9.9 | 12,697 | 2.4 | 20 |
| L35 | Mossley Hill Road | 5.8 | 12,697 | 2.4 | 45 |
| L36 | Mossley Hill Drive | 9.7 | 7,975 | 1.0 | 45 |
| L37 | Mossley Hill Drive/ Greenbank junction | 9.1 | 7,975 | 1.0 | 20 |
| L38 | Mossley Hill Drive | 9.3 | 7,975 | 1.0 | 45 |
| L39 | Mossley Hill Drive roundabout | 9.8 | 143 | 0.0 | 15 |
| L40 | Mossley Hill Drive roundabout | 9.8 | 7,975 | 1.0 | 15 |
| L41 | Mossley Hill Drive | 8.8 | 7,975 | 1.0 | 45 |
| L42 | Aigburth Road split | 6.9 | 9,929 | 4.6 | 45 |
| L43 | Aigburth Road split | 7.9 | 9,929 | 4.6 | 45 |
| L44 | Aigburth Road split/ Ashfield Road junction | 7.3 | 9,929 | 4.6 | 20 |
| L45 | Aigburth Road split/ Ashfield Road junction | 10.9 | 9,929 | 4.6 | 20 |

| Road Link | | Road Width (m) | 24-hour AADT Flow | HDV Prop. (%) | Mean Vehicle Speed (km/h) |
|---|---|---|---|---|---|
| L46 | Queens Drive Mossley Hill/ Smithdown junction split | 6.9 | 6,349 | 2.4 | 15 |
| L47 | Queens Drive Mossley Hill/ Smithdown junction split | 6.7 | 6,349 | 2.4 | 15 |
| L48 | Queens Drive Mossley Hill | 7.1 | 12,697 | 2.4 | 45 |
| L49 | Queens Drive Mossley Hill/ Elm Hall Drive junction | 6.9 | 12,697 | 2.4 | 25 |
| L50 | Queens Drive Mossley Hill | 6.4 | 12,697 | 2.4 | 45 |
| L51 | Queens Drive Mossley Hill/ Dovedale Road junction approach | 6.7 | 12,697 | 2.4 | 20 |
| L52 | Queens Drive Mossley Hill | 8.5 | 12,697 | 2.4 | 15 |
| L53 | Queens Drive Mossley Hill/ North Mossley Hill Road | 9.4 | 12,697 | 2.4 | 15 |
| L54 | Queens Drive Mossley Hill/ North Mossley Hill Road junction | 10.5 | 8,618 | 2.4 | 15 |
| L55 | Queens Drive Mossley Hill | 8.0 | 8,618 | 2.4 | 45 |
| L56 | Queens Drive Mossley Hill | 7.9 | 8,618 | 2.4 | 45 |
| L57 | Queens Drive Mossley Hill roundabout approach | 7.9 | 8,618 | 2.4 | 15 |
| L58 | Park Avenue roundabout approach | 8.5 | 1,284 | 1.1 | 15 |
| L59 | Park Avenue | 6.1 | 1,284 | 1.1 | 45 |
| L60 | Park Avenue/ Aigburth Vale junction | 6.3 | 1,284 | 1.1 | 15 |
| L61 | Park Avenue/ Aigburth Vale junction | 6.3 | 1,553 | 2.3 | 15 |
| L62 | Park Avenue | 6.0 | 1,553 | 2.3 | 40 |
| L63 | Park Avenue/ North Mossley Hill Road | 5.8 | 1,553 | 2.3 | 15 |
| L64 | Aigburth Vale/ Queens Drive Mossley Hill junction | 8.6 | 4,574 | 4.1 | 15 |
| L65 | Aigburth Vale | 7.2 | 4,574 | 4.1 | 45 |
| L66 | Aigburth Vale | 7.2 | 5,244 | 4.3 | 45 |
| L67 | Aigburth Vale/ Carnatic Road | 6.6 | 5,244 | 4.3 | 40 |
| L68 | Victoria Road | 6.5 | 5,244 | 4.3 | 45 |
| L69 | Victoria Road/ Elmswood Road | 7.4 | 5,244 | 4.3 | 15 |
| L70 | Ashfield Road | 7.4 | 5,244 | 4.3 | 45 |
| L71 | Ashfield Road/ Aigburth junction | 7.5 | 5,244 | 4.3 | 15 |

| Road Link | | Road Width (m) | 24-hour AADT Flow | HDV Prop. (%) | Mean Vehicle Speed (km/h) |
|---|---|---|---|---|---|
| R1 | Roundabout | 11.0 | 9,902 | 1.2 | 15 |

The road width and mean vehicle speed shown in Table All.1 remained the same for the DM and DS scenarios. A summary of the 2015 traffic data is shown in Table All.2.

**Table AII.2 2016 Traffic Data**

| Road Link | | DM | | DS | |
|---|---|---|---|---|---|
| | | 24-hour AADT Flow | HDV Prop. (%) | 24-hour AADT Flow | HDV Prop. (%) |
| L1 | Smithdown Road | 18,001 | 5.8 | 18,047 | 5.8 |
| L2 | Smithdown Road/ Thornycroft Road junction | 18,001 | 5.8 | 18,047 | 5.8 |
| L3 | Smithdown Road | 18,001 | 5.8 | 18,047 | 5.8 |
| L4 | Smithdown Road/ Gainsborough Road junction | 18,001 | 5.8 | 18,047 | 5.8 |
| L5 | Smithdown Road | 18,001 | 5.8 | 18,047 | 5.8 |
| L6 | Smithdown Road/ Ullet Road junction approach | 18,001 | 5.8 | 18,047 | 5.8 |
| L7 | Smithdown Road/ Ullet Road junction | 18,001 | 5.8 | 18,047 | 5.8 |
| L8 | Smithdown Road/ Ullet Road junction depart | 19,642 | 7.4 | 19,734 | 7.4 |
| L9 | Smithdown Road/ Greenback Road junction | 19,642 | 7.4 | 19,734 | 7.4 |
| L10 | Smithdown Road | 19,642 | 7.4 | 19,734 | 7.4 |
| L11 | Smithdown Road Bypass split/ Grant Avenue junction | 9,821 | 7.4 | 9,867 | 7.4 |
| L12 | Smithdown Road Bypass split/ Grant Avenue junction | 9,821 | 7.4 | 9,867 | 7.4 |
| L13 | Smithdown Road Bypass split | 9,821 | 7.4 | 9,867 | 7.4 |
| L14 | Smithdown Road Bypass split | 9,821 | 7.4 | 9,867 | 7.4 |
| L15 | Smithdown Road Bypass split depart | 9,821 | 7.4 | 9,867 | 7.4 |
| L16 | Smithdown Road Bypass split depart | 9,821 | 7.4 | 9,867 | 7.4 |
| L17 | Smithdown Road | 19,642 | 7.4 | 19,734 | 7.4 |
| L18 | Smithdown Road Bypass split/ Church Road junction | 9,821 | 7.4 | 9,867 | 7.4 |
| L19 | Smithdown Road Bypass split/ Church Road junction | 9,821 | 7.4 | 9,867 | 7.4 |
| L20 | Smithdown Road Bypass split depart | 9,821 | 7.4 | 9,867 | 7.4 |

| Road Link | | DM | | DS | |
|---|---|---|---|---|---|
| | | 24-hour AADT Flow | HDV Prop. (%) | 24-hour AADT Flow | HDV Prop. (%) |
| L21 | Smithdown Road Bypass split depart | 9,821 | 7.4 | 9,867 | 7.4 |
| L22 | Smithdown Road Bypass split depart/ Queens Drive | 9,821 | 7.4 | 9,867 | 7.4 |
| L23 | Smithdown Road Bypass split depart/ Queens Drive | 9,821 | 7.4 | 9,867 | 7.4 |
| L24 | Allerton Road | 9,821 | 7.4 | 9,867 | 7.4 |
| L25 | Allerton Road | 9,821 | 7.4 | 9,867 | 7.4 |
| L26 | Ullet Road | 14,797 | 4.7 | 14,843 | 4.7 |
| L27 | Ullet Road/ Smithdown Road junction | 14,797 | 4.7 | 14,843 | 4.7 |
| L28 | Greenbank Road/ Smithdown junction | 13,422 | 2.4 | 13,514 | 2.4 |
| L29 | Greenbank Road | 13,422 | 2.4 | 13,514 | 2.4 |
| L30 | Greenbank Road/ Queens Drive Mossley Hill junction | 13,422 | 2.4 | 13,514 | 2.4 |
| L31 | North Mossley Hill Road / Queens Drive Mossley Hill junction | 13,422 | 2.4 | 13,514 | 2.4 |
| L32 | North Mossley Hill Road/ Park Avenue junction | 13,422 | 2.4 | 13,514 | 2.4 |
| L33 | North Mossley Hill Road | 13,422 | 2.4 | 13,514 | 2.4 |
| L34 | Rose Lane | 13,422 | 2.4 | 13,514 | 2.4 |
| L35 | Mossley Hill Road | 13,422 | 2.4 | 13,514 | 2.4 |
| L36 | Mossley Hill Drive | 8,415 | 1.0 | 8,476 | 1.0 |
| L37 | Mossley Hill Drive/ Greenbank junction | 8,415 | 1.0 | 8,476 | 1.0 |
| L38 | Mossley Hill Drive | 8,415 | 1.0 | 8,476 | 1.0 |
| L39 | Mossley Hill Drive roundabout | 151 | 0.0 | 151 | 0.0 |
| L40 | Mossley Hill Drive roundabout | 8,415 | 1.0 | 8,476 | 1.0 |
| L41 | Mossley Hill Drive | 8,415 | 1.0 | 8,476 | 1.0 |
| L42 | Aigburth Road split | 10,159 | 4.6 | 10,180 | 4.6 |
| L43 | Aigburth Road split | 10,159 | 4.6 | 10,180 | 4.6 |
| L44 | Aigburth Road split/ Ashfield Road junction | 10,159 | 4.6 | 10,180 | 4.6 |
| L45 | Aigburth Road split/ Ashfield Road junction | 10,159 | 4.6 | 10,180 | 4.6 |
| L46 | Queens Drive Mossley Hill/ Smithdown junction split | 6,711 | 2.4 | 6,757 | 2.4 |

| Road Link | | DM | | DS | |
|---|---|---|---|---|---|
| | | 24-hour AADT Flow | HDV Prop. (%) | 24-hour AADT Flow | HDV Prop. (%) |
| L47 | Queens Drive Mossley Hill/ Smithdown junction split | 6,711 | 2.4 | 6,757 | 2.4 |
| L48 | Queens Drive Mossley Hill | 13,422 | 2.4 | 13,514 | 2.4 |
| L49 | Queens Drive Mossley Hill/ Elm Hall Drive junction | 13,422 | 2.4 | 13,514 | 2.4 |
| L50 | Queens Drive Mossley Hill | 13,422 | 2.4 | 13,514 | 2.4 |
| L51 | Queens Drive Mossley Hill/ Dovedale Road junction approach | 13,422 | 2.4 | 13,514 | 2.4 |
| L52 | Queens Drive Mossley Hill | 13,422 | 2.4 | 13,514 | 2.4 |
| L53 | Queens Drive Mossley Hill/ North Mossley Hill Road | 13,422 | 2.4 | 13,514 | 2.4 |
| L54 | Queens Drive Mossley Hill/ North Mossley Hill Road junction | 9,111 | 2.4 | 9,162 | 2.4 |
| L55 | Queens Drive Mossley Hill | 9,111 | 2.4 | 9,162 | 2.4 |
| L56 | Queens Drive Mossley Hill | 9,111 | 2.4 | 9,162 | 2.4 |
| L57 | Queens Drive Mossley Hill roundabout approach | 9,111 | 2.4 | 9,162 | 2.4 |
| L58 | Park Avenue roundabout approach | 1,337 | 1.1 | 1,429 | 1.1 |
| L59 | Park Avenue | 1,337 | 1.1 | 1,429 | 1.1 |
| L60 | Park Avenue/ Aigburth Vale junction | 1,337 | 1.1 | 1,429 | 1.1 |
| L61 | Park Avenue/ Aigburth Vale junction | 1,629 | 2.3 | 1,639 | 2.3 |
| L62 | Park Avenue | 1,629 | 2.3 | 1,639 | 2.3 |
| L63 | Park Avenue/ North Mossley Hill Road | 1,629 | 2.3 | 1,639 | 2.3 |
| L64 | Aigburth Vale/ Queens Drive Mossley Hill junction | 4,847 | 4.1 | 4,887 | 4.1 |
| L65 | Aigburth Vale | 4,847 | 4.1 | 4,887 | 4.1 |
| L66 | Aigburth Vale | 4,847 | 4.3 | 4,887 | 4.3 |
| L67 | Aigburth Vale/ Carnatic Road | 4,847 | 4.3 | 4,887 | 4.3 |
| L68 | Victoria Road | 4,847 | 4.3 | 4,887 | 4.3 |
| L69 | Victoria Road/ Elmswood Road | 4,847 | 4.3 | 4,887 | 4.3 |
| L70 | Ashfield Road | 4,847 | 4.3 | 4,887 | 4.3 |
| L71 | Ashfield Road/ Aigburth junction | 4,847 | 4.3 | 4,887 | 4.3 |
| R1 | Roundabout | 10,448 | 1.2 | 10,591 | 1.2 |

**Emission Factors**

Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 6.0.1) released in June 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, 2012 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 meteorological station over the period 1st January 2012 to 31st December 2012 (inclusive). Liverpool observation station is located at NGR: 343488, 381791 which is approximately 5.2km south-east of the proposed development. DEFRA guidance LAQM.TG(09)[18] 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.

**Roughness Length**

A roughness length ($z_0$) of 1m was used in this dispersion modelling study. This value of $z_0$ is considered appropriate for the morphology of the dispersion modelling assessment area and is suggested within ADMS-Roads as being suitable for 'cities, woodlands'.

**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 is suggested within ADMS-Roads as being suitable for 'cities and large towns'.

**Background Concentrations**

The annual mean $NO_2$ and $PM_{10}$ concentrations monitored at the Speke automatic analyser during 2012, as displayed in Table All.3, were used in the dispersion modelling assessment to represent existing pollutant levels in the vicinity of the site. The concentrations monitored at the Speke automatic analyser were higher than the background data available from DEFRA and was therefore utilised in order to provide a worst case scenario.

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

**Table AII.3 Automatic Monitoring Results**

| Site | Annual Mean Concentration (µg/m$^3$) 2012 | |
|---|---|---|
| | $NO_2$ | $PM_{10}$ |
| Speke | 25.00 | 13.00 |

Similarly to emission factors, background concentrations for 2012 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).

**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.

For the purpose of this assessment model verification was undertaken for 2012, using traffic data, meteorological data and monitoring results from this year.

LCC undertakes monitoring of $NO_2$ concentrations at a number of locations 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)[19]. The monitored annual mean $NO_2$ concentration and calculated roadside $NO_x$ concentration is summarised in Table AII.4.

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

**Table AII.4 2013 Monitoring Results**

| Monitoring Location | Monitored $NO_2$ Concentration ($\mu g/m^3$) | Calculated Roadside $NO_x$ Concentration ($\mu g/m^3$) |
|---|---|---|
| Smithdown Road Lamp outside Costcutter | 67.0 | 119.3 |
| Smithdown Road Lamp outside Sefton Park pharmacy | 63.0 | 104.6 |
| Smithdown Road Lamp in central Res. opp. Budget exhausts | 52.0 | 68.0 |

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.5.

**Table AII.5 Verification Results**

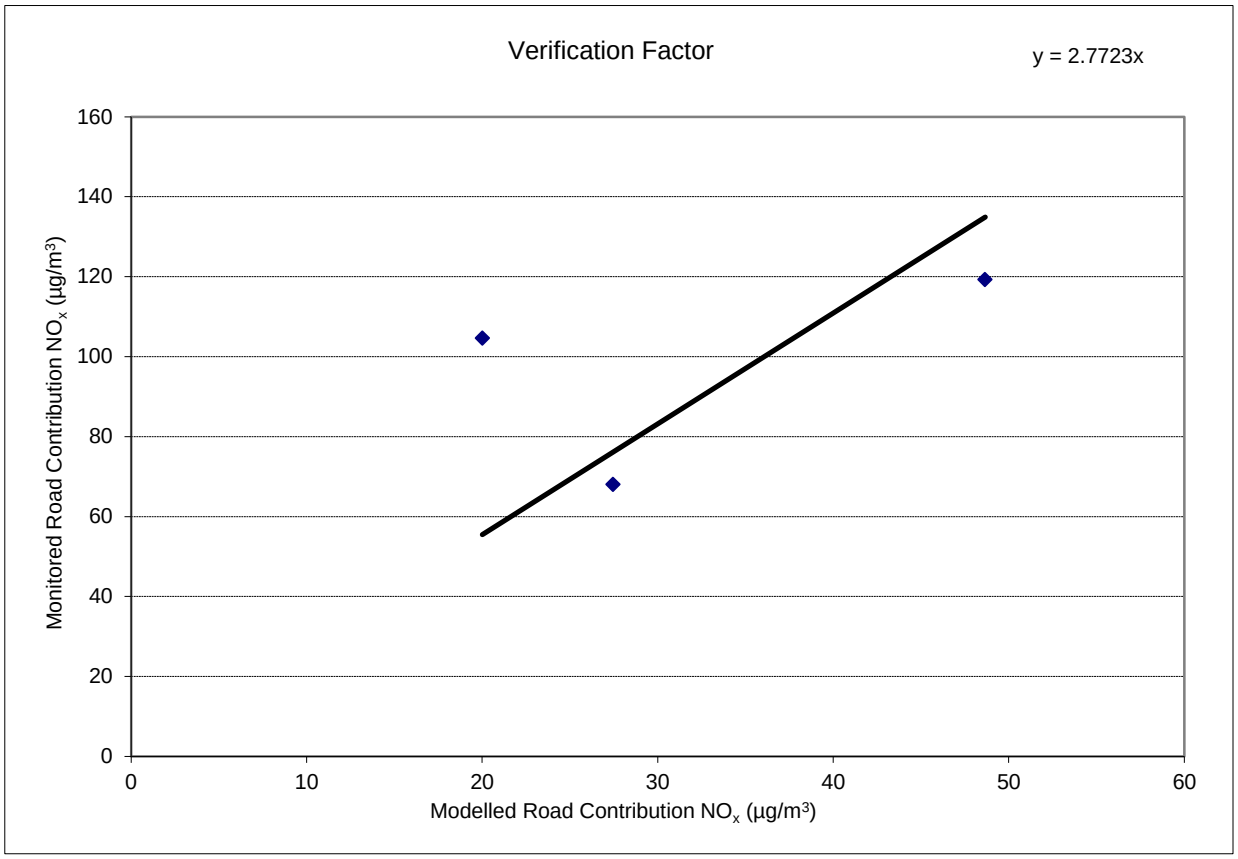
| Monitoring Location | Modelled Roadside $NO_x$ Concentration ($\mu g/m^3$) |
|---|---|
| Smithdown Road Lamp outside Costcutter | 48.7 |
| Smithdown Road Lamp outside Sefton Park pharmacy | 20.0 |
| Smithdown Road Lamp in central Res. opp. Budget exhausts | 27.5 |

The monitored and modelled $NO_x$ road contribution concentrations were graphed and the equation of this trendline based on the linear progression through zero calculated, as shown in Graph 1. This indicated a verification factor of **2.7723** was required to be applied to all modelling results.

As $PM_{10}$ monitoring is not undertaken within the assessment extents, a verification factor of **2.7723** was also used to adjust model predictions of this pollutant in accordance with the guidance provided within LAQM.TG(09)[20].

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

**Graph 1 Verification Factor**



# APPENDIX III ASSESSOR'S CURRICULUM VITAE

# JETHRO REDMORE

## Associate Director

BEng (Hons), MSc, MIAQM, MIEnvSc, AIEMA, CEnv

### KEY EXPERIENCE:

Jethro is a Chartered Environmentalist with specialist experience in the air quality sector. His key capabilities include:

- Production and management of Air Quality and Odour Assessments to DEFRA, Environment Agency and EPUK methodologies for a wide-range of clients from the retail, residential, infrastructure, commercial and industrial sectors.
- Significant proportion of assessments produced as part of over-arching Environmental Statements (ES) for large developments throughout the UK and internationally.
- Detailed dispersion modelling of road vehicle and industrial emissions using ADMS-Roads, ADMS-4, AERMOD-PRIME and BREEZE-ROADS. Studies have included impact assessment of ground level pollutant and odour concentrations and assessment of suitability of development sites for proposed end-use.
- Project management and co-ordination of EIAs and scoping reports for developments throughout the UK.
- Design and project management of pollutant monitoring campaigns to define baseline conditions and inform future assessment in accordance with DEFRA and Environment Agency guidance.
- Co-ordination and management of large-scale multi-disciplinary projects and submissions.
- Production and co-ordination of Environmental Permit applications for a variety of industrial sectors.
- Provision of expert advice to local government and international environmental bodies.

### SELECT PROJECTS SUMMARY:

#### Residential Developments

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

Church Way Doncaster - mixed use scheme adjacent to AQMA.

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

Mill Street, Crewe - residential development in proximity of 2-AQMAs.

Wheatstone House, London - mixed use scheme in AQMA.

Elephant and Castle Leisure Centre - baseline AQA for redevelopment.

Carr Lodge, Doncaster - EIA for large residential development.

Poplar Business Park, Tower Hamlets - AQA for residential development.

Queensland Road, Highbury - residential scheme including CHP.

Bicester Ecotown - dispersion modelling of energy centre for EIA.

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

York St, Bury - residential development adjacent to AQMA.

Temple Point Leeds - residential development adjacent to M1.

Currock Yard, Carlisle - residential development adjacent to rail line.

#### Commercial and Retail Developments

Pleasington Lakes, Blackburn - EIA for holiday village adjacent to M65.

Wakefield College - redevelopment of city centre campus in AQMA.

Pleckgate School, Blackburn - biomass boiler and odour assessment.

Deptford Terrace, Sunderland - AQA for mixed use development.

Pakeezah Gourmet, Bradford - AQA including DMRB for new food store.

Witton Park School, Blackburn - AQA for school redevelopment close to AQMA.

Manchester Airport Cargo Shed - commercial development.

New Crown Wood School, Greenwich - biomass boiler emission assessment.

Morton District Shopping Centre, Carlisle - air quality EIA for commercial development.

Manchester Airport Apron Extension - EIA including aircraft emission modelling.

#### Industrial Developments

Tatweer Petroleum - dispersion modelling of Bahrain oil field.

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

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

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

Agrivert - dispersion modelling of AD plant.

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

Blue Star Fibres, Grimsby - fibre manufacturing plant adjacent to SPA.

Maesgwyn Biomass Plant - AQA including ecological assessment.

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

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

Countrystyle Biomass Plant, Kent - EIA for biomass facility.

Beddington Heat and Power, London - biomass energy recovery plant.

Fleetwood Transfer Station - dispersion modelling of energy recovery plant.

Brook Bridge Poultry Farm - Ammonia dispersion modelling of quail farm.

# JONATHAN ASHCROFT

## Graduate Air Quality Consultant

BSc (Hons), LLM, IEMA

### KEY EXPERIENCE:

Jonathan is a Graduate Environmental Consultant with specialist experience in the air quality sector. His 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, infrastructure and commercial sectors.
- Detailed dispersion modelling of road vehicle emissions using ADMS-Roads. Studies have included impact assessment of ground level pollutant concentrations 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 s
- Assessment of dust impacts from construction sites to the Institute of Air Quality Management (IAQM) methodology.
- Execution of field odour surveys and assessments in accordance with the Environment Agency 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 Laws
- Graduate IEMA

### SELECT PROJECTS SUMMARY:

#### Residential and Mixed Use Developments

North Northallerton Development Area - Air Quality Assessment for large scale, mixed-use development.

Klondyke Phase II - Air Quality Assessment for large residential development in close proximity to an AQMA.

Corus Steelworks Workington - An Air Quality Assessment addressing a planning condition for a mixed use development comprising residential, commercial, small-scale retail, community and leisure land uses over approximately 50 hectares at the former Corus Steelworks.

Land off Strathaven Road, Stonehouse, West Scotland - Air Quality Assessment in support of a residential development of 119 residential units.

Blake Avenue, Barking - Air Quality Assessment in support of the creation of a residential development comprising 14 residential units located within an AQMA.

Manchester Road West, Cutacre - Air Quality Assessment in support of a new residential development of up to a 100 dwellings located partially in and adjacent to an AQMA.

Buckley Street, Droylsden - Air Quality Assessment in support of a residential led development of up to 117 dwellings, with additional commercial retail units and associated infrastructure.

Betafence, Wigan - Air Quality Assessment in support of a new residential development of up to130 dwellings in close proximity to an AQMA.

351 Rotherhithe Street, Southwark - Air Quality Assessment in support of the creation of a residential development comprising 6 residential units located within an AQMA.

#### Commercial and Retail Developments

LIDL, Altofts Road, Normanton - Air Quality Assessment for the proposed redevelopment of LIDL to provide a larger retail store.

#### Education Developments

Fenby Avenue Academy, Bradford - Air Quality Assessment in support of an educational development consisting of a new secondary school for 1,050 pupils.

1283 Manchester Road, Huddersfield - Air Quality Assessment in support of the development of two student accommodation buildings which will both comprise 252 self-contained studio units and associated infrastructure over 11 floor levels.

#### Infrastructure Developments

Langho Station Park and Ride, Langho - Air Quality Assessment assessing impacts of residential development with site access roads for a park and ride scheme.

35 Station Road, Northwich - Air Quality Assessment for residential development located within a redeveloped roundabout scheme.

Southwood Close Biomass Installation, Kent - Air Quality Assessment of the potential emissions associated with a proposed 199kw biomass boiler and associated plant items at an existing residential development.