**Bellway Homes Limited**

# Lathom Pastures Phase II

## Detailed Air Quality Assessment

Report No. 443891-04 (00)

**DECEMBER 2020**

# RSK GENERAL NOTES

**Project No.:** 443891-04 (00)

**Title:** Detailed Air Quality Assessment

**Client:** Bellway Homes Limited

**Date:** 15th December 2020

**Office:** Hemel Hempstead

**Status:** Final

| | | | |
|---|---|---|---|
| **Author** | Natalie Espelid<br>Air Quality Consultant | **Technical reviewer** | Dr Christina Higgins<br>Senior Consultant |
| Signature | N. Espelid | Signature | CMHiggins |
| Date: | 15th December 2020 | Date: | 16th December 2020 |

# Abbreviations

| | |
|---|---|
| AADT | Annual Average Daily Traffic |
| ADMS-Roads | Atmospheric Dispersion Modelling System – Roads (a dispersion modelling software application) |
| AQAP | Air Quality Action Plan |
| AQMA | Air Quality Management Area |
| AQO | Air Quality Objective |
| AQS | Air Quality Standard |
| Defra | Department for Environment, Food and Rural Affairs |
| DMP | Dust Management Plan |
| EC | European Commission |
| EPUK | Environmental Protection UK |
| EU | European Union |
| HDV | Heavy Duty Vehicle |
| IAQM | Institute of Air Quality Management |
| LAQM | Local Air Quality Management |
| LAQM TG.16 | Local Air Quality Management Technical Guidance (2016) |
| LDV | Light Duty Vehicle |
| NPPF | National Planning Policy Framework |
| $NO_2$ | Nitrogen dioxide |
| $NO_x$ | Oxides of nitrogen |
| $PM_{2.5}$ | Particulate matter of size fraction approximating to <2.5mm diameter |
| $PM_{10}$ | Particulate matter of size fraction approximating to <10mm diameter |
| RSK | RSK Environment Limited |
| TG | Technical Guidance |
| UK-AIR | UK Atmospheric Information Resource |
| WLBC | West Lancashire Borough Council |
| WLBCLP | West Lancashire Borough Council Local Plan |

# Contents

# 1 INTRODUCTION

## 1.1 Background

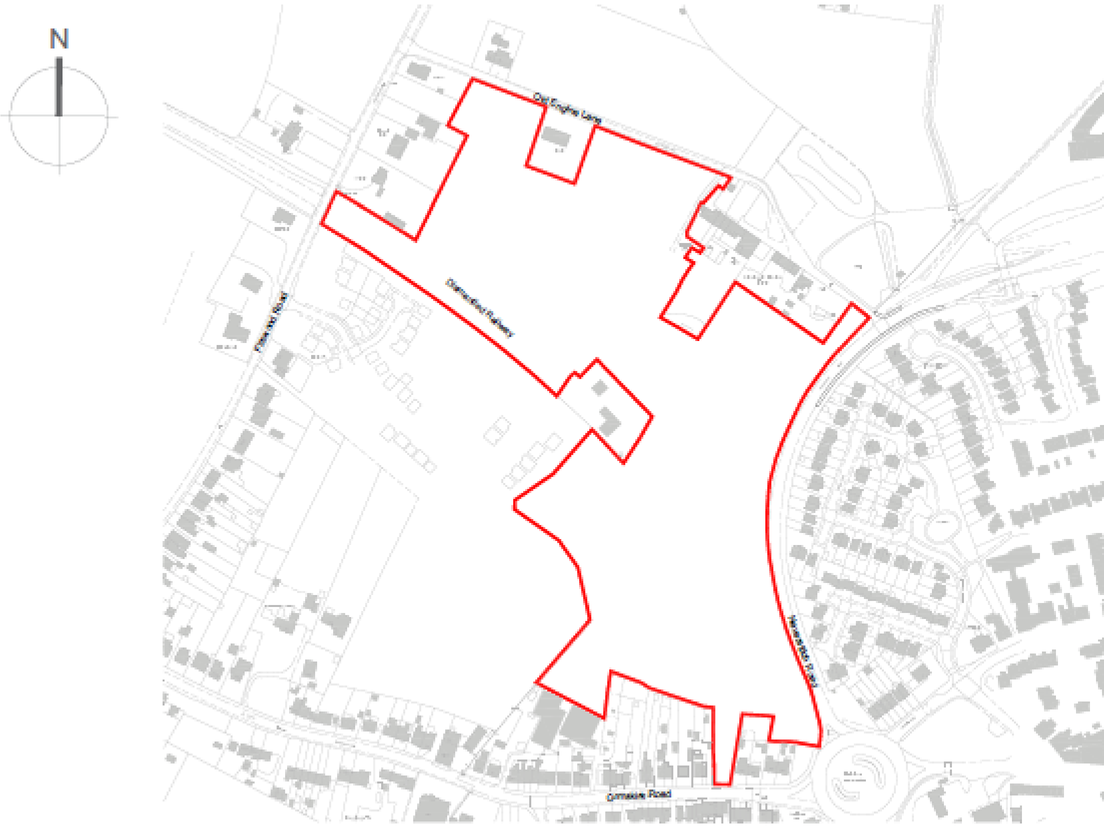
RSK Environment Ltd (RSK) was commissioned to undertake an assessment of the potential air quality impacts associated with the proposed residential development in Skelmersdale. RSK prepared a preliminary air quality assessment of the proposed development in Spring 2020 (Ref: 443891-02 (00)).

The proposed development site is located at land to the west of the A577 Neverstitch Road, Skelmersdale. The proposed site is in proximity to the consented WainHomes Ltd development, which is located to the north of the site and consists of 140 dwellings. Bellway's development Lathom Pastures Phase I is located to the south of the proposed development site and comprises 94 dwellings. The preliminary air quality report recommended that operational phase air quality impacts of the development at the proposed site are assessed with reference to the '*Land-Use Planning & Development Control: Planning for Air Quality*' guidance published by Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) as part of any future application for planning consent.

Figure 1-1 shows the proposed development site. The application site lies within the jurisdiction of West Lancashire Borough Council (WLBC).

The following report presents the findings of an air quality review of existing/baseline air quality conditions and the assessment of potential air quality impacts during the construction and operational phase of the proposed development.

## Figure 1-1: Proposed Development Site Location Plan



# 2 LEGISLATION, PLANNING POLICY & GUIDANCE

## 2.1 Key Legislation

### 2.1.1 Air Quality Strategy

UK air quality policy is published under the umbrella of the Environment Act 1995, Part IV and specifically Section 80, the National Air Quality Strategy. The latest *Air Quality Strategy for England, Scotland, Wales and Northern Ireland – Working Together for Clean Air*, published in July 2007 sets air quality standards and objectives for ten key air pollutants to be achieved between 2003 and 2020.

The EU Air Quality Framework Directive (1996) established a framework under which the EU could set limit or target values for specified pollutants. The directive identified several pollutants for which limit or target values have been, or will be set in subsequent 'daughter directives'. The framework and daughter directives were consolidated by Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe, which retains the existing air quality standards and introduces new objectives for fine particulates ($PM_{2.5}$).

### 2.1.2 Air Quality Standards

The air quality standards (AQSs) in the United Kingdom are derived from EC directives and are adopted into English law via the Air Quality (England) Regulations 2000 and Air Quality (England) Amendment Regulations 2002. The Air Quality Limit Values Regulations 2003 and subsequent amendments implement the Air Quality Framework Directive into English Law. Directive 2008/50/EC was translated into UK law in 2010 via the Air Quality Standards Regulations 2010.

The relevant[1] standards for England and Wales to protect human health are summarised in Table 2-1.

**Table 2-1: Air Quality Standards Relevant to the Proposed Development**

| Substance | Averaging period | Exceedances allowed per year | Ground level concentration limit ($\mu g/m^3$) |
|---|---|---|---|
| Nitrogen dioxide ($NO_2$) | 1 calendar year | - | 40 |
| | 1 hour | 18 | 200 |
| Fine particles ($PM_{10}$) | 1 calendar year | - | 40 |
| | 24 hours | 35 | 50 |
| Fine particles ($PM_{2.5}$) | 1 year | - | 25 |

[1] Relevance, in this case, is defined by the scope of the assessment.

### 2.1.1 The Environment Act

These objectives are to be used in the review and assessment of air quality by local authorities under Section 82 of the Environment Act (1995). If exceedances are measured or predicted through the review and assessment process, the local authority must declare an Air Quality Management Area (AQMA) under Section 83 of the act, and produce an Air Quality Action Plan (AQAP) to outline how air quality is to be improved.

## 2.2 Planning Policy

The land use planning process is a key means of improving air quality, particularly in the long term, through the strategic location and design of new developments. Any air quality concern that relates to land use and its development can, depending on the details of the proposed development, be a material consideration in the determination of planning applications.

### 2.2.1 National Planning Policy Framework

In 2019 the revised National Planning Policy Framework (NPPF) was published, superseding the previous NPPF with immediate effect. The NPPF includes a presumption in favour of sustainable development.

Section 15 of the NPPF deals with Conserving and Enhancing the Natural Environment, and states that the intention is that the planning system should prevent '*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*' and goes on to state that '*new development* [should be] *appropriate for its location' and 'the effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account*.'

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

### 2.2.2 Local Planning Policy

**West Lancashire Borough Council Local Plan**

Policy GN3 *'Criteria for Sustainable Development'* of the West Lancashire Borough Council Local Plan (WLBCLP) 2012-2027 states that:

*"Development will be assessed against the following criteria, in addition to meeting other policy requirements within the Local Plan…*

*5. Other Environmental Considerations*

*In addition to the above criteria, proposals for development should:*

*i. Be designed to minimise any reduction in air quality*

*v. Minimise the risk from all types of pollution and contamination"*

## 2.3 Best Practice Guidance Documents

### 2.3.1 Guidance on the Assessment of Dust from Demolition and Construction

The IAQM published a guidance document in 2014 (Holman *et al*., 2014) on the assessment of construction phase impacts. The guidance was produced to provide advice to developers, consultants and environmental health officers on how to assess the impacts arising from construction activities. The emphasis of the methodology is on classifying sites according to the risk of impacts (in terms of dust nuisance, $PM_{10}$ impacts on public exposure and impact upon sensitive ecological receptors) and to identify mitigation measure appropriate to the level of risk identified.

### 2.3.2 Local Air Quality Management Review and Assessment Technical Guidance

The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their air quality review and assessment work. This guidance, referred to in this document as the Local Air Quality Management Technical Guidance (Defra, 2016) ('LAQM TG.16')

### 2.3.3 Land-Use Planning & Development Control: Planning for Air Quality

EPUK and the IAQM jointly published a revised version of the guidance note 'Land-Use Planning & Development Control: Planning for Air Quality' in 2017 (herein the 'EPUK-IAQM guidance') to facilitate consideration of air quality within local development control processes. It provides a framework for air quality considerations, promoting a consistent approach to the treatment of air quality issues within development control decisions.

The guidance includes methods for undertaken an air quality assessment and an approach for assessing the significance of effects. The guidance note is widely accepted as an appropriate reference method for this purpose.

# 3 ASSESSMENT SCOPE

## 3.1 Overall Approach

The approach taken for assessing the potential air quality impacts of the proposed development may be summarised as follows:

- Consultation with the local authority;
- Baseline characterisation of local air quality;
- Qualitative assessment of construction phase fugitive dust impacts;
- Advanced dispersion modelling assessment of air quality impacts of the proposed development traffic under the following three scenarios:
  - (i) Scenario 1 (S1) - ‘Baseline’ scenario representing the ‘existing’ air quality situation in 2018;
  - (ii) Scenario 2 (S2) - ‘Without Development’ scenario (2021, the expected year of opening, without the proposed development in place, but with consented development); and
  - (iii) Scenario 3 (S3) - ‘With Development’ scenario (2021, the expected year of opening and with the proposed development in place, as well as consented development).
- Consideration of possible mitigation measures, where appropriate; and
- Recommendation for any further work.

## 3.2 Consultation

The Environmental Protection team at WLBC was consulted in the preparation of this air quality assessment. The proposed approach as stated above was agreed with WLBC.

## 3.3 Baseline Characterisation

Existing or baseline air quality refers to the concentrations of relevant substances that are already present in ambient air. These substances are emitted by various sources, including road traffic, industrial, domestic, agricultural and natural sources.

A desk-based study has been undertaken using data obtained from continuous and diffusion tube monitoring stations maintained by WLBC. Estimated background data from the LAQM Support website maintained by Defra are also included.

## 3.4 Construction Phase Assessment

### 3.4.1 Construction Dust and Particulate Matter

Construction works for the proposed development have the potential to lead to the release of fugitive dust and particulate matter. An assessment of the likely significant effects of construction phase dust and particulate matter at sensitive receptors has therefore been undertaken following the IAQM's construction dust guidance.

In order to assess the potential impacts construction activities are divided into four types:

- Demolition;
- Earthworks;
- Construction; and
- Trackout[2].

Annex A details how the 'dust emission magnitude', associated with each of these activities, is combined with the sensitivity of receptors (human or ecological), to determine the overall 'dust risk'. Once the level of risk has been determined, then mitigation proportionate to the level of risk can be identified. The 'dust risk' has been assessed and presented in Section 5.

### 3.4.2 Emissions to Air from Construction Traffic and Plant

Exhaust emissions from construction phase vehicles and plant may have an impact on local air quality adjacent to the routes used by these vehicles to access the application site and in the vicinity of the application site itself. Detailed information on the construction phase plant is not available at this stage (and would not be until after appointment of the main construction contractors), therefore a qualitative impact assessment has been undertaken based on professional judgement and considering the following factors (where available):

- The likely duration of the construction phase;
- The potential number and type of plant that could be required; and
- The number and proximity of sensitive receptors to the application site boundary.

## 3.5 Operational Phase Traffic Impact Assessment

Once operational, the proposed development will generate additional traffic on the surrounding road network; the emissions to air associated with this traffic have the potential to impact on nearby sensitive receptors. The EPUK-IAQM guidance provides an approach for assessing the

[2] Trackout is defined as the transport of dust and dirt from the construction / demolition sites onto public road network, where it may be deposited and then re-suspended by vehicles using the network.

significance of air quality impacts associated with a development in relation to emissions from traffic.

To assess the impacts of a development on the surrounding area, the guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion. The approach is further described in Annex B including the descriptors for the impact significance.

The following subsections provide further information regarding input to the dispersion model including traffic emissions sources, meteorological data and receptors included.

### 3.5.1 Modelling Software

ADMS-Roads is a 'new generation' advanced dispersion model developed by the UK consultancy CERC (Cambridge Environmental Research Consultants). ADMS-Roads is widely used and validated within the UK and Europe. The model allows for the skewed nature of turbulence within the atmospheric boundary layer. ADMS-Roads is capable of processing hourly sequential meteorological data, whilst taking the turbulence caused by vehicles into account in calculating the dispersion profiles of emitted pollutants. ADMS-Roads enables the user to predict concentrations of pollutants of concern at multiple receptor locations.

ADMS-Roads (Version 5.0) was used for assessing potential road traffic emission air quality impacts resulting from the operational phase of the proposed development.

### 3.5.2 Traffic Data

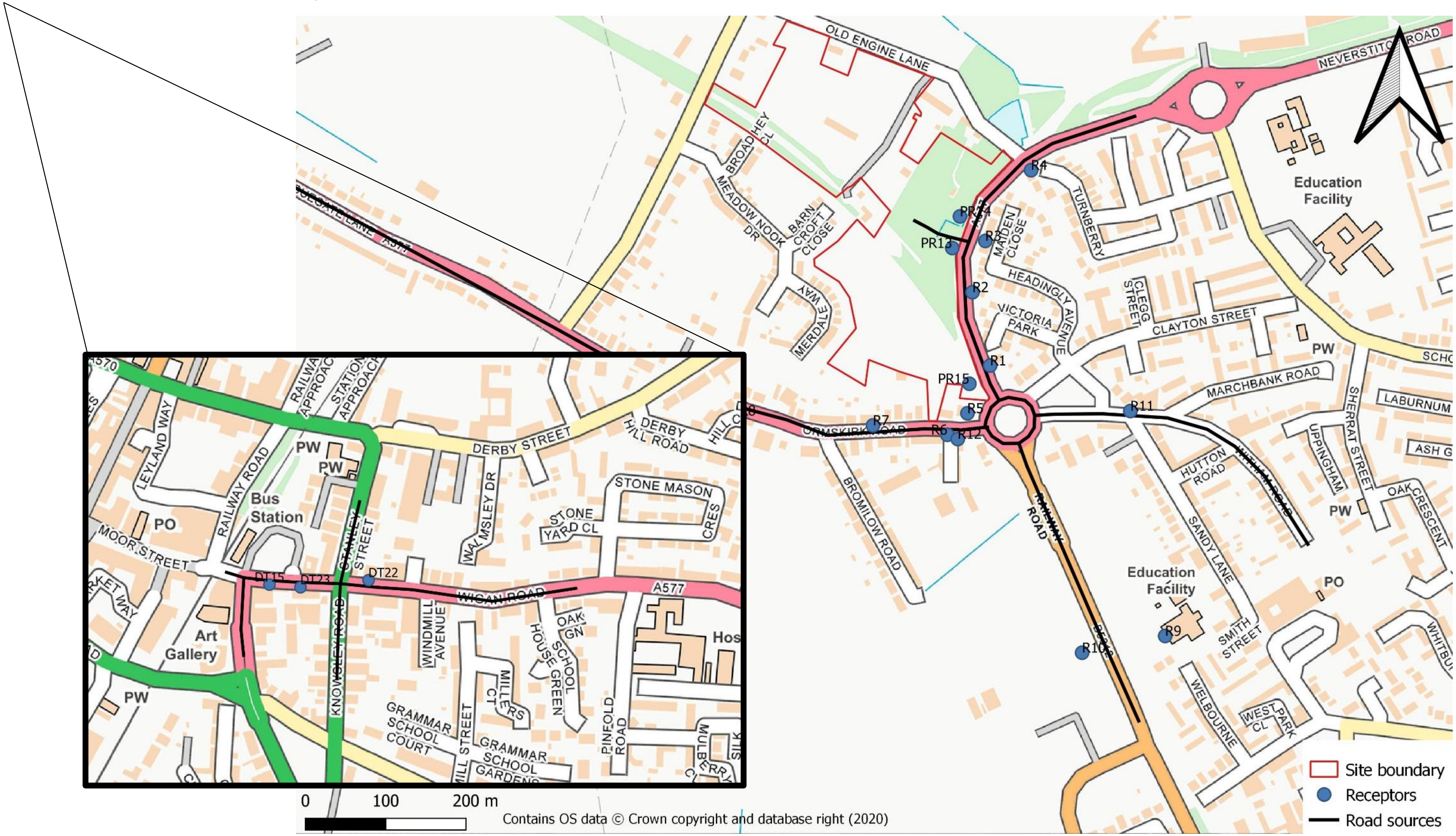
The transport consultants for the development scheme, CBO Transport, provided the traffic data predicted for the proposed development during the operational phase. Traffic data from the Department for Transport (DfT) have been used for the verification of the model results. The traffic data used in the air quality modelling are presented in Annex C.

The road network included in the dispersion model is presented in Figure 3-1. Speed limit data, professional judgement and LAQM.TG(16) were used to determine speeds for use within the model, including reduced speeds at junctions.

### 3.5.3 Time-Varying Profile

Vehicle movements vary with time. Diurnal profiles for the roads included within the model were not available and instead the UK 2018 national diurnal profile from the DfT was applied to all roads, which is presented in Annex C.

**Figure 3-1: Road Sources and Receptors in the Model**



### 3.5.4 Emission Factors

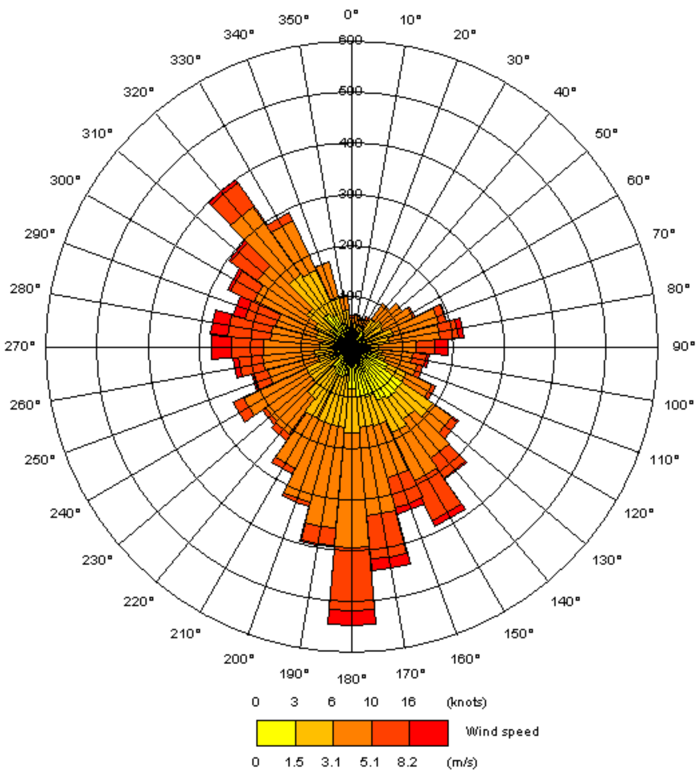
Version 10.1 of the EFT, published by Defra, was used to derive vehicle emissions factors (i.e. the amount of pollution emitted from the average vehicle fleet, in g/km/s) for nitrogen oxide ($NO_x$), $PM_{10}$ and $PM_{2.5.}$ Within the EFT, emission factors are available for all years between 2018 and 2030 and take into account the most recent evidence relating to factors such as advances in vehicle and exhaust technology and changes in composition of the vehicle fleet. The emission factors consequently reduce over time.

### 3.5.5 Meteorological Data

Hourly sequential meteorological data were employed in the dispersion model. The data were recorded in 2018 at the Rostherne meteorological station. Rostherne meteorological station is located approximately 36km to the southeast of the application site. Although there are several meteorological stations located closer to the application site, these stations are all located in coastal environments, and it is therefore considered that the Rostherne meteorological station is most representative of conditions at the site.

The windrose derived from the 2018 dataset is presented in Figure 3-2. The predominant wind direction was from the south.

**Figure 3-2: Windrose from the Rostherne Meteorological Station in 2018**



### 3.5.6 Background Air Quality Data Used in the Modelling

Given that there are currently no nearby representative background monitoring locations, background air quality data has been obtained from the Defra LAQM Support website, which provides estimated annual average background concentrations of $NO_2$, $PM_{10}$ and $PM_{2.5}$ on a 1 $km^2$ grid basis. The Defra LAQM background concentration maps assume that background concentrations will improve (i.e. reduce) over time, in line with predicted reduction in vehicle emissions as well as reduction in emissions from other sources.

$NO_2$, $PM_{10}$ and $PM_{2.5}$ background concentrations have been obtained from the Defra background maps (based on 2018 base maps). For a conservative approach, 2018 background concentrations will be used in the opening year with development scenario. The background concentrations included in the dispersion modelling assessment are presented in Table 3-1.

**Table 3-1: Background concentrations included in the assessment, obtained from 2018-based Defra Background maps.**

| Receptor | 2018 Annual Average $NO_2$ ($\mu g/m^3$) | 2018 Annual Average $PM_{10}$ ($\mu g/m^3$) | 2018 Annual Average $PM_{2.5}$ ($\mu g/m^3$) |
|---|---|---|---|
| Modelled sensitive receptors | 11.2 | 12.2 | 7.5 |

### 3.7.1 Receptor Locations

Pollutant concentrations were predicted at a number of human receptors at the proposed site and along the roads included in the study at locations where the greatest changes in traffic flows were predicted due to the operational phase. A height of 1.5m has been used for human receptors to represent the approximate average breathing height of an adult. A height of 1m has been used for the primary school. Details of all specific human receptors included in the modelling study (and hence the air quality impacts assessed) are summarised in Table 3-2. The locations of all assessed receptors are shown in Figure 3-1.

The receptors were selected to represent existing and proposed receptors, considered to represent 'worst-case' exposure locations.

**Table 3-2: Diffusion Tubes and Receptors Included in the Dispersion Modelling Assessment**

| Receptor ID | Receptor Location | Grid reference | | Height (m) |
|---|---|---|---|---|
| | | X | Y | |
| **Diffusion tubes used for verification** | | | | |
| DT15 | 50 Moor Street | 341629 | 408158 | 2.0 |
| DT22 | 3 Wigan Road | 341741 | 408163 | 2.0 |
| DT23 | Moor Street Dental Practice | 341664 | 408155 | 2.0 |

| Receptor ID | Receptor Location | Grid reference | | Height (m) |
|---|---|---|---|---|
| | | X | Y | |
| **Receptors** | | | | |
| R1 | Façade Residential Receptor | 346404 | 406402 | 1.5 |
| R2 | Façade Residential Receptor | 346382 | 406494 | 1.5 |
| R3 | Façade Residential Receptor | 346398 | 406558 | 1.5 |
| R4 | Façade Residential Receptor | 346455 | 406646 | 1.5 |
| R5 | Façade Residential Receptor | 346376 | 406343 | 1.5 |
| R6 | Façade Residential Receptor | 346351 | 406316 | 1.5 |
| R7 | Façade Residential Receptor | 346258 | 406328 | 1.5 |
| R8 | Façade Residential Receptor | 346092 | 406340 | 1.5 |
| R9 | St Richards Catholic Primary school | 346622 | 406066 | 1.0 |
| R10 | Playing fields | 346519 | 406045 | 1.0 |
| R11 | Façade Residential Receptor | 346579 | 406346 | 1.5 |
| R12 | Façade Residential Receptor | 346364 | 406311 | 1.5 |
| PR13 | Proposed Residential Receptor | 346357 | 406549 | 1.5 |
| PR14 | Proposed Residential Receptor | 346367 | 406588 | 1.5 |
| PR15 | Proposed Residential Receptor | 346378 | 406380 | 1.5 |

### 3.7.2 Other Model Input Parameters

In order to represent the nature of the site and surrounding area, a surface roughness length of 0.5m was included in the model. The Monin-Obukhov length (related to atmospheric stability) was assumed to be 10m. A surface roughness length of 0.2m was used for the meteorological site.

### 3.7.3 Model Verification

The ADMS-Roads dispersion model has been widely validated for this type of assessment and is considered to be fit for purpose. Model validation undertaken by the software developer will not have included validation in the vicinity of the development considered in this assessment. To determine the performance of the model at a local level, a comparison of modelled results with the results of monitoring carried out at three locations in 2018 (see diffusion tube locations in Table 3-2) near to the study area was undertaken. This process of verification attempts to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results, and was carried out following the methodology specified in LAQM.TG(16).

Full details of the verification calculations are presented within Annex D.

Adjustment factors of 4.4 was obtained as part of the verification process for $NO_2$. The adjustment factor was applied to the modelled road-$NO_x$ component predicted at relevant receptors, prior conversion to annual mean $NO_2$ concentrations utilising the $NO_x$:$NO_2$ calculator (version 8.1) available from the Defra website.

Local monitoring data are not available for concentrations of $PM_{10}$ and $PM_{2.5}$ and consequently, the predicted road-$PM_{10}$ and road-$PM_{2.5}$ contributions was adjusted using the factors calculated for road-$NO_x$, before adding the appropriate background concentrations. This approach is consistent with guidance given in LAQM.TG(16). The number of days with $PM_{10}$ concentrations greater than 50µg/m$^3$ will then be estimated using the relationship with the annual mean concentration described in LAQM.TG(16).

LAQM.TG(16) advises that an exceedance of the 1 hour mean $NO_2$ objective is unlikely to occur where the annual mean concentration is below 60µg/m$^3$, where road transport is the main source of pollution. This concentration has been used to screen whether the hourly mean objective is likely to be achieved.

Once processed, the predicted concentrations (full results presented in Annex D) were compared against the current statutory limit values and objectives for $NO_2$, $PM_{10}$ and $PM_{2.5}$ set out in Table 2-1.

The modelling input parameters for the dispersion modelling assessment are presented in Table 3-3.

**Table 3-3: Summary of Inputs to the Dispersion Model**

| Parameter | Brief Description | Input into model |
|---|---|---|
| Emission year | Predicted emission rates depend on the year of emission being used | 2018 for S1, 2021 for S2 and S3. |
| Road source emissions | Road source emission rates calculated from traffic flow data using an emission factor toolkit from AQC or Defra EFT | EFT v10.1. |
| Time varied emissions | Diurnal variations of emissions applied to road sources | 2018 national diurnal profile |
| Road elevation | Elevation of road above ground level | No elevated roads and no terrain file used (due to relatively flat nature of study area |
| Road width | Width of road (m) | Road widths determined based on approximate measurement of roads (internet mapping) |
| Canyon heights | Height of canyons effects turbulent flow patterns; these are greater with larger canyon heights | No canyons included |

| Parameter | Brief Description | Input into model |
| --- | --- | --- |
| Road type | Selection of different types of road to be assessed, inputted into the emission factor toolkit calculations | Urban (not London) settings |
| Road speeds | Speed of the road effects the vehicle emissions to air | Standard speed limits used and professional judgement with slowing at junctions or bends |
| Meteorology | Representative hourly sequential meteorological data | Rostherne 2018 |
| Latitude | Allows the location of the model area to be determined | 53.3° |
| Surface roughness | This defines the surface roughness of the model area | 0.5m |
| Monin-Obukhov length | A boundary layer parameter required to precisely describe the atmospheric stability conditions and to predict dispersion of pollutants released from road traffic | Assumed to be 10m |

## 3.8 Uncertainties and Assumptions

The following uncertainties and assumptions have been made in the air quality assessment:

- In the absence of measured air quality data at the proposed development location, estimated background data from the Defra LAQM website were used in the assessment. In reality, baseline air quality levels vary with time and location but in the absence of on-site baseline monitoring data, the assumption that the baseline concentrations obtained from the above-mentioned data source is applicable to the site location, is considered appropriate;
- There will be uncertainties introduced because the modelling has simplified real-world processes into a series of algorithms. For example, it has been assumed that wind conditions measured at Rostherne meteorological monitoring station in 2018 were representative of wind conditions at the site. Furthermore, it has been assumed that the subsequent dispersion of emitted pollutants will conform to a Gaussian distribution over flat terrain in order to simplify the real-world dilution and dispersion conditions;
- An important step in the assessment is verifying the dispersion model against measured data. The model verification was based on the comparison of model results based on DfT traffic data with 2018 measured roadside $NO_2$ diffusion tube;
- The 2018 national diurnal profile obtained from DfT has been assumed to be applicable for the roads assessed (diurnal profiles for the specific roads modelled were not available);
- There is an element of uncertainty in all measured and modelled data. All values presented in this chapter are best possible estimates.

# 4 BASELINE AIR QUALITY CHARACTERISATION

## 4.1 Emission Sources and Key Air Pollutants

The proposed development site is located in an area where the main source of air pollution is likely to be road traffic exhaust emissions. The proposed development site is located between Firswood Road to the east, Old Engine Lane to the north and north-west and Neverstitch Road the west.

There are no known industrial sites in the immediate vicinity of the application site likely to have a significant impact on local air quality. Thus, the principal pollutants relevant to this assessment are considered to be $NO_2$, $PM_{10}$ and $PM_{2.5}$, generally regarded as the most significant air pollutants released by vehicular combustion processes, or subsequently generated by vehicle emissions in the atmosphere through chemical reactions.

## 4.2 Presence of AQMAs

The proposed development is located within WLBC administrative area. WLBC has declared one AQMA, for exceedances of the annual mean $NO_2$ AQS. The Moor Street AQMA is approximately 4km to the west of the site in Ormskirk.

## 4.3 Baseline Monitoring Data

According to WLBCs Air Quality Annual Status Report 2019, there were nine non-automatic monitoring locations in 2018, out of which none are within 3km to the proposed development site. The annual average $NO_2$ concentrations for the diffusion tube sites in the borough are reproduced in Table 4-1. Two diffusion tube monitoring locations exceeded the annual mean $NO_2$ AQS. Both of these are located within the AQMA, and approximately 4.8km from the proposed development site.

WLBC do not monitor $PM_{10}$ or $PM_{2.5}$ concentrations and therefore, no monitoring data for particulate matter is available.

**Table 4-1: Annual Average Measured Pollutant Concentrations at the Monitoring Locations in WLBC**

| Site Name | Approx distance from proposed development (km) | Annual Average $NO_2$ (µg/m$^3$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
| 26 Stanley Street | 4.8 | 33.9 | 32.6 | 31.1 | 29.1 | 29.1 | 28.4 |
| 41 Stanley Street | 4.8 | 39.7 | 39.4 | 36 | 36 | 32.7 | 33.5 |
| 55 Moor Street | 4.8 | 36.1 | 32.5 | 31.6 | 34.4 | 31.4 | 32.5 |
| 3 Wigan Road | 4.8 | 36.7 | 32.3 | 31.4 | 33.5 | 31.3 | 32.1 |
| Moor Street Dental Practice | 4.8 | **48.6** | **48.5** | **47.5** | **45.3** | **44** | **43.5** |
| 50 Moor street | 4.9 | **49.5** | **46.7** | **47.2** | **43.3** | **41.1** | **43.8** |
| Junction at Moor Street/St. Helens Road | 4.9 | 36.9 | 36.1 | 33.4 | 33.9 | 32 | 31 |
| Liverpool Road | 5.0 | 34.2 | 34.8 | 27.4 | 27.7 | 27.7 | 25.2 |
| Junction at Park Road/Aughton Street | 5.1 | 35.8 | 33.7 | 31.9 | 33.5 | 30.3 | 32.6 |

Note: Results shown in **bold** exceed the air quality objective.

## 4.4 LAQM Background Data

In addition to the local monitoring data, estimated background air quality data available from the LAQM-Tools website, may also be used to establish likely background air quality conditions at the proposed development site.

This website provides estimated annual average background concentrations of $NO_x$, $NO_2$, $PM_{10}$ and $PM_{2.5}$ on a 1km$^2$ grid basis. Table 4-2 identifies estimated annual average background concentrations for the grid square containing the proposed development site for years 2020 and 2021 (the year of opening). No exceedances of the $NO_2$, $PM_{10}$ or $PM_{2.5}$ air quality objectives (AQO) are predicted.

**Table 4-2: Estimated Background Annual Average $NO_2$, $PM_{10}$ and $PM_{2.5}$ Concentrations at the Proposed Development Site**

| Assessment Year | Estimated Annual Average Pollutant Concentrations Derived from the LAQM Support Website (µg/m$^3$) | | |
|---|---|---|---|
| | $NO_2$ | $PM_{10}$ | $PM_{2.5}$ |
| **2020** | 10.0 | 12.6 | 8.0 |
| **2021** | 9.7 | 10.9 | 6.7 |
| **Air Quality Objective** | **40** | **40** | **25*** |

Notes: Presented concentrations for 1km$^2$ grid centred on 346500, 406500; approximate centre of development site is 346266, 406693.; *Target objective only.

# 5 ASSESSMENT OF IMPACTS

## 5.1 Construction Phase

### 5.1.1 Exhaust Emissions from Plant and Vehicles

The operation of vehicles and equipment powered by internal combustion engines results in the emission of exhaust gases containing the pollutants $NO_x$, $PM_{10}$, volatile organic compounds, and carbon monoxide. The quantities emitted depend on factors such as engine type, service history, pattern of usage and fuel composition.

Based on the temporary nature of the construction activities, it is considered unlikely that vehicle movements associated with staff commutes to and from the site would have a significant impact on local air quality. Moreover, plant would be used to facilitate earthworks and construction. The operation of site equipment and machinery will result in emissions to atmosphere of exhaust gases, but with suitable controls and site management such emissions are unlikely to be significant.

### 5.1.2 Fugitive Construction Dust and Particulate Matter

Fugitive dust emissions arising from construction activities are likely to be variable in nature and will depend upon the type and extent of the activity, soil type and moisture, road surface conditions and weather conditions. Periods of dry weather combined with higher than average wind speeds have the potential to generate more dust.

Fugitive dust arising from construction is mainly of a particle size greater than the $PM_{10}$ fraction (which can potentially impact upon human health. However, it is noted that construction activities may contribute to local $PM_{10}$ concentrations. Appropriate dust control measures can be highly effective for controlling emissions from potentially dust generating activities identified above, and adverse effects can be greatly reduced or eliminated.

### 5.1.3 Potential Dust Emission Magnitude

With reference to the IAQM criteria outlined in Annex A, the dust emission magnitudes for demolition, earthworks, construction and trackout activities are summarised in Table 5-1. The information summarised in Table 5-1 was provided by the client.

**Table 5-1: Summary of Dust Emission Magnitudes (Before Mitigation)**

| Activity | IAQM Criteria | Dust Emission Magnitude |
|---|---|---|
| **Demolition** | - Total volume of buildings to be demolished <20,000m[2]<br>- No on-site crushing or screening proposed<br>- The height of demolition activities has been estimated to <10m<br>- Demolition likely to take place during spring/summer | **Small** |
| **Earthworks** | - Total area where earthworks will take place is estimated by the client to be >10,000m[2]<br>- The soil type on site includes sand and silts<br>- The number of heavy earthmoving vehicles has been estimated to <5<br>- Height of stockpiled materials is predicted to be 4-8m.<br>- The total weight of material to be moved is estimated to be <20,000 tonnes. | **Medium** |
| **Construction** | - Total volume of buildings to be built is between 25,000-100,000m[3]<br>- No on-site concrete batching and sandblasting proposed | **Medium** |
| **Trackout** | - The maximum number of heavy-duty vehicle (HDV) outward a movement in any one day is anticipated to be <10.<br>- Extent of unpaved road within site will be <50m | **Small** |

### 5.1.4 Sensitivity of the Area

As per the IAQM Guidance, the sensitivity of the area takes into account a number of factors, including:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of $PM_{10}$, the local background concentration; and
- Site specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

Consideration is given to human and ecological receptors from the impact of the construction site boundary and the routes along which trackout may be expected to occur. In this instance trackout is anticipated to be 50m in both directions along Neverstitch Road. This is because the trackout dust emissions magnitude was classified as small and the IAQM guidance suggests that trackout should be considered for 50m, 200m and 500m from a site exit for small, medium and large sites, respectively.

The Natural England MAGIC Maps website indicates that there are no Sites of Special Scientific Interest, Special Areas of Conservation, Special Protection Areas, Ramsar sites, National Nature Reserves or Local Nature Reserves within 50m of the site boundary or potential trackout routes. Impacts of ecological receptors are therefore not considered applicable and have not been considered further.

Table 5-2 presents the determined sensitivity of the area. Earthworks and construction activities are relevant up to 350m from the proposed development site boundary, whereas trackout activities are only considered relevant up to 50m from the edge of the roads likely to be affected by trackout (up to 50m from the site access), as per the IAQM guidance. Figure 5-1 and Figure 5-2 shows map indicating the construction and trackout buffers, for identifying the sensitivity of the area.

**Table 5-2: Summary of the Sensitivity of the Area to Dust Soiling and Human Health**

| Potential Impact | | Sensitivity of the surrounding area | | | |
|---|---|---|---|---|---|
| | | Demolition | Earthworks | Construction | Trackout |
| **Dust soiling** | Receptor sensitivity | High | High | High | High |
| | Number of receptors and distance from the source | 10-100 Residential receptors within 20m of site boundary | 10-100 Residential receptors within 20m of site boundary | 10-100 Residential receptors within 20m of site boundary | 10-100 Residential receptors within 20m of trackout |
| | **Overall Sensitivity of the Area** | **High** | **High** | **High** | **High** |
| **Human health** | Receptor sensitivity | High | High | High | High |
| | Annual mean $PM_{10}$ concentration | <24µg/m$^3$ | <24µg/m$^3$ | <24µg/m$^3$ | <24µg/m$^3$ |
| | Number of receptors and distance from the source | 10-100 Residential receptors within 20m of site boundary | 10-100 Residential receptors within 20m of site boundary | 10-100 Residential receptors within 20m of site boundary | 10-100 Residential receptors within 20m of trackout |
| | **Overall Sensitivity of the Area** | **Low** | **Low** | **Low** | **Low** |

Figure 5-1: Construction/Earthworks Buffers

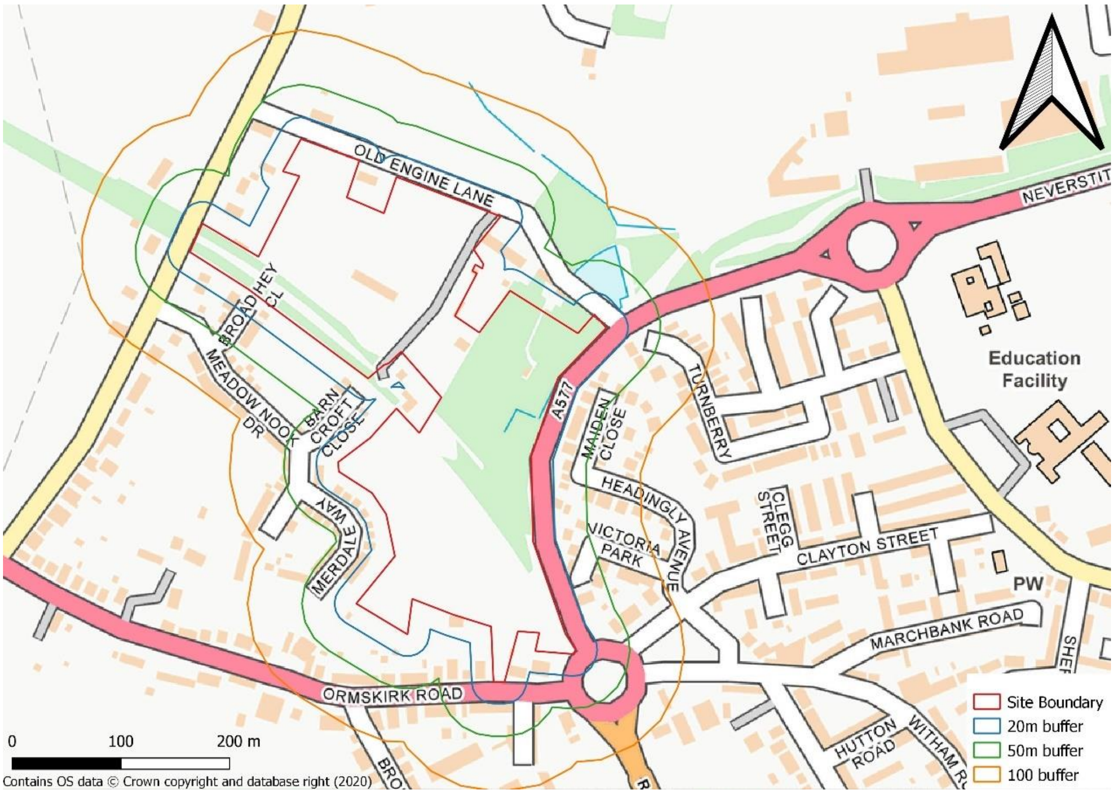
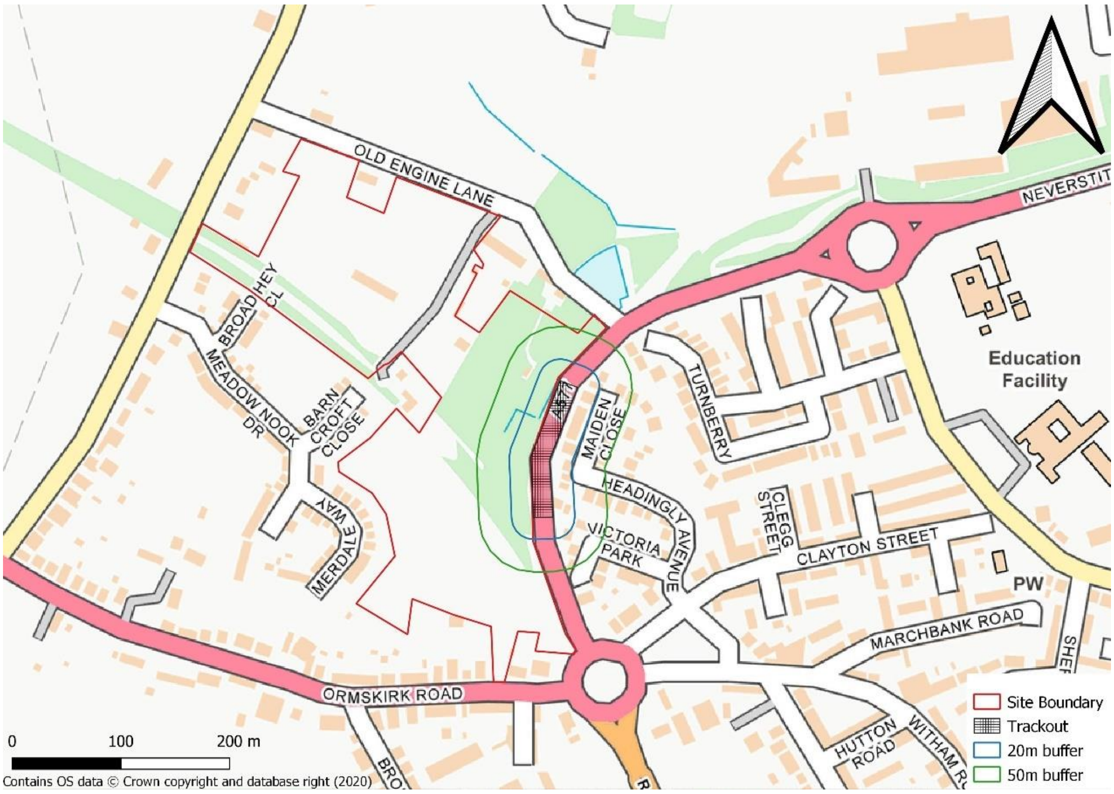



Figure 5-2: Trackout Buffers



### 5.1.5 Risk of Effects

The dust emission magnitude summarised in Table 5-1 has been combined with the sensitivity of the area in Table 5-2 to determine the risk of effects of construction activities before mitigation as summarised in Table 5-3. Mitigation measures to reduce construction phase effects and the residual effect is described at Section 6.3.

**Table 5-3: Summary of the Dust Risk from Construction Activities**

| Potential Effect | Dust Risk Effect | | | |
|---|---|---|---|---|
| | Demolition | Earthworks | Construction | Trackout |
| Dust soiling | Medium risk | Medium risk | Medium risk | Low risk |
| Human health | Negligible | Low risk | Low risk | Negligible |

## 5.2 Operational Phase

The main potential impact of the proposed development is considered to be emissions from increased road traffic associated with the operational phases. Figure 3-1 shows the roads and sensitive receptors included in the dispersion modelling assessment. Detailed dispersion modelling was undertaken with the use of the ADMS-Roads dispersion model software, following guidance in accordance with LAQM.TG(16).

The modelled concentrations were verified using monitoring data; for reference, the methodology for this has been described in Annex D. Model results for $NO_2$, $PM_{10}$ and $PM_{2.5}$ concentrations at receptors are presented in Annex D.

### 5.2.1 Impact of the Development on Local Air Quality at Human Receptors

Nitrogen Dioxide ($NO_2$)

Table D6 in Annex D presents the predicted annual mean $NO_2$ concentrations for the assessed scenarios at the assessment receptor locations.

Table 5-4 shows the comparison of annual mean $NO_2$ concentrations under the 'S2 2021 Without Development' and 'S3 2021 With Development' scenarios, respectively, at the assessed receptor locations. The percentage changes in annual mean $NO_2$ concentrations relative to the air quality objective and the classification of impact magnitudes with reference to the EPUK-IAQM guidance are also presented. The predicted annual mean $NO_2$ concentrations are below the AQO at all of the modelled receptor points.

The maximum annual mean $NO_2$ increase as a result of the operational phase traffic is predicted to be 1.3µg/m$^3$ at R1 (3% change relative to the air quality assessment level (AQAL)). This 3% change corresponds to a 'slight' impact on local air quality. The impact is predicted as 'negligible' at all other receptor locations.

LAQM TG.16 indicates that the hourly mean $NO_2$ AQS would be unlikely to be exceeded if annual mean $NO_2$ concentrations do not exceed 60µg/m$^3$. Therefore, it is not anticipated that the hourly mean $NO_2$ objective would be exceeded at the site prior to or when the proposed development becomes operational.

The 'S3 2021 With Development' modelling results as the mapped contour of annual average $NO_2$ concentrations at gridded point receptors is show in Figure 5-3.

**Table 5-4: Comparison of Predicted Long-Term $NO_2$ Concentrations Under the 'S2 2021 Without Development' and 'S3 2021 With Development' Scenarios**

| Receptor ID | 2021 Without Development | | 2021 With Development | | % Change Concentration Relative to AQAL | Predicted Impact |
|---|---|---|---|---|---|---|
| | Total (µg/m$^3$) | % of AQAL | Total (µg/m$^3$) | % of AQAL | | |
| R1 | 30.1 | 75 | 31.4 | 79 | 3 | Slight |
| R2 | 24.2 | 60 | 25.4 | 63 | 3 | Negligible |
| R3 | 19.6 | 49 | 20.4 | 51 | 2 | Negligible |
| R4 | 19.1 | 48 | 19.6 | 49 | 1 | Negligible |
| R5 | 25.8 | 65 | 26.0 | 65 | 0 | Negligible |
| R6 | 24.9 | 62 | 25.0 | 62 | 0 | Negligible |
| R7 | 24.6 | 61 | 24.6 | 62 | 0 | Negligible |
| R8 | 20.1 | 50 | 20.1 | 50 | 0 | Negligible |
| R9 | 14.0 | 35 | 14.1 | 35 | 0 | Negligible |
| R10 | 15.7 | 39 | 15.9 | 40 | 1 | Negligible |
| R11 | 26.8 | 67 | 26.9 | 67 | 0 | Negligible |
| R12 | 23.1 | 58 | 23.2 | 58 | 0 | Negligible |
| PR13 | - | - | 20.1 | 50 | - | - |
| PR14 | - | - | 19.5 | 49 | - | - |
| PR15 | - | - | 22.0 | 55 | - | - |

Figure 5-3: Predicted $NO_2$ Concentrations for 'S3 2021 With Development' Scenario


Particulate Matter ($PM_{10}$ and $PM_{2.5}$)

The predicted $PM_{10}$ and $PM_{2.5}$ concentrations at all the assessed receptors and under all scenarios would not exceed the relevant AQO.

Table 5-5 shows the comparison of annual mean $PM_{10}$ and $PM_{2.5}$ concentrations under the 'S2 2021 Without Development' and 'S3 2021 With Development' scenarios at the assessed receptor locations. With reference to the EPUK-IAQM guidance, the proposed development would have a 'negligible' predicted impact upon annual mean $PM_{10}$ and $PM_{2.5}$ concentrations, as all concentration changes are predicted to be 1% or below of the AQAL and predicted total concentrations with the development operational are <75% of the relevant AQALs.

**Table 5-5: Comparison of Predicted Annual Mean $PM_{10}$ and $PM_{2.5}$ Concentrations for the 'S2 2021 Without Development' and 'S3 2021 With Development' Scenarios**

| Receptor ID | Annual Mean $PM_{10}$ Concentration ($\mu g/m^3$) | | Annual Mean $PM_{2.5}$ Concentration ($\mu g/m^3$) | |
|---|---|---|---|---|
| | 2021 Without Development | 2021 With Development | 2021 Without Development | 2021 With Development |
| R1 | 16.5 | 16.8 | 9.9 | 10.1 |
| R2 | 15.3 | 15.6 | 9.3 | 9.5 |
| R3 | 13.9 | 14.1 | 8.5 | 8.6 |

| Receptor ID | Annual Mean $PM_{10}$ Concentration (µg/m$^3$) | | Annual Mean $PM_{2.5}$ Concentration (µg/m$^3$) | |
|---|---|---|---|---|
| | 2021 Without Development | 2021 With Development | 2021 Without Development | 2021 With Development |
| R4 | 14.1 | 14.2 | 8.6 | 8.6 |
| R5 | 15.1 | 15.1 | 9.2 | 9.2 |
| R6 | 15.3 | 15.3 | 9.3 | 9.3 |
| R7 | 15.4 | 15.4 | 9.3 | 9.3 |
| R8 | 14.3 | 14.3 | 8.7 | 8.7 |
| R9 | 12.8 | 12.9 | 7.9 | 7.9 |
| R10 | 13.2 | 13.3 | 8.1 | 8.1 |
| R11 | 15.5 | 15.5 | 9.4 | 9.4 |
| R12 | 14.7 | 14.7 | 8.9 | 8.9 |
| PR13 | - | 14.1 | - | 8.6 |
| PR14 | - | 13.9 | - | 8.5 |
| PR15 | - | 14.4 | - | 8.7 |

LAQM TG.16 indicates that the number of annual exceedances of the 24-hour mean $PM_{10}$ AQS can be estimated using the following formula: $-18.5 + 0.00145 \times annual\ mean^3 + (206/annual\ mean)$. As shown in Table D6 in Appendix D, the number of exceedances of the daily mean $PM_{10}$ AQS objective was fewer than the permissible 35 at all modelled existing and proposed receptor locations in any of the model scenarios.

Overall Significance of Operational Phase Traffic Impacts on Local Air Quality

As detailed above, with the proposed development in place (S3 2021 With Development) annual mean $PM_{10}$ and $PM_{2.5}$ concentrations at nearby receptors are predicted to be well below the air quality objectives, with a 'negligible' impact to air quality predicted, with reference to the EPUK-IAQM guidance. No exceedances of the annual mean $NO_2$ concentrations objective are predicted. With reference to the EPUK-IAQM guidance, a 'slight' impact at R1 is predicted, while 'negligible' impacts on air quality was predicted at all other receptor locations. Therefore, the air quality impact of the proposed development once operational on local air quality is considered not significant.

# 6 MITIGATION MEASURES & RESIDUAL IMPACTS

## 6.1 Construction Phase Mitigation

The dust emitting activities outlined in Section 5.1 (demolition, earthworks, construction and trackout activities) can be effectively controlled by appropriate dust control measures and any adverse effects can be greatly reduced or eliminated.

It is understood that a Construction Environmental Management Plan (CEMP) (ref: BH/NW/LP2/CEMP/001) has been prepared for the proposed development in line with the IAQM guidance. It is anticipated that the CEMP will be approved and agreed with the local authority to ensure that the potential for adverse environmental effects on local receptors is minimised. The CEMP should include *inter alia*, measures for controlling dust and general pollution from site construction operations, and include details of any monitoring scheme, if appropriate. Controls should be applied throughout the construction period to ensure that emissions are mitigated.

To reduce any effects of construction plant on local air quality, it is recommended that plant used on-site comply with the $NO_x$, PM and CO emissions standards specified in the EU Directive 97/68/EC and subsequent amendments as a minimum, where they have net power of between 37kW and 560kW. The emissions standards vary depending on the net power the engine produces.

The air quality impact of increased traffic during the construction phase will be temporary in nature and will be along traffic routes employed by haulage/construction vehicles and workers. Any effects on air quality will be temporary i.e. during the construction period only and can be minimised by the employment of mitigation measures for operating vehicles.

## 6.2 Operational Mitigation

As identified in Section 5, the proposed development is predicted to have a ‘slight’ air quality impact at R1, while ‘negligible’ air quality impact on all other surrounding sensitive receptors.

As best practice, it is recommended that transport related mitigation measures should be included to minimise the impact of the development on the surrounding road network and hence air quality. These measures could include:

- Travel plans;
- Incentives for increased public transport use; and
- Provision for alternative fuels, such as electric vehicle charge points.

## 6.3 Residual Impacts: Significance

With the proposed construction activities mitigation measures as described the CEMP in place, the significance of the residual impacts is considered to be 'not significant' for the construction phase for human receptors.

As discussed in Section 5, the assessment demonstrates that the proposed development is not predicted to have a significant adverse impact on local air quality when complete and occupied and therefore following mitigation the residual impacts are considered to remain of negligible significance.

# 7 CONCLUSIONS

A detailed air quality assessment for a residential development has been undertaken with reference to existing air quality in the area and relevant air quality legislation, policy and guidance.

During the construction phase, impacts on local air quality may potentially arise due to fugitive dust emissions. The risk of dust impacts was assessed according to a widely used method published by the IAQM. Mitigation measures appropriate to the construction phase will be specified by a CEMP to be agreed with WLBC; therefore, significant residual effects are not anticipated.

The principal air quality impact once the proposed development is complete and operational is likely to be emissions from the increased traffic on local roads surrounding the site. An assessment of operational phase impacts has been undertaken using the latest version of the ADMS-Roads atmospheric dispersion model.

Concentrations of the key pollutants ($NO_2$, $PM_{10}$ and $PM_{2.5}$) were predicted at the most relevant receptor locations for the base year and for 2021 without and with the proposed development, but with nearby consented developments in place. The air quality impacts of the proposed development on existing receptors have been assessed.

The predicted $NO_2$, $PM_{10}$ and $PM_{2.5}$ concentrations, at all existing and proposed human receptors, would not exceed the relevant AQOs. As a result of the development during operational phases, a 'slight' air quality impact is predicted with respect to annual mean $NO_2$ at R1, while a 'slight' air quality impact is predicted with respect to annual mean $NO_2$, $PM_{10}$ and $PM_{2.5}$ at all other assessed sensitive receptors. Therefore, the overall air quality impact of the development may be considered 'not significant'.

As best practice mitigation measures to reduce the impact of emissions to air at sensitive receptors are recommended to ensure the air quality impacts are minimised. These include good design principles, and measures to help minimise vehicular trips and encourage more sustainable modes of travel.

Mitigation measures which could be implemented to facilitate a further reduction in the effects of the development on local air quality during construction phase have been recommended in the CEMP. The effects of the development on local air quality would be considered to remain insignificant following the implementation of an appropriate selection of measures such as those recommended.

# 8 REFERENCES


Air Quality (England) Regulations 2000, 928. London, Her Majesty's Stationery Office.

Air Quality (England) (Amendment) Regulations 2002, 3043. London, Her Majesty's Stationery Office.

Communities and Local Government, 2019. National Planning Policy Framework, London: Crown. Department of Environment, Food and Rural Affairs, 2007. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volume 1). London, Her Majesty's Stationary Office.

Department of Environment, Food and Rural Affairs, 2007. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volume 2). London, Her Majesty's Stationary Office.

Department of Environment, Food and Rural Affairs, 2016. Part IV of the Environment Act 1995: Local Air Quality Management: Technical Guidance LAQM.TG(16).

Department of Environment, Food and Rural Affairs, 2018. UK-AIR Atmospheric Information Resource [online] Available at: http://uk-air.defra.gov.uk [Accessed December 2020].

Environment Act 1995. London, Her Majesty's Stationery Office.

Her Majesty's Stationery Office, 2010. Environmental Protection: The Air Quality Standards Regulations 2010, [online] Available at: http://www.legislation.gov.uk/uksi/2010/1001/pdfs/uksi_20101001_en.pdf. [Accessed December 2020].

Institute of Air Quality Management, 2014. Guidance on the assessment of dust from demolition and construction.

Moorcroft et al. 2017. Land-Use Planning & Development Control: Planning for Air Quality. Environmental Protection UK and Institute of Air Quality Management, London.

West Lancashire Borough Council, 2019 Air Quality Annual Status Report.

West Lancashire Borough Council, Local Plan 2012-2027.

# ANNEX A
# CONSTRUCTION DUST ASSESSMENT METHODOLOGY

This appendix contains the construction dust assessment methodology used in the assessment.

To assess the potential impacts, construction activities are divided into demolition, earthworks, construction and trackout. The descriptors included in this section are based upon the IAQM construction dust guidance. The assessment follows the steps recommended in the guidance.

**Step 1: Screen the requirement for assessment**

The first step is to screen out the requirement for a construction dust assessment, this is usually a somewhat conservative level of screening. An assessment is usually required where there is:

- a ‘human receptor’ within:
  - 350m of the boundary of the site; or
  - 50m of the route used by construction vehicles on the public highway, up to 500m from the site entrance(s).
- an ‘ecological receptor’:
  - 50m of the boundary of the site; or
  - 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

**Step 2A: Defining the Potential Dust Emission Magnitude**

**Demolition**

The dust emission magnitude category for demolition is varied for each site in terms of timing, building type, duration and scale. Examples of the potential dust emission classes are provided in the guidance as follows:

- **Large**: Total building volume >50,000m$^3$, potentially dusty construction material, on-site crushing and screening, demolition activities >20m above ground level;
- **Medium**: Total building volume 20,000m$^3$ – 50,000m$^3$, potentially dusty construction material, demolition activities 10m – 20m above ground level; and
- **Small**: Total building volume <20,000m$^3$, construction material with low potential for dust release, demolition activities <10m above ground, demolition during wetter months.

**Earthworks**

The dust emission magnitude category for earthworks is varied for each site in terms of timing, geology, topography and duration. Examples of the potential dust emission classes are provided in the guidance as follows:

- **Large**: Total site area >10,000m$^2$, potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds >8m in height, total material moved >100,000 tonnes;
- **Medium**: Total site area 2,500 – 10,000m$^2$, moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 4 – 8m in height, total material moved 20,000 – 100,000 tonnes; and

- **Small**: Total site area < 2,500m$^2$, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4m in height, total material moved <10,000 tonnes, earthworks during wetter months.

**Construction**

The dust emission magnitude category for construction is varied for each site in terms of timing, building type, duration, and scale. Examples of the potential dust emissions classes are provided in the guidance as follows:

- **Large**: Total building volume >100,000m$^3$, on site concrete batching;
- **Medium**: Total building volume 25,000 – 100,000m$^3$, potentially dusty construction material (e.g. concrete), on site concrete batching; and
- **Small**: Total building volume <25,000m$^3$, construction material with low potential for dust release (e.g. metal cladding or timber).

**Trackout**

Factors which determine the dust emission magnitude class of trackout activities are vehicle size, vehicle speed, vehicle number, geology and duration. Examples of the potential dust emissions classes are provided in the guidance as follows:

- **Large**: >50 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;
- **Medium**: 10 – 50 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 – 100m; and
- **Small**: <10 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50m.

**Step 2B: Defining the Sensitivity of the Area**

The sensitivity of the area is defined for dust soiling, human health and ecosystems. The sensitivity of the area takes into account the following factors:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of $PM_{10}$, the local background concentration; and
- Site-specific factors, such as whether here are natural shelters such as trees, to reduce the risk of wind-blown dust.

Table A1 has been used to define the sensitivity of different types of receptors to dust soiling, health effects and ecological effects.

**Table A1: Sensitivity of the Area Surrounding the Site**

| Sensitivity of Area | Dust Soiling | Human Receptors | Ecological Receptors |
|---|---|---|---|
| **High** | • Users can reasonably expect enjoyment of a high level of amenity.<br>• The appearance, aesthetics or value of their property would be diminished by soiling.<br>• The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.<br>• Examples include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms. | • Locations where members of the public are exposed over a time period relevant to the air quality objective for $PM_{10}$ (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day)<br>• Examples include residential properties, hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment. | • Locations with an international or national designation *and* the designated features may be affected by dust soiling.<br>• Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain.<br>• Examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings. |
| **Medium** | • Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home.<br>• The appearance, aesthetics or value of their property could be diminished by soiling.<br>• The 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.<br>• Examples include parks and places of work. | • Locations where the people exposed are workers and exposure is over a time period relevant to the air quality objective for $PM_{10}$ (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).<br>• Examples include office and shop workers, but will generally not include workers occupationally exposed to $PM_{10}$, as protection is covered by Health and Safety at Work legislation. | • Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown.<br>• Locations with a national designation where the features may be affected by dust deposition.<br>• Example is a Site of Special Scientific Interest (SSSI) with dust sensitive features. |

| Sensitivity of Area | Dust Soiling | Human Receptors | Ecological Receptors |
|---|---|---|---|
| Low | • The enjoyment of amenity would not reasonably be expected.<br>• Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling.<br>• There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.<br>• Examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads. | • Locations where human exposure is transient.<br>• Indicative examples include public footpaths, playing fields, parks and shopping streets. | • Locations with a local designation where the features may be affected by dust deposition.<br>• Example is a local Nature Reserve with dust sensitive features. |

Based on the sensitivities assigned of the different types of receptors surrounding the site and numbers of receptors within certain distances of the site, a sensitivity classification for the area can be defined for each. Tables A2 to A4 indicate the method used to determine the sensitivity of the area for dust soiling, human health and ecological impacts, respectively.

For trackout, as per the IAQM construction dust guidance, it is only considered necessary to consider trackout impacts up to 50m from the edge of the road.

**Table A2: Sensitivity of the area to dust soiling effects on people and property**

| Receptor Sensitivity | Number of Receptors | Distances from the Source (m) | | | |
|---|---|---|---|---|---|
| | | <20 | <50 | <100 | <350 |
| High | >100 | High | High | Medium | Low |
| | 10-100 | High | Medium | Low | Low |
| | 1-10 | Medium | Low | Low | Low |
| Medium | >1 | Medium | Low | Low | Low |
| Low | >1 | Low | Low | Low | Low |

**Table A3: Sensitivity of the area to Human Health Impacts**

| Receptor Sensitivity | Annual Mean $PM_{10}$ Conc. | Number of Receptors | Distances from the Source (m) | | | | |
|---|---|---|---|---|---|---|---|
| | | | <20 | <50 | <100 | <200 | <350 |
| High | >32µg/m$^3$ | >100 | High | High | High | Medium | Low |
| | | 10-100 | High | High | Medium | Low | Low |
| | | 1-10 | High | Medium | Low | Low | Low |
| | 28-32 µg/m$^3$ | >100 | High | High | Medium | Low | Low |
| | | 10-100 | High | Medium | Low | Low | Low |
| | | 1-10 | High | Medium | Low | Low | Low |
| | 24-28 µg/m$^3$ | >100 | High | Medium | Low | Low | Low |
| | | 10-100 | High | Medium | Low | Low | Low |
| | | 1-10 | Medium | Low | Low | Low | Low |
| | <24µg/m$^3$ | >100 | Medium | Low | Low | Low | Low |
| | | 10-100 | Low | Low | Low | Low | Low |
| | | 1-10 | Low | Low | Low | Low | Low |
| Medium | >32µg/m$^3$ | >10 | High | Medium | Low | Low | Low |
| | | 1-10 | Medium | Low | Low | Low | Low |
| | 28-32 µg/m$^3$ | >10 | Medium | Low | Low | Low | Low |
| | | 1-10 | Low | Low | Low | Low | Low |
| | 24-28 µg/m$^3$ | >10 | Low | Low | Low | Low | Low |
| | | 1-10 | Low | Low | Low | Low | Low |
| | <24 µg/m$^3$ | >10 | Low | Low | Low | Low | Low |
| | | 1-10 | Low | Low | Low | Low | Low |
| Low | - | >1 | Low | Low | Low | Low | Low |

**Table A4: Sensitivity of the area to Ecological Impacts**

| Receptor Sensitivity | Distances from the Source (m) | |
|---|---|---|
| | <20 | <50 |
| High | High | Medium |
| Medium | Medium | Low |
| Low | Low | Low |

**Step 2C: Defining the Risk of Impacts**

The final step is to use both the dust emission magnitude classification with the sensitivity of the area, to determine a potential risk of impacts for each construction activity, before the application of mitigation. Tables A5 to A7 indicate the method used to assign the level of risk for each construction activity.

**Table A5: Risk of Dust Impacts from Demolition**

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

**Table A6: Risk of Dust Impacts from Earthworks/Construction**

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

**Table A7: Risk of Dust Impacts from Trackout**

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

# ANNEX B
# OPERATION IMPACT ASSESSMENT METHODOLOGY

This Annex contains the methodology used in the assessment for the operational impact assessment to include reference to the IAQM and EPUK guidance.

The IAQM and EPUK guidance makes reference to the Town and Country Planning (Development Management Procedure) Order (England) 2010 [(Wales) 2012] definition of a 'major' development when scoping assessments required for the planning process. A 'major' development includes developments where:

- The number of dwellings is 10 or above;
- The residential development is carried out of a site of more than 0.5ha where the number of dwellings is unknown;
- The provision of more than 1,000m$^2$ commercial floorspace; or
- Development carried out on land of 1ha or more.

Consideration of air quality impacts and approaches to reduce impacts from any 'major' developments is therefore recommended.

There are two types of air quality impact to be considered:

- The impact of existing sources in the local area on the proposed development (governed by background pollutant levels and proximity to sources of air pollution); and,
- The impacts of the proposed development on the local area.

With regard to the changes in air quality or exposure to air pollution, the guidance indicates that each local authority will be likely to have their own view on the significance of this; these are to be described in relation to whether an air quality objective is predicted to be met, or at risk of not being met. Exceedances of these objectives are considered as **significant** if not mitigated.

As part of the impact of the proposed development on the local area, a two-staged assessment is recommended as per guidance.

Stage 1: Determines whether an air quality assessment is required. Requires any of the criteria under (A) coupled with any of the criteria under (B) in Table B1 to apply to be required to proceed to Stage 2.

Stage 2: Where an assessment is deemed to be required, this may take the form of a Simple Assessment or a Detailed Assessment, taking reference to the criteria in Table B2.

**Table B1: Stage 1 Criteria to proceed to Stage 2**

| Criteria to Proceed to Stage 2 |
|---|
| A. If any of the following apply:<br>• 10 or more residential units of a site area of more than 0.5ha<br>• More than 1,000m$^2$ of floor space for all other uses or a site area greater than 1ha |
| B. Coupled with any of the following:<br>• The development has more than 10 parking spaces<br>• The development will have a centralised energy facility or other centralised combustion process |

**Table B2: Indicative Criteria for Requiring an Air Quality Assessment**

| The Development will | Indicative Criteria to Proceed to an Air Quality Assessment |
|---|---|
| 1. Cause a significant change in Light Duty Vehicle (LDV) traffic slows on local roads with relevant receptors. | A change of LDV flows of:<br>- more than 100 AADT within or adjacent to an AQMA<br>- more than 500 AADT elsewhere. |
| 2. Cause a significant change in HDV flows on local roads with relevant receptors. | A Change of HDV flows of:<br>- more than 25 AADT within or adjacent to an AQMA<br>- more than 100AADT elsewhere. |
| 3. Realign roads, i.e. changing the proximity of receptors to traffic lanes. | Where the change is 5m or more and the road is within an AQMA |
| 4. Introduce a new junction or remove an existing junction near to relevant receptors. | Applies to junctions that cause traffic to significantly change vehicle accelerate/decelerate, e.g. traffic lights, or roundabouts. |
| 5. Introduce or change a bus station. | Where bus flows will change by:<br>- more than 25 AADT within or adjacent to an AQMA<br>- more than 100 AADT elsewhere. |
| 6. Have an underground car park with extraction system. | The ventilation extract for the car park will be within 20m of a relevant receptor.<br>Coupled with the car park having more than 100 movements per day (total in and out). |
| 7. Have one or more substantial combustion processes, where there is a risk of impacts at relevant receptors. | Typically, any combustion plant where the single or combined $NO_x$ emission rate is less than 5 mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion.<br>- In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates. Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable. |

To assess the impacts of a development on the surrounding area, the EPUK-IAQM 2017 guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion. Table B3 presents the suggested framework, provided within the EPUK/IAQM guidance, for describing the impacts.

**Table B3: Impact Descriptors for Individual Receptors**

| Long term average concentration at receptor in assessment year | % Change in concentration relative to Air Quality Assessment Level (AQAL) | | | |
|---|---|---|---|---|
| | 1 | 2-5 | 6-10 | >10 |
| 75% or less of AQAL | Negligible | Negligible | Slight | Moderate |
| 79 – 94% of AQAL | Negligible | Slight | Moderate | Moderate |
| 95 – 102% of AQAL | Slight | Moderate | Moderate | Substantial |
| 103 – 109% of AQAL | Moderate | Moderate | Substantial | Substantial |
| 110% or more of AQAL | Moderate | Substantial | Substantial | Substantial |
| Notes:<br>AQAL = Air Quality Assessment Level, which for this assessment related to the UK Air Quality Strategy Objectives.<br>Where the % change in concentrations is <0.5%, the change is described as 'negligible' regardless of the concentration.<br>Where concentrations increase the impact is described as adverse, and where it decrease as beneficial. | | | | |

The EPUK/IAQM guidance notes that the criteria in Table B1 should be used to describe impacts at individual receptors and should only be considered as a starting point to make a judgement on significance of effects, as other influences may need to be accounted for. The EPUK/IAQM guidance states that the assessment of overall significance should be based on professional judgement, taking into account several factors, including:

- The existing and future air quality in the absence of the development;
- The extent of current and future population exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

The EPUK/IAQM guidance states that for most road transport related emissions, long-term average concentrations are the most useful for evaluating the severity of impacts.

# ANNEX C
# TRAFFIC DATA

This Annex contains the traffic data used in the dispersion modelling assessment, survey data were provided by CBO Transport and the DfT. Included are traffic flow data in AADT, percentage Heavy Good Vehicle (HGV) (HDV were not available) and the speed included for each road link. A reduced speed was employed at junctions.



**Table C1: AADT Traffic Flows for Model Scenarios used in the dispersion modelling assessment**

| Ref | Road Link | S1 2018 Base case | S2 2021 Without Dev | S3 2021 With Dev |
|---|---|---|---|---|
| 1 | Site access | 0 | 0 | 1,400 |
| 2 | Neverstitch Road north of site | 8,125 | 8,772 | 9,206 |
| 3 | Neverstitch Road south of site | 8,125 | 8,772 | 9,738 |
| 4 | Witham Road | 6,277 | 6,842 | 6,842 |
| 5 | Railway Road | 9,741 | 10,722 | 11,380 |
| 6 | Ormskirk road | 8,024 | 8,896 | 9,204 |
| 7 | The Roundabout | 8,048 | 8,808 | 9,291 |
| 8 | Wigan Road* | 8,908 | - | - |
| 9 | Moor St* | 10,355 | - | - |
| 10 | Stanley St* | 10,070 | - | - |
| 11 | Knowsley Rd* | 7,049 | - | - |

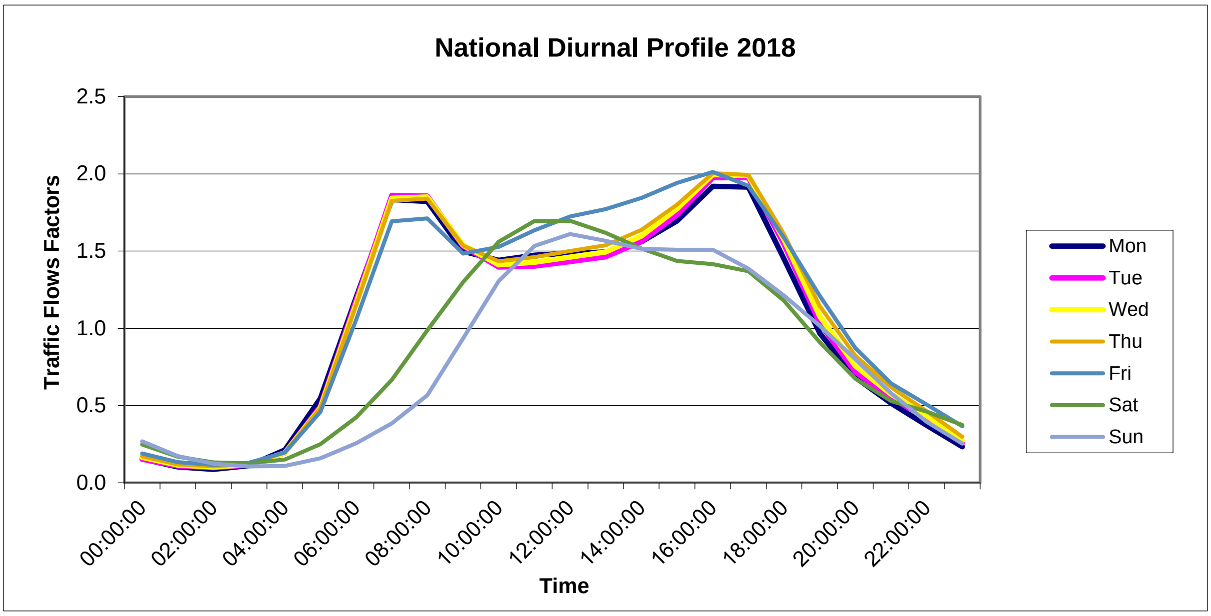
*Traffic flows sources from the DfT.

**Table C2: Heavy Goods Vehicle % for Model Scenarios used in the dispersion modelling assessment**

| Road Link | S1 2018 Base case | S2 2021 Without Dev | S3 2013 With Dev |
|---|---|---|---|
| 1 | 0% | 0% | 0% |
| 2 | 4% | 4% | 3% |
| 3 | 4% | 4% | 3% |
| 4 | 4% | 4% | 4% |
| 5 | 4% | 4% | 4% |
| 6 | 1% | 1% | 1% |
| 7 | 3% | 3% | 3% |

| Road Link | S1 2018 Base case | S2 2021 Without Dev | S3 2013 With Dev |
|---|---|---|---|
| 8 | 1% | - | - |
| 9 | 1% | - | - |
| 10 | 2% | - | - |
| 11 | 3% | - | - |

**Figure C1: Diurnal Profile Included in the Dispersion Modelling Assessment**



# ANNEX D
# MODELLING OF OPERATIONAL PHASE – VERIFICATION METHODOLOGY AND MODEL RESULTS

The dispersion model results were verified following the relevant guidance in LAQM.TG(16). Predicted results from a dispersion model may differ from measured concentrations for a variety of reasons, these are identified in LAQM.TG(16) to include:

- Estimates of background concentrations;
- Meteorological data uncertainties;
- Uncertainties in source data for example, traffic flow data and emission factors;
- Model input parameters such as roughness length, minimum Monin-Obukhov and overall model limitations; and
- Uncertainties associated with monitoring data, including locations.

The $NO_2$ diffusion tubes DT15, DT22 and DT23, as detailed in Section 3, were used for the dispersion model verification against traffic data. DT14 is located on the same road but was not included in this verification process, as it is considered this tube is located within a canyon (and canyons are not present in other areas of the model).

A comparison of modelled versus monitored $NO_2$ concentrations at these sites are presented in Table D1. Model adjustment has been undertaken in accordance with LAQM.TG(16).

**Table D1 Modelled versus Monitored $NO_2$ Concentrations, unverified**

| Site | Background $NO_2$ | Monitored total $NO_2$ | Modelled total $NO_2$ | % Difference [(modelled – monitored)/monitored]x100 |
|---|---|---|---|---|
| DT15 | 11.6 | 43.8 | 17.7 | -60 |
| DT22 | 11.6 | 32.1 | 17.8 | -44 |
| DT23 | 11.6 | 43.5 | 17.4 | -60 |

Modelled versus measured road $NO_X$ at the sites is shown in Table D2. The model predicts a lower concentration than that estimated based on $NO_2$ concentrations measured. If the percentage difference between the two is greater than 25%, LAQM.TG(16) recommends verification. The verification was carried out as detailed below.

**Table D2 Modelled versus Monitored $NO_x/NO_2$**

| Site | Monitored total $NO_2$ | Background $NO_2$ | Monitored Road Contribution $NO_x$ | Modelled road contribution $NO_x$ | Ratio of Modelled and Measured Road $NO_x$ |
|---|---|---|---|---|---|
| DT15 | 43.8 | 11.6 | 66.7 | 11.3 | 5.9 |
| DT22 | 32.1 | 11.6 | 40.2 | 11.5 | 3.5 |
| DT23 | 43.5 | 11.6 | 66.0 | 10.6 | 6.2 |

The overall verification factor was 4.4. The factor is considered conservative and could be improved by the inclusion of queuing traffic data. However, no additional data were available.

The verified annual average modelled road contribution $NO_x$ concentration was used to estimate annual average road $NO_2$ by using the Defra $NO_x$ to $NO_2$ spreadsheet. A comparison of monitored and model adjusted total $NO_2$ is presented in Table D3 for the diffusion tube result used for verification. This indicates that following verification model performance improved.

**Table D3 Modelled versus Monitored $NO_2$ Concentrations, following verification**

| Site | Background $NO_2$ | Monitored total $NO_2$ | Modelled total $NO_2$ after adjustment | % Difference [(modelled – monitored)/ monitored]x100 |
|---|---|---|---|---|
| DT15 | 11.6 | 43.8 | 36.4 | -17 |
| DT22 | 11.6 | 32.1 | 36.9 | 15 |
| DT23 | 11.6 | 43.5 | 35.2 | -19 |

Measured annual $PM_{10}$ and $PM_{2.5}$ concentrations were not available. Therefore, as per the recommendations in LAQM.TG(16), the same factor (4.4) was applied to the modelled $PM_{10}$ and $PM_{2.5}$ concentrations.

Verified $NO_2$, $PM_{10}$ and $PM_{2.5}$ model results are shown in Table D4.

**Table D4: Predicted Pollutant Concentrations at Residential Receptor Locations (2018 meteorological data, background concentrations included): S1, S2 and S3.**

| Receptor | Annual Mean $NO_2$ Concentrations (µg/m$^3$) | | | Annual Mean $PM_{10}$ Concentrations (µg/m$^3$) | | | No. days $PM_{10}$ 24-Hour Average Concentrations (µg/m$^3$) | | | Annual Mean $PM_{2.5}$ Concentrations (µg/m$^3$) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | S1 2018 | S2 2021 | S3 2021 | S1 2018 | S2 2021 | S3 2021 | S1 2018 | S2 2021 | S3 2021 | S1 2018 | S2 2021 | S3 2021 |
| R1 | 33.0 | 30.1 | 31.4 | 16.3 | 16.5 | 16.8 | 0 | 0 | 1 | 9.9 | 9.9 | 10.1 |
| R2 | 26.4 | 24.2 | 25.4 | 15.2 | 15.3 | 15.6 | 0 | 0 | 0 | 9.3 | 9.3 | 9.5 |
| R3 | 21.9 | 19.6 | 20.4 | 14.0 | 13.9 | 14.1 | 0 | 0 | 0 | 8.6 | 8.5 | 8.6 |
| R4 | 20.5 | 19.1 | 19.6 | 14.0 | 14.1 | 14.2 | 0 | 0 | 0 | 8.6 | 8.6 | 8.6 |
| R5 | 27.9 | 25.8 | 26.0 | 15.0 | 15.1 | 15.1 | 0 | 0 | 0 | 9.2 | 9.2 | 9.2 |
| R6 | 26.7 | 24.9 | 25.0 | 15.1 | 15.3 | 15.3 | 0 | 0 | 0 | 9.2 | 9.3 | 9.3 |
| R7 | 26.3 | 24.6 | 24.6 | 15.1 | 15.4 | 15.4 | 0 | 0 | 0 | 9.2 | 9.3 | 9.3 |
| R8 | 21.3 | 20.1 | 20.1 | 14.1 | 14.3 | 14.3 | 0 | 0 | 0 | 8.6 | 8.7 | 8.7 |
| R9 | 14.4 | 14.0 | 14.1 | 12.8 | 12.8 | 12.9 | 1 | 1 | 1 | 7.8 | 7.9 | 7.9 |
| R10 | 16.3 | 15.7 | 15.9 | 13.2 | 13.2 | 13.3 | 0 | 0 | 0 | 8.1 | 8.1 | 8.1 |
| R11 | 29.1 | 26.8 | 26.9 | 15.4 | 15.5 | 15.5 | 0 | 0 | 0 | 9.4 | 9.4 | 9.4 |
| R12 | 24.7 | 23.1 | 23.2 | 14.5 | 14.7 | 14.7 | 0 | 0 | 0 | 8.9 | 8.9 | 8.9 |
| PR13 | 21.1 | 18.5 | 20.1 | 13.9 | 13.8 | 14.1 | 0 | 0 | 0 | 8.5 | 8.4 | 8.6 |
| PR14 | 20.1 | 18.4 | 19.5 | 13.7 | 13.7 | 13.9 | 0 | 0 | 0 | 8.4 | 8.4 | 8.5 |
| PR15 | 23.1 | 21.6 | 22.0 | 14.2 | 14.3 | 14.4 | 0 | 0 | 0 | 8.7 | 8.7 | 8.7 |
| DT15 | 36.4 | - | - | 15.3 | - | - | 0 | - | - | 9.6 | - | - |
| DT22 | 36.9 | - | - | 15.5 | - | - | 0 | - | - | 9.8 | - | - |
| DT23 | 35.2 | - | - | 15.2 | - | - | 0 | - | - | 9.6 | - | - |
| Air Quality Objective | **40** | | | **40** | | | **35** | | | **25** | | |

Note: Results in **bold** exceed the objectives.