# Littlemoor, Clitheroe

Air Quality Assessment

**The Trustees of the Standen Estate**

April 2012

Final Report

9V7186

A COMPANY OF

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## SUMMARY

The Trustees of the Standen Estate (the Applicant) intends to submit a planning application for residential development on a site off Littlemoor, Clitheroe. The proposed development comprises:

- 15no two & three bedroom semi-detached / terraced properties;
- 18no three bedroom semi-detached properties;
- 16no three & four bed detached properties;
- associated garden space, driveways and landscaping;
- creation of a new junction, with access to Littlemoor House improved; and
- a 'looped' access route for vehicular movement.

An air quality assessment was undertaken to consider the potential local air quality impacts relating to the construction and operation of the proposed development, with particular focus on nitrogen dioxide ($NO_2$) and particulate matter ($PM_{10}$). The assessment also considered the suitability of the site for residential use, with respect to air quality.

The site is not located within or in proximity to an Air Quality Management Area. A review of existing and future predicted background pollutant concentrations demonstrated that $NO_2$ and $PM_{10}$ background concentrations were well below the respective annual mean Air Quality Strategy Objectives.

Construction of the development would have the potential to adversely impact proximate sensitive receptors through the release of fugitive dust. It was recommended that a Code of Construction Practice (CoCP) be implemented incorporating good practice construction dust minimisation and management techniques.

The impact of traffic generated by the proposed development on local air quality was assessed using the Design Manual for Roads and Bridges (DMRB) screening methodology. Vehicle exhaust emissions from traffic generated by the proposed development were predicted to have a ***negligible*** effect on local air quality at potentially sensitive receptor locations in proximity to the main road network.

Furthermore, the results of the DMRB assessment at sensitive receptor locations, considered to be representative of future residential exposure within the development site, predicted that $NO_2$ and $PM_{10}$ concentrations would be below the respective Air Quality Strategy Objectives. Therefore, the site would be considered suitable for residential use in respect of local air quality.

## CONTENTS

# 1 INTRODUCTION

The Trustees of the Standen Estate (the Applicant) intends to submit a planning application for residential development on a site off Littlemoor, Clitheroe. The proposed development comprises:

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- creation of a new junction, with access to Littlemoor House improved;
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This report, prepared by Royal Haskoning, provides an assessment of the existing air quality in proximity to the proposed development site and the potential impact of the proposed development on local air quality, in accordance with Local Air Quality Management Technical Guidance document LAQM TG(09) (DEFRA, 2009)[1]. The potential local air quality impacts associated with both the construction phase and operational phase are assessed, including pollutant emissions from generated road traffic.

Air pollution in urban areas is generally dominated by emissions from road vehicles. The quantity and composition of vehicle emissions is dependent on the volume of traffic but also on the type of fuel used, engine type, size and efficiency, vehicle speeds and emission specifications.

The main pollutants of health concern from road traffic are nitrogen dioxide ($NO_2$) and fine particulates – normally assessed as the fraction of airborne particles of mean aerodynamic diameter less than ten micrometers ($PM_{10}$), since these pollutants are most likely to approach Air Quality Objectives in proximity to busy roads and in congested areas.

## 1.1 Site Description

The proposed development site is approximately 900m south-west of Clitheroe town centre, and is located along the Littlemoor road, adjacent to Whalley Road in the Ribble Valley district. The site is bounded by Littlemoor to the south-east; Copperfield Close and playing fields to the north-east; Littlemoor View and the back of properties fronting Whalley Road (including a petrol filling station and local store) to the west; and a cleared site and private properties to the south.

Residential and commercial properties are sited along the aforementioned roads to the north, east and west. A pedestrian route runs outside the site along the north-east boundary. Immediately north of the site is approximately 0.5 acres of public open space (incorporating an equipped play area).

Access to the proposed development will be gained from Littlemoor. A figure depicting the site location is presented at **Figure A1** in **Appendix A,** with the proposed development plan depicted in **Figure A2,**

[1] Department for the Environment Food and Rural Affairs (2009) *'Local Air Quality Management Technical Guidance Document LAQM.TG(09)'*, London: DEFRA.

# 2 LEGISLATIVE FRAMEWORK AND PLANNING POLICY

## 2.1 National Legislation

### 2.1.1 The Air Quality Strategy

Air pollution can have adverse effects on the health of humans and ecosystems. European Union (EU) legislation forms the basis for UK air quality policy. The EU Air Quality Framework Directive 96/62/EC on Ambient Air Quality Assessment and Management entered into force in September 1996[2]. This was a framework for tackling air quality through setting European-wide air quality limit values in a series of daughter directives, prescribing how air quality should be assessed and managed by the Member States. Directive 96/62/EC and the first three daughter Objectives were combined to form the new EU Directive 2008/50/EC[3] on Ambient Air Quality and Cleaner Air for Europe, which came into force June 2008.

The 1995 Environment Act[4] required the preparation of a national Air Quality Strategy (AQS) which set air quality standards and objectives for specified pollutants. The Act also outlined measures to be taken by local planning authorities (LPAs) in relation to meeting these standards and objectives (the Local Air Quality Management (LAQM) system).

The UK AQS was originally adopted in 1997[5] and has been reviewed and updated as necessary in order to take account of the evolving EU Legislation, technical and policy developments and the latest information on health effects of air pollution. The strategy was revised and reissued in 2000 as the AQS for England, Scotland, Wales and Northern Ireland[6]. This was subsequently amended in 2003[7] and was last updated in July 2007[8].

The standards and objectives relevant to the LAQM framework have been prescribed through the Air Quality (England) Regulations (2000)[9], and the Air Quality (England) (Amendment) Regulations 2002[10]; the Air Quality Standards Regulations 2010 set out the combined Daughter Directive limit values and interim targets for Member State compliance[11]. The current air quality standards and objectives are presented in **Table 1**. Pollutant standards relate to ambient pollutant concentrations in air, set based on medical and scientific evidence of how each pollutant affects human health. Pollutant objectives however, incorporate future dates by which each standard is to be achieved, taking into account economic considerations, practicability and technical feasibility.

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[2] European Parliament (1996) *Council Directive 96/62/EC on Ambient Air Quality Assessment and Management*.
[3] European Parliament (2008) Council Directive 2008/50/EC on *Ambient Air Quality and Cleaner Air for Europe*.
[4] HMSO (1995) *'The Environment Act 1995 (c.25)'*, London:TSO.
[5] Department of the Environment (DoE) (1997) *'The UK National Air Quality Strategy'*, London: HMSO.
[6] Department of the Environment, Transport & the Regions (DETR) (2000) '*UK Air Quality Strategy*'. London:HMSO.
[7] DETR (2003) '*UK Air Quality Strategy- Addendum*'. London:HMSO.
[8] Department for Environment, Food and Rural Affairs (DEFRA) (2007) *'The Air Quality Strategy for England, Scotland, Wales and Northern Ireland'*, London:HMSO.
[9] HMSO (2000) *'Statutory Instrument 2000 No. 928, The Air Quality (England) Regulations 2000'*, London:HMSO.
[10] HMSO (2002) *'Statutory Instrument 2002 No. 3043, The Air Quality (England) (Amendment) Regulations 2002',* London:HMSO.
[11] HMSO (2010) *'Statutory Instrument 2010 No. 1001, Air Quality Standards (England) Regulations, 2010'*. London:HMSO.

Where an air quality objective is unlikely to be met by the relevant deadline, local authorities must designate those areas as Air Quality Management Areas (AQMAs) and take action, along with others, to work towards meeting the objectives. Following the designation of AQMAs, local authorities are required to develop air quality action plans (AQAPs) to identify and implement actions to improve air quality locally.

Possible exceedences of air quality objectives are usually assessed in relation to those locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the objective.

**Table 1: Air Quality Strategy Objectives (England) for the Purposes of LAQM**

| Pollutant | Air Quality Objective | | To be achieved by |
|---|---|---|---|
| | Concentration | Measured as* | |
| Benzene | 5 µg.m-3 | Annual mean | 31/12/2010 |
| 1,3 Butadiene | 2.25 µg.m-3 | Running annual mean | 31/12/2003 |
| Carbon monoxide | 10 mg.m-3 | Maximum daily running 8-hour mean | 31/12/2003 |
| Lead | 0.25 µg.m-3 | Annual Mean | 31/12/2008 |
| Nitrogen dioxide (NO2) | 200 µg.m-3 | 1 hour mean not to be exceeded more than 18 times per year | 31/12/2005 |
| | 40 µg.m-3 | Annual mean | 31/12/2005 |
| Particles (PM10) | 50 µg.m-3 | 24-hour mean not to be exceeded more than 35 times per year | 31/12/2004 |
| | 40 µg.m-3 | Annual mean | 31/12/2004 |
| Particles (PM2.5) | 25 µg.m-3 | Annual mean (target) | 2020 |
| | 15% cut in annual mean (urban background exposure) | | 2010 - 2020 |
| Sulphur Dioxide (SO2) | 350 µg.m-3 | 1-hour mean not to be exceeded more than 24 times a year | 31/12/2004 |
| | 125 µg.m-3 | 24-hour mean not to be exceeded more than 3 times a year | 31/12/2004 |
| | 266 µg.m-3 | 15-minute mean not to be exceeded more than 35 times a year | 31/12/2005 |

Note: * how the Objectives are to be measured is set out in the UK Air Quality (England) Regulations (2000).

## 2.2 National Planning Policy

### 2.2.1 The National Planning Policy Framework

In March 2012, the National Planning Policy Framework (NPPF) replaced Planning Policy Statement (PPS) 23[12].

The NPPF[13] refers to the Local Air Quality Management (LAQM) process and recognises that, *'…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.'* The NPPF identifies that planning departments of Local Authorities should maintain consistency within the LAQM process and states that, *'…planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan.'*

[12] HMSO (2004) *'Planning Policy Statement (PPS) 23: Planning and Pollution Control'*, London:TSO.
[13] Dept. Communities & Local Government (2012) '*The National Planning Policy Framework'* London

# 3 METHODOLOGY

The air quality assessment was undertaken using information from a variety of sources, including:

- a review of Ribble Valley Borough Council (RVBC) LAQM documents;
- obtaining air pollutant concentrations from the UK Air Quality Archive;
- collation of traffic flow data from the project transport consultants, Royal Haskoning's Planning and Transport team;
- application of the methodology of the Highway Agency's Design Manual for Roads and Bridges (DMRB) Localised Air Quality Assessment[14] to predict the effect from the traffic generation as a result of the proposals on the future local air quality; and
- comparison of the predicted air pollutant concentrations with the Air Quality Strategy Objectives and against Environment Protection UK (EPUK) impact significance criteria[15].

## 3.1 Baseline Air Quality Conditions

RVBC has published a series of Review and Assessment documents in accordance with the LAQM process. The following documents were reviewed in order to establish the existing conditions at and in proximity to the site:

- Updating and Screening Assessment, May 2009; and
- Air Quality Progress Report, July 2010.

Background air pollution concentrations corresponding to the 1 km x 1 km grid square covering the site were obtained from the UK Air Quality Archive (AQA) for the current year (2011) and future years (2012 – 2015). This was undertaken in order to gain an insight into the predicted background air quality at the site both before and after the development becomes operational.

Existing baseline traffic data for 2011, and year of opening in 2013 was utilised within the DMRB model to establish the baseline air quality conditions at existing sensitive receptors within proximity to the assessed road network.

## 3.2 Construction Phase Impacts

Potential air quality impacts associated with the construction of the development were assessed within the context of dust emissions and exhaust emissions of $NO_2$ and $PM_{10}$ generated by on-site activities, including movements of non-road mobile machinery (NRMM) and on-road construction vehicles. Information relating to construction activities and schedules was not available at the time of writing and so a qualitative assessment was undertaken.

Receptors potentially sensitive to dust emissions were identified in proximity to the site, following guidance from '*Minerals Policy Statement 2*'[16] (ODPM, 2005), as presented in

[14] Highway Agency (2007) '*Design Manual for Roads and Bridges (DMRB) Localised Air Quality Assessment*'.
[15] EPUK, (2010) *Development Control: Planning for Air Quality, 2010 Update.*
[16] Office of the Deputy Prime Minister (2005) *Minerals Policy Statement 2: Controlling and Mitigating the Environmental Effects of Mineral Extraction in England,* London: HMSO.

**Table 2**. Receptors sensitive to emissions of $NO_2$ and $PM_{10}$ from on-road construction vehicle and non-road mobile machinery (NRMM) exhaust emissions were also identified.

**Table 2: Dust Sensitive Receptors**

| High Sensitivity | Medium Sensitivity | Low Sensitivity |
|---|---|---|
| Hospitals and Clinics | Schools | Farms |
| Retirement Homes | Residential Areas | Light and Heavy Industry |
| Hi-Tech Industries | Food Retailers | Outdoor Storage |
| Food Processing | Offices | |

## 3.3 Operational Phase Impacts

The potential for long-term impacts on local air quality are likely to be associated with changes in vehicle flows on the local road network related to the proposed development. In order to assess the potential impact on ambient air quality associated with potential changes in vehicle exhaust emissions, comparisons were made between the predicted ambient air quality concentrations for the 'baseline' (2011), and the 'without development' and 'with development' scenarios for 2013 (the anticipated year of opening).

Air pollutant concentrations were assessed at chosen sensitive receptor locations using the DMRB model[14]. The method requires data relating to vehicle speeds, the distance between the receptor and the roads carrying the traffic, the proportion of Heavy Goods Vehicles (HGVs) and changes in future exhaust emissions given legislative and technological controls. In this way, predicted changes in air quality resulting from the development could be established and pollutant concentrations compared to the Air Quality Strategy Objectives.

The DMRB methodology states that there is unlikely to be any significant effect on local air quality due to road traffic at properties beyond 200m from any roads which experience a change in traffic flow. Traffic flow data comprising annual averaged daily traffic (24-hour AADT) flows and traffic composition, including percentage HGVs, were provided for the following roads by Royal Haskoning's Planning and Transport team:

- Littlemoor;
- Whalley Road; and
- Beverley Drive.

A summary of the relevant traffic data is provided in **Table 3**. **Figure A3** (**Appendix A**) depicts the assessed road network. The data are considered to be representative of local traffic movements.

**Table 3: Traffic data (AADT) used within the DMRB Localised Air Quality Assessment**

| Road | 2011 Baseline | %HGV | 2013 'without' development | %HGV | 2013 'with' development | %HGV |
|---|---|---|---|---|---|---|
| Whalley Road | 13645 | 5 | 14110 | 5 | 14110 | 5 |
| Littlemoor | 1535 | 5 | 1585 | 5 | 1905 | 5 |
| Beverley Drive | 135 | 5 | 135 | 5 | 135 | 5 |

An average annual speed of 45 km.h$^{-1}$ (30 mph) was used for the Whalley Road link, with the average speed reduced to 24 km.h$^{-1}$ (15 mph) to account for the approach and progress of vehicles through the junction at Littlemoor.

Ambient concentrations of $NO_2$ and $PM_{10}$ were predicted for six identified sensitive receptor locations, as detailed in **Table 4**. The locations of each receptor are indicated in **Figure 1** (**Appendix A**) and are considered to represent the locations most sensitive to changes in vehicle exhaust emissions, subsequent to completion of the development.

One receptor was selected at the development site boundary, given that the proposed properties will be located within 200m from the assessed road network. Each proposed residential receptor modelled represents the closest point to the adjacent assessed road.

**Table 4: Receptor locations assessed using the DMRB methodology**

| Receptor Number | Receptor Location (Type) | Assessed road(s) | Shortest distance between receptor and road centre |
|---|---|---|---|
| 1 | 19 Littlemoor (Residential) | Littlemoor | 5 m |
| 2 | 159 Whalley Road (Residential) | Whalley Road | 10 m |
| 3 | Lime Field Cottage (Residential) | Littlemoor | 10 m |
| 4 | Millersdene, Whalley Road (Residential) | Littlemoor; Whalley Road | 10 m |
| 5 | Primrose Garage, Whalley Road (Commercial) | Whalley Road | 10 m |
| 6 | Development Site | Littlemoor | 2.5 m |

## 3.4 Significance Criteria

The significance of any changes in local air quality was established through the consideration of the following factors:

- geographical extent (local, district or regional);
- duration (temporary or long term);
- reversibility (reversible or permanent);
- magnitude of pollutant concentration changes;
- exceedence of standards (e.g. Air Quality Strategy Objectives); and
- changes in pollutant exposure.

The EPUK guidance document '*Development Control: Planning for Air Quality Update*'[15] provides an example of criteria for magnitude of change and related significance of quantified impacts as a result of a development. **Table 5** presents the magnitude of change in air pollutant concentration descriptors and **Table 6** presents the significance descriptors that take account of the magnitude of changes (both positive and negative) and the concentration in relation to the air quality Objective.

**Table 5: Magnitude of Change Descriptor in Relation to Changes in Concentrations of $NO_2$ and $PM_{10}$**

| Magnitude of change | Annual mean $NO_2/PM_{10}$ | Days $PM_{10}$ >50 µg/m$^3$ |
|---|---|---|
| **Large** | Increase/decrease >4 µg.m$^{-3}$ | Increase/decrease >4 days |
| **Medium** | Increase/decrease 2-4 µg.m$^{-3}$ | Increase/decrease 2-4 days |
| **Small** | Increase/decrease 0.4-2 µg.m$^{-3}$ | Increase/decrease 1-2 days |
| **Imperceptible** | Increase/decrease <0.4 µg.m$^{-3}$ | Increase/decrease <1 day |

**Table 6: Air quality impact descriptors for changes to annual mean $NO_2/PM_{10}$ at a receptor**

| Absolute Concentration in relation to Objective / Limit Value | Change in Concentration | | |
|---|---|---|---|
| | **Small** | **Medium** | **Large** |
| **Increase *With* Scheme** | | | |
| **Above Objective / Limit Value *With* Scheme (>40 µg.m$^{-3}$)** | Minor Adverse | Moderate Adverse | Major Adverse |
| **Just Below Objective / Limit Value *With* Scheme (36 – 40 µg.m$^{-3}$)** | Minor Adverse | Moderate Adverse | Moderate Adverse |
| **Below Objective / Limit Value *With* Scheme (30 – 36 µg.m$^{-3}$)** | Negligible | Minor Adverse | Minor Adverse |
| **Well Below Objective / Limit Value *With* Scheme (<30 µg.m$^{-3}$)** | Negligible | Negligible | Minor Adverse |
| **Decrease *With* Scheme** | | | |
| **Above Objective / Limit Value *Without* Scheme (>40 µg.m$^{-3}$)** | Minor Beneficial | Moderate Beneficial | Major Beneficial |
| **Just Below Objective / Limit Value *Without* Scheme (36 – 40 µg.m$^{-3}$)** | Minor Beneficial | Moderate Beneficial | Moderate Beneficial |
| **Below Objective / Limit Value *Without* Scheme (30 – 36 µg.m$^{-3}$)** | Negligible | Minor Beneficial | Minor Beneficial |
| **Well Below Objective / Limit Value *Without* Scheme (<30 µg.m$^{-3}$)** | Negligible | Negligible | Minor Beneficial |

Note: Well below objective = < 75% of the objective level.

## 3.5 Baseline Air Quality Conditions

### 3.5.1 Ribble Valley Borough Council Local Air Quality Review and Assessment

RVBC declared an AQMA along a stretch of Whalley Road, Clitheroe. The AQMA was declared subsequent to a fourth round Updated Screening Assessment of air quality undertaken in 2009, relating to the exceedence of the annual mean $NO_2$ AQS Objective. The AQMA is located approximately 800m north of the development site.

In 2010, RVBC issued an Air Quality Progress Report. This document stated that levels of $NO_2$ within the AQMA are expected to continue to exceed the AQS Objective, and an Air Quality Action Plan is currently being developed for the AQMA. Monitoring will be continued using diffusion tubes at Whalley Road.

RVBC operates a network of 9 $NO_2$ passive diffusion tubes at 2 locations within the borough, with 5 diffusion tubes located in Clitheroe and 4 located in Read. The 2010 progress report concluded that the AQS objective for $NO_2$ would be exceeded at 1 of the 9 monitoring locations within the network.

### 3.5.2 Air Quality Monitoring in Ribble Valley

RVBC do not operate any automatic air quality monitoring stations in proximity to the site. Due to the designation of an AQMA along the Whalley Road, the majority of monitoring locations are concentrated in this area.

The nearest diffusion tube is located within the AQMA at 57 Whalley Road, located approximately 700m north of the proposed development. The annual mean $NO_2$ results for the years 2007 to 2010 are presented in **Table 7**, as reported in the 2010 RVBC Air Quality Progress report. The results show that the annual mean objective was exceeded in 2009 at this location.

**Table 7: $NO_2$ diffusion tube results for '57 Whalley Road' site from 2007 to 2010**

| Site Type | Distance from nearest road (m) | Mean $NO_2$ ($\mu g.m^{-3}$) | | |
|---|---|---|---|---|
| | | 2008 | 2009 | 2010 |
| Urban Roadside | 1.0 | 37.8 | **49.4** | 34.9 |
| **Objective** | | | **40** | |

Monitored concentrations at this location are not considered to be representative of the ambient air quality conditions at the site. Traffic volumes within the AQMA at the town centre, where this diffusion tube is located, would be higher than those experienced at the development site, in addition to lower average speeds, resulting in relatively higher pollutant emissions.

### 3.5.3 Pollutant Background Concentrations

The UK AQA provides estimates of existing and predicted pollutant background concentrations based on national emission inventories for industrial and transport emissions data.

Background concentrations of $NO_X$, $NO_2$ and $PM_{10}$ were obtained for the 1 x 1 km grid square corresponding to the site (grid reference 374500, 440500) for the years 2011 to 2015, and are presented in **Table 8**.

**Table 8: Background Pollutant Concentrations (µg.m$^{-3}$) at the site (374500, 440500)**

| Pollutant | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| Oxides of Nitrogen ($NO_x$) | 11.08 | 10.62 | 10.16 | 9.69 | 9.23 |
| Nitrogen Dioxide ($NO_2$) | 8.68 | 8.34 | 8.00 | 7.66 | 7.32 |
| Particulates ($PM_{10}$) | 10.63 | 10.53 | 10.43 | 10.33 | 10.23 |

All the existing and predicted background pollutant concentrations in proximity to the site are below the annual mean Objectives relating to $NO_2$ and $PM_{10}$.

The 1 x 1 km grid square background concentrations were utilised within the DMRB assessment to facilitate prediction of the local air quality impacts relating to the operation of the development.

### Existing Air Quality

The existing (2011) air quality conditions at the identified sensitive receptors were assessed using the 2011 traffic data, and the results are presented in **Table 9**.

**Table 9: Results of DMRB Localised Air Quality Assessment for 2011**

| Receptor ID | $NO_2$ Annual Mean [µg.m$^{-3}$] | $PM_{10}$ Annual Mean [µg.m$^{-3}$] | No. 24-hour mean $PM_{10}$ exceedences > 50 µg.m$^{-3}$ * |
|---|---|---|---|
| 1 | 9.7 | 10.9 | 0 |
| 2 | 15.5 | 12.1 | 0 |
| 3 | 9.6 | 10.9 | 0 |
| 4 | 17.0 | 12.4 | 0 |
| 5 | 15.5 | 12.1 | 0 |
| 6 | 9.7 | 10.9 | 0 |

* 50 µg.m$^{-3}$ not to be exceeded more than 35 times per year

It is evident from **Table 9** that existing annual mean concentrations of $NO_2$ and $PM_{10}$ are predicted to be well below the respective objectives at all modelled receptor locations. Furthermore, the short term Objectives for both $NO_2$ and $PM_{10}$ are predicted to be achieved in the current year.

# 4 AIR QUALITY IMPACT ASSESSMENT

This section assesses the impact of concentrations of $NO_2$, $PM_{10}$ and dust particles on sensitive receptor locations relating to the construction and operational phases of the proposed development.

## 4.1 Construction Phase

### 4.1.1 Potential Dust Impacts

The construction works associated with the scheme have the potential to impact on local air quality conditions, as follows:

- dust generated from construction activities;
- emissions from non-road mobile machinery (NRMM); and
- emissions from vehicles (e.g. Lorries, cars and vans) associated with the construction of the scheme, accessing and leaving the site on the local access road network.

The Air Quality Strategy Objectives seek to minimise the health implications of, amongst other pollutants, fine particulate matter, of which a significant source is the combustion of fuels such as in motor vehicle engines. In the case of particles released from earthworks and construction, the majority of these will tend to be larger particles, which generally settle out close to the works and may cause annoyance due to their soiling capability. Typically, such deposition that could give rise to significant soiling tends to occur within 50 to 100m of the source.

The closest residential receptors to the development site are within 30m of the site boundary. The prevailing wind in Clitheroe is from the southwest, thus residential properties located adjacent to the north and northeast of the development site, along Lingfield Avenue, Hillside Close and Part Street would be particularly susceptible to dust emissions related to construction activities. In the absence of mitigation, dust emissions from construction activities are predicted to have a ***moderate, temporary and localised adverse*** impact at these sensitive receptor locations.

It is acknowledged that, periodically, the wind direction will change resulting in the exposure of other proximate receptors to the site, particularly properties adjacent to the west of the site on Whalley Road and Parker Avenue. The potential for all identified sensitive locations to be affected will vary depending on the duration and location of dust-raising activity taking place on the site and the prevailing local dispersion conditions.

### 4.1.2 Non Road Mobile Machinery

Engine exhaust emissions from off-road vehicles known as non road mobile machinery (NRMM), such as excavators, bulldozers, front loaders and generators have the potential to affect local air quality. The main pollutants of concern from these emissions are those relating to fuel combustion such as CO, $NO_2$, $SO_2$ and $PM_{10}$.

Air quality in close proximity to the development site is likely to be affected by emissions from NRMM operating on the development site. The impact will be local and short term – lasting for the duration of construction only. In the absence of mitigation, emissions

from NRMM used during construction are predicted to have a ***minor, temporary and localised adverse*** impact on local air quality.

### 4.1.3 On-Road Construction Traffic

No data were received with respect to predicted construction traffic movements to and from the site. Although construction traffic emissions would potentially contribute to local ambient concentrations of $NO_2$ and $PM_{10}$, the number of daily construction traffic movements would be likely to result in a ***negligible*** impact on existing local air quality, given the small scale of the development and relatively low existing background pollution levels.

### 4.1.4 Operational Phase Impacts

The impact of road traffic emissions generated by the proposed development on local air quality ($NO_2$ and $PM_{10}$) was assessed using the DMRB local air quality model. The results of the DMRB assessment for 'without' and 'with' the development in 2013 are presented in **Table 10**.

**Table 10: DMRB results for '*without*' and '*with*' development in 2013 (opening year) – annual mean concentrations**

| | **$NO_2$ Annual Mean ($\mu g.m^{-3}$) +** | | | **$PM_{10}$ Annual Mean ($\mu g.m^{-3}$)** | | |
|---|---|---|---|---|---|---|
| **Receptors** | **2013 Without** | **2013 With** | **($\mu g.m^{-3}$) Impact** | **2013 Without** | **2013 With** | **($\mu g.m^{-3}$) Impact** |
| 1 | 9.3 | 9.4 | **+ 0.1** | 10.7 | 10.8 | **+ 0.1** |
| 2 | 14.7 | 14.7 | **-** | 11.8 | 11.8 | **-** |
| 3 | 9.2 | 9.3 | **+ 0.1** | 10.7 | 10.8 | **+ 0.1** |
| 4 | 16.1 | 16.3 | **+ 0.2** | 12.1 | 12.2 | **+ 0.1** |
| 5 | 14.7 | 14.7 | **-** | 11.8 | 11.8 | **-** |
| 6 | 9.3 | 9.3 | **-** | 10.7 | 10.8 | **+ 0.1** |

**+** Road vehicle contribution of $NO_x$ converted to $NO_2$ using $NO_x$ – $NO_2$ calculator (v2.1 2010) in accordance with LAQM.TG (09).

The results of the DMRB assessment predict that annual mean concentrations of $NO_2$ and $PM_{10}$ would be well below the respective objectives in 2013, both '*without*' and '*with*' the proposed development in place.

The highest predicted annual mean concentration of $NO_2$ (16.3 $\mu g.m^{-3}$) was predicted to occur at receptor location 4 (Millersdene) in 2013, *'with'* the development. The highest concentration of $PM_{10}$ (12.2 $\mu g.m^{-3}$) was predicted at the same location. This reflects the proximity of this receptor to the junction of Whalley Road and Littlemoor, where traffic would approach and progress through this junction at a relatively lower speed. Conservative assumptions were made within the modelling process, including the use of low speeds (24 kph) along the road link throughout the immediate area.

The additional traffic generated by the completed development is predicted to have a maximum impact of 0.2 $\mu g.m^{-3}$, in terms of annual mean $NO_2$ at receptor 4 (Millersdene, Whalley Road). This equates to an *'imperceptible'* magnitude of change in accordance

with EPUK guidance (*see* **Table 5**). The predicted local air quality impact of the development at this location therefore corresponds to a ***negligible*** impact (*see* **Table 6**).

All other concentration impacts were predicted to be below 0.2 µg.m$^{-3}$ for annual mean $NO_2$ and annual mean $PM_{10}$, which corresponds to ***negligible*** local air quality impacts at all other receptors.

The vehicle movements generated by the proposed development above baseline flows in 2013 are therefore predicted to have a ***negligible*** impact on local air quality at all modelled receptors. In terms of proposed residential receptor on the site, the predicted $NO_2$ and $PM_{10}$ annual mean concentrations at receptor 6 are well below the respective air quality objectives in 2013. Therefore, the site is considered to be suitable for residential use in respect of local air quality.

# 5 MITIGATION ISSUES

## 5.1 Construction Phase Impacts

### 5.1.1 Construction Dust

A range of environmental management controls are described in both the Building Research Establishment (BRE) guidance[17] and the Greater London Authority and London Councils Best Practice Guidance[18], and a Code of Construction Practice (CoCP) is recommended to minimise the release of dust entering the atmosphere and/or being deposited on nearby receptors. Particular attention would be paid to operations, which must unavoidably take place close to the site boundary. Such measures would include:

- damping down surfaces during dry windy weather;
- erection of appropriate hoarding and/or fencing, particularly adjacent to the site boundaries, to reduce dust dispersion and restrict public access, and sheeting of buildings, chutes, skips and vehicles;
- appropriate handling and storage of materials;
- restriction of drop heights onto lorries;
- use of a wheel wash, limiting of vehicle speeds on site, avoidance of unnecessary idling of engines and routing of site traffic as far from residential and commercial properties as possible;
- fitting all equipment (e.g. for cutting, grinding, crushing) with dust control measures such as water sprays wherever possible;
- prevention of dust-contaminated run-off water from the site;
- use of gas powered generators rather than diesel if possible (these are also quieter) and ensuring that all plant and vehicles are well maintained so that exhaust emissions do not breach statutory emission limits; and
- use of a road sweeper to clean mud and other deposited particulates from hardstanding roads and footpaths.

Such measures are routinely and successfully applied to construction projects throughout the UK, and are capable of significantly reducing the potential for adverse nuisance dust impacts associated with the various stages of demolition and construction work.

Effective implementation of a CoCP which is appropriate and commensurate with the scale of this development would contribute to reducing the impact of construction emissions on sensitive receptors to ***minor, temporary and localised adverse***.

### 5.1.2 Non Road Mobile Machinery

Non road mobile machinery and plant would be expected to be well maintained. If any emissions of dark smoke occur then the relevant machinery should stop immediately and any problem rectified. In addition, the following controls should apply to non-road mobile machinery:

[17] Building Research Establishment (BRE), 2004, *'Controlling Particles, Vapour and Noise Pollution from Construction Sites'*

[18] Greater London Authority and London Councils (2006) *The Control of Dust and Emissions from Construction and Demolition – Best Practice Guidance*

- all NRMM should use fuel equivalent to ultra low sulphur diesel (fuel meeting the specification within EN590:2004);
- all NRMM should comply with either the current or previous EU Directive Staged Emission Standards (97/68/EC, 2002/88/EC, 2004/26/EC). As new emission standards are introduced the acceptable standards should be updated to the previous and most current standard;
- all NRMM should be fitted with Diesel Particulate Filters (DPF) conforming to defined and demonstrated filtration efficiency (load/duty cycle permitting);
- the ongoing conformity of plant retrofitted with DPF, to a defined performance standard, should be ensured through a programme of on-site checks; and
- implementation of energy conservation measures including instructions to throttle down or switch off idle construction equipment; switch off the engines of trucks while they are waiting to access the site and while they are being loaded or unloaded, ensure equipment is properly maintained to ensure efficient energy consumption.

Successful implementation of the above mitigation measures may reduce emissions from NRMM used during construction.

### 5.1.3 Operational Phase Impacts

Vehicle exhaust emissions from traffic generated by the proposed development are predicted to have a ***negligible*** effect on local air quality at potentially sensitive receptor locations in proximity to the main road network. As such, no mitigation measures would be required.

# 6 CONCLUSION

The air quality assessment was undertaken to ascertain the suitability of the proposed development site for residential use and the impact of the proposed development on existing air quality. This assessment considered existing background air quality, with mapped data obtained from the UK air quality archive, and RVBCs formal review and assessment submissions to DEFRA.

The Council has designated a statutory AQMA within Clitheroe. The proposed development lies within 800m to the south of Clitheroe Town Centre. However, background pollutant concentrations ($NO_2$ and $PM_{10}$) at the proposed development for 2011 were shown to be well below the respective air quality Objectives.

The impact of road traffic emissions likely to be generated by the proposed development on local air quality was assessed using the DMRB local air quality model for road traffic.

The construction phase has the potential to cause nuisance through the emission of dust at residential properties some of which are within 30m of the development site. The potential for these properties to be affected will vary depending on where on site the dust-raising activity takes place and the prevailing local meteorological conditions.

A Code of Construction Practice (CoCP) would be expected to be implemented for this development. Effective implementation of a CoCP, which is appropriate and commensurate with the scale of this development and which incorporates appropriate measures for dust management and control, would contribute to the reduction of the impact of construction emissions on sensitive receptors to ***minor, temporary and localised adverse***.

Emissions from non road mobile machinery and construction traffic utilised during construction were predicted to have a ***minor, temporary and localised adverse*** impact on air quality. Successful implementation of the mitigation measures may reduce emissions from NRMM used during construction. The impact of on road construction traffic was predicted to have a ***negligible*** effect on local air quality.

Overall, the proposed development is predicted to have a ***negligible*** impact on local air quality with respect to sensitive receptors located adjacent to the site and surrounding road network. With respect to proposed residential properties within the site, annual mean concentrations of $NO_2$ and $PM_{10}$ at properties in closest proximity to the immediate road network are predicted to be well below the respective air quality objectives in 2013. Therefore, the site is considered suitable for residential use in respect of local air quality.

## GLOSSARY

| | |
|---|---|
| **24-Hour Mean** | The average of all concentrations recorded (usually hour by hour) for a specific pollutant at a monitoring location for a period of one day. |
| **Air Quality Standard** | Pollutant standards relate to ambient pollutant concentrations in air, set on the basis of medical and scientific evidence of how each pollutant affects human health and the environment. |
| **Air Quality Objective** | Pollutant objectives are future dates by which each standard is to be achieved, taking into account economic considerations, practicability and technical feasibility |
| **Air Quality Management Area** | Should the Local Authority identify a location(s) where an Air Quality Objective is not likely to be achieved, it must declare an AQMA there. This may be just one or two streets, or a much bigger area. |
| **Annual Mean** | The average of all concentrations recorded for a specific pollutant at a monitoring location for a period of one year. |
| **Background Concentrations** | The term used to describe pollutant concentrations which exist in the ambient atmosphere, excluding local pollution sources such as roads and stacks. |
| **Days with exceedence** | The number of days in which at least one period has a concentration greater than, or equal to, the relevant air quality standard (the averaging period will be that defined by that standard). Since the national air quality standards cover different time periods (15 min average, 24 hour running mean etc.) this gives a useful way of comparing data for different pollutants. |
| **Diffusion Tube** | A passive sampling instrument exposed to the atmosphere for a period of between 1-5 weeks, used as an indicative monitoring technique to identify areas of elevated concentrations (e.g. $NO_2$). This method of sampling does not provide the same level of precision and accuracy as an automatic continuous analyser. |
| **Dust** | Defined as all particulate matter up to 75 micrometres, µm, in diameter (according to BS6069) and comprising both suspended and deposited material. |
| **Exceedence** | A period of time where the concentration of a pollutant is greater than, or equal to the appropriate air quality standard. |
| **Hourly Mean** | The average of all concentrations recorded for a specific pollutant at a monitoring location for a period of one hour. |
| **$NO_x$** | A term used to describe the mixture of nitrogen oxides which is present in the atmosphere as a result of combustion reactions in both industry and vehicle engines. Nitrogen dioxide ($NO_2$) is the primary concern for effects on health, and is the species for which the health-based standard is expressed. The various oxides of nitrogen can also react with hydrocarbons in the atmosphere to contribute to photochemical smog. |
| **$PM_{10}$** | Fine airborne particles of variable chemical composition, but consisting in urban air of minerals, combustion (carbon) products, or natural materials (e.g. pollen) which are small enough to be inhaled and many of which will reach the lower |

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|---|---|
| | (gas exchange) region of the lungs. $PM_{10}$ particles are those with a mean aerodynamic diameter of less than 10 micrometres, µm (one-hundredth of a millimetre). Exposure to elevated levels has been linked to different health indicators, including hospital admission rates for both respiratory and coronary conditions. |
| **Road source emissions** | This term refers to exhaust emissions (e.g. $NO_x$ and $PM_{10}$) released to the atmosphere from vehicles utilising the modelled road network. |
| **Running Mean** | This is a mean - or series of means - calculated for overlapping time periods, and is used in the calculation of several of the national air quality standards. For instance, an 8 hour running mean is calculated every hour, and averages the values for eight hours. The period of averaging is stepped forward by one hour for each value, so running mean values are given for the periods 00:00 - 07:59, 01:00 - 08:59 etc. |
| **'With' Development** | The term used to describe the modelled scenario in which future generated traffic and other pollution sources associated with the Proposed Development are included within the model, in addition to the future baseline conditions. |
| **'Without' Development** | The term used to describe the future modelled scenario in which the Proposed Development would not exist (i.e. future baseline). This specifically relates to the absence of generated traffic and other sources of pollution predicted to be associated with the Development. |
| **µg.m$^{-3}$** | Microgrammes (of pollutant) per cubic metre of air. A measure of concentration in terms of mass per unit volume. A concentration of 1 µg.m$^{-3}$ means that one cubic metre of air contains one microgramme (millionth of a gramme) of pollutant. |
| **mg.m$^{-3}$** | Milligrammes (of pollutant) per cubic metre of air. A measure of concentration in terms of mass per unit volume. A concentration of 1 mg.m$^{-3}$ means that one cubic metre of air contains one milligramme (thousandth of a gramme) of pollutant. |

# APPENDICES

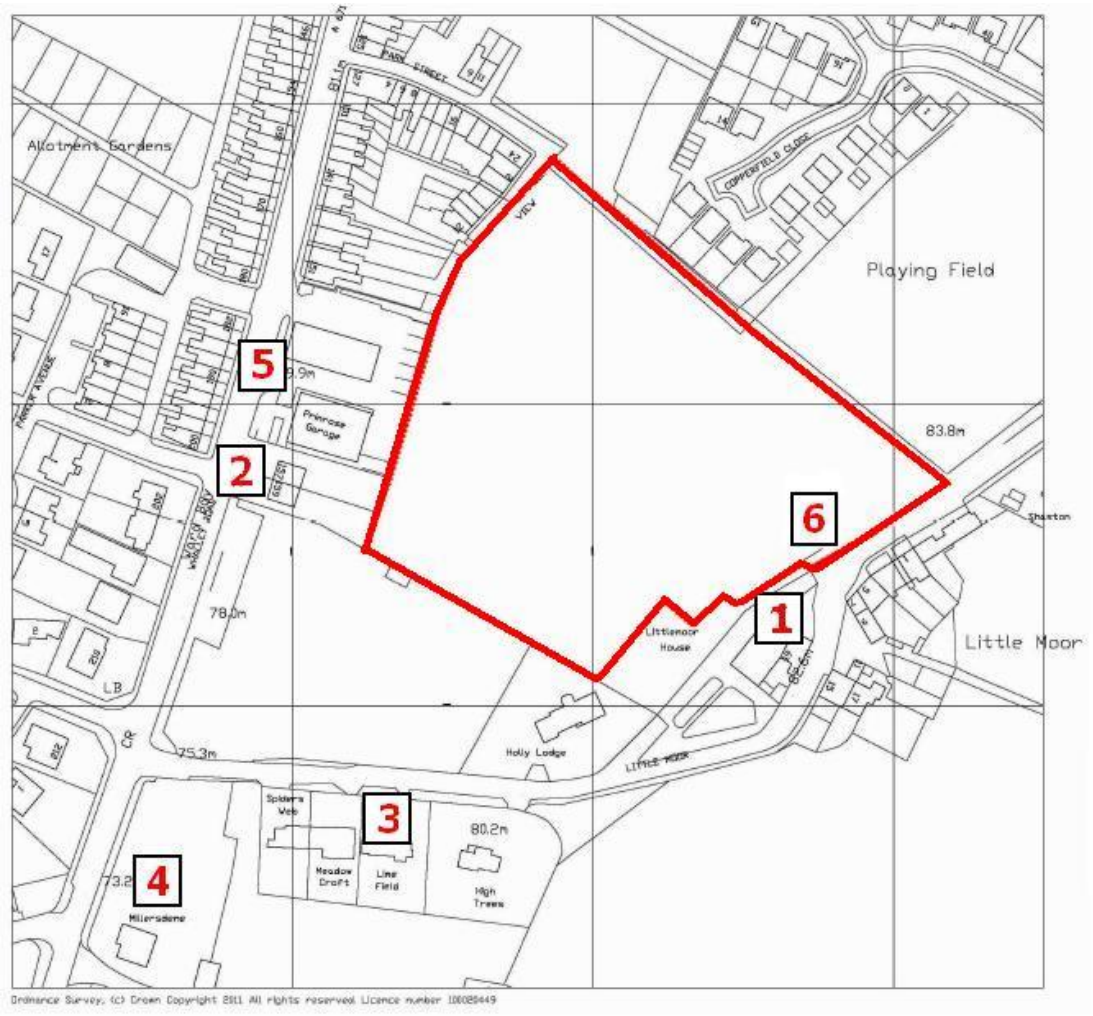
## APPENDIX A

**Figure A1 – Site Location Plan**

**Figure A2 – Proposed Development Plan**

**Figure A3 – Road Network**

## Figure A1: Site Location Plan



## Figure A2: Proposed Development Plan

## Figure A3: Road Network