100 chalk farm road
london NW1 8EH

100

air quality assessment
wsp environmental uk

august 2013

one housing group

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WSP

100 CHALK FARM ROAD

AIR QUALITY ASSESSMENT

26/07/2013

Quality Management

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1 Introduction

1.1.1 WSP Environmental Ltd (WSPE) has been commissioned to carry out an air quality assessment to identify potential effects arising from a proposed mixed use development scheme in 100 Chalk Farm, NW1 8EH (herein referred as the Proposed Development or the Application Site).

1.1.2 The Proposed Development will comprise retail (A1 and A3) and parking space for bicycles at ground floor level, offices (B1) at ground level and first floors, and 63 residential units from 1st to 8th floors. The site is located along Chalk Farm and its boundary is presented in Figure 1.

1.1.3 The Proposed Development will not generate a significant level of travel as there is no car park spaces proposed and hence traffic levels on the local network are expected to remain at current levels. As such, an air quality assessment is required only to determine the potential exposure to air quality ambient levels of the future occupants of the site.

1.1.4 This report presents the findings of the assessment of the potential air quality impacts of the Proposed Development during the construction phase and also the potential exposure of future occupants to air pollution once the development is operational. For both phases the type, source and significance of potential impacts are identified, and the measures that should be employed to minimise these impacts are described.

1.1.5 A glossary of terms used is provided in **Appendix A**.

2 Relevant Legislation & Guidance

2.1 LEGISLATION

2.1.1 The applicable legislative framework is summarised as follows:

- Air Quality Directive 2008/50/EC (Ref. 1);
- The Air Quality (England) Regulations 2000 - Statutory Instrument 2000 No.928 (Ref. 2);
- The Air Quality (England) (Amendment) Regulations 2002 - Statutory Instrument 2002 No.3043 (Ref. 3);
- The Air Quality Standards Regulations 2010 - Statutory Instrument 2010 No. 1001 (Ref. 4);
- The Environmental Protection Act 1990 (Ref. 5); and
- The Environment Act 1995 (Ref. 6).

2.1.2 A summary of the relevant legislation is provided below.

Air Quality Directive 2008/50/EC

2.1.3 The Air Quality Directive 2008/50/EC came into force on the 11th June 2008. This directive merged three existing Directives and one Council Decision into a single Directive on air quality. It sets air quality limit values, target values, and critical levels for a number of air pollutants established by the European Parliament and Council for the protection of human health, vegetation and ecosystems. These are sulphur dioxide (SO_2), nitrogen dioxide (NO_2), oxides of nitrogen (NO_x) particulate matter smaller than 10µm in aerodynamic diameter (PM_{10} and $PM_{2.5}$), lead (Pb), benzene (C_6H_6), carbon monoxide (CO) and ozone (O_3). These have been transposed into UK legislation by the 2010 Regulations.

2.1.4 It also sets new standards and target dates for reducing concentrations of fine particles. Under the Directive Member States (MS) are required to reduce exposure to $PM_{2.5}$ in urban areas by an average of 20% by 2020 based on 2010 levels. The magnitude of the required reduction depends on national average concentrations between 2009 and 2011. For the UK, from the 47 $PM_{2.5}$ stations used in a study by DEFRA in 2011, it is likely that average $PM_{2.5}$ concentrations for 2009-2011 will be between 13-14 µg/m^3. This would require the UK to comply with a 15% reduction target for 2020, equating to a required reduction in average concentrations of around 2.0 µg/m^3.

2.1.5 The directive also obliges MS to meet a Limit Value of 25µg/m^3 by 2015 and a Limit Value of 20µg/m^3 by 2020.

The Air Quality (England) Regulations 2000 and the Air Quality (England) (Amendment) Regulations 2002

2.1.6 The UK Government and the devolved administrations published the latest Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland in July 2007 defining both the standards and objectives for each of a range of air pollutants.

2.1.7 The air quality standards are concentration limits which represent negligible or zero risk to health, based on medical and scientific evidence reviewed by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO). Above these limits sensitive members of the public (e.g. children, the elderly and the unwell) might experience adverse health effects.

2.1.8 The objectives set out the extent to which the UK Government and EU expect the standards to be achieved by a certain date and maintained thereafter. They take account of the costs, benefits, feasibility and practicality of achieving the standards. Air Quality Objectives (AQO) which are relevant to the current study (NO_2 and PM_{10}) for the protection of human health are outlined in **Appendix B.**

2.1.9 Many of the objectives in the AQS have been made statutory in England with the Air Quality (England) Regulations 2000 and the Air Quality (England) (Amendment) Regulations 2002 for the purpose of Local Air Quality Management (LAQM). These set a series of air quality standards and air quality objectives with the aim of protecting human health.

2.1.10 The Regulations require that likely exceedences of Air Quality Objectives are assessed in relation to:

"…the quality of the air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present…"

(Stationery Office, 2000 and 2002)

2.1.11 The AQO apply only where members of the public are likely to be regularly present for the averaging time of the objectives (i.e. where people will be exposed to pollutants). The annual mean objectives apply to all locations where members of the public might be regularly exposed; these include building façades of residential properties, schools, hospitals, care homes etc. The 24 Hour Mean Objectives apply to all locations where the annual mean objective would apply, together with hotels and gardens of residential properties. The 1 Hour Mean Objectives also apply at these locations as well as at any outdoor location where a member of the public might reasonably be expected to stay for 1 hour or more, such as shopping streets, parks and sports grounds, as well as bus stations and railway stations that are not fully enclosed.

2.1.12 These periods reflect the varying effects on health of differing exposures to pollutants, for example temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road.

The Air Quality Standards Regulations 2010

2.1.13 These Regulations transpose 2008/50/EC in to the UK legislation and also incorporate the 4th air quality daughter directive (2004/107/EC) that sets targets for levels in outdoor air of certain toxic heavy metals (Arsenic (Ar), Cadmium (Cd), Nickel (Ni), Mercury (Hg)), Benzo(a)pyrene and other polycyclic aromatic hydrocarbons (PAHs).

The Environmental Protection Act 1990 - Control of dust and particulates associated with construction

2.1.14 Section 79 of the Environmental Protection Act 1990 gives the following definitions of statutory nuisance relevant to dust and particles:

'Any dust, steam, smell or other effluvia arising from industrial, trade or business premises or smoke, fumes or gases emitted from premises so as to be prejudicial to health or a nuisance', and

'Any accumulation or deposit which is prejudicial to health or a nuisance'

2.1.15 Following this, Section 80 says that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

2.1.16 There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist. Nuisance is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred.

Environment Act 1995

2.1.17 Under Part IV of the Environment Act 1995, local authorities must review and document local air quality within their area by way of staged appraisals and respond accordingly, with the aim of meeting the air quality objectives by the years defined in the Regulations. Where the objectives of the Air Quality Regulations are not likely to be achieved by the objective year, an authority is required to designate an Air Quality Management Area (AQMA). For each AQMA the local authority is required to draw up an Air Quality Action Plan (AQAP) to secure improvements in air quality and show how it intends to work towards achieving air quality standards in the future.

2.2 POLICY FRAMEWORK

2.2.1 The applicable policy framework is summarised as follows:

- The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2) July 2007 (Ref. 7);
- National Planning Policy Framework 2012 (Ref. 8);
- Regional Planning Policy – The Mayor's Air Quality Strategy (Ref. 9)and the London Plan: Spatial Development Strategy for Greater London (July 2011) (Ref. 10); and
- Local Planning Policy – London Borough of Camden Core Strategy (Adoption Version 2010) (Ref. 11) and Local Development Framework Development Policies (Ref. 12).

Air Quality Strategy for England, Scotland, Wales and Northern Ireland

2.2.2 The Government's policy on air quality within the UK is set out in the AQS published in July 2007. The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in the UK. The AQS is designed to be an evolving process that is monitored and regularly reviewed. The AQS sets standards and objectives for nine main air pollutants to protect health, vegetation and ecosystems, notably NO_2, PM_{10} and $PM_{2.5}$, SO_2, O_3, C_6H_6, 1,3-butadiene (C_4H_6), CO, Pb, and PAHs.

2.2.3 Out of the pollutants included in the AQS, NO_2 and PM_{10} are of relevance to this assessment, as they will be emitted from the traffic generated by the Proposed Development. **Appendix B** presents the

limit values and objectives for these pollutants applicable where members of the public are likely to be regularly exposed for the averaging period required.

National Planning Policy Framework

2.2.4 The National Planning Policy Framework set out the Government's planning policies for England and how these are expected to be applied. It promotes sustainable development and opportunities for local communities to engage in plan making at a neighbourhood level. The core underpinning principle of the framework is the presumption in favour of sustainable development, defined as:

'Development that meets the needs of the present without compromising the ability of future generations to meet their own needs'

2.2.5 One of the 12 core planning principles in the NPPF is that planning should 'contribute to conserving and enhancing the natural environment and reducing pollution.'

2.2.6 In relation to air quality, the document states 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. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan';*
- *'The planning system should contribute to and enhance the natural and local environment by:…preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soils, air, water, or noise pollution..';*
- *'In preparing plans to meet development needs, the aim should be to minimise pollution and other adverse effects on the local and natural environment. Plans should allocate land with the least environmental or amenity values, where consistent with other policies in this Framework.'*
- *'..local planning authorities should focus on whether the development itself is an acceptable use of the land, and the impact of the use, rather than the control of processes or emissions themselves where these are subject to approval under pollution control regimes. Local planning authorities should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities'; and*
- *'Local Planning authorities should consider where otherwise unacceptable development could be made acceptable though the use of conditions or planning obligations. Planning Obligations should only be used where it is not possible to address unacceptable impacts through a planning condition.'*

The Mayor's Air Quality Strategy (Greater London Authority)

2.2.7 In 2010 the GLA/Mayor of London published a new Mayor's Air Quality Strategy for London. This strategy is focused on improving London's air quality and it explains the current air quality experienced across London and gives predictions of future levels of pollution. The sources of this pollution are outlined and a comprehensive set of policies and proposals are set out that will improve air quality in the London Boroughs.

2.2.8 The strategy sets out a framework for delivering improvements to London's air quality and includes measures aimed at reducing emissions from transport, homes, offices and new developments, promoting smarter more sustainable travel, as well as raising awareness of air quality issues.

The London Plan: Spatial Development Strategy for Greater London (July 2011)

2.2.9 Policy 7.14 of the London Plan is specific to air quality and states that development proposals should:

- *"minimise exposure to existing poor air quality and make provision to address local problems of air quality;*
- *promote sustainable design and construction in order to reduce emissions associated with the demolition and construction of buildings following best practice guidance published by the GLA and London Councils;*
- *be at least 'air quality neutral' and not lead to a further deterioration of existing poor air quality;*
- *ensure that where provision needs to be made to reduce emissions from a development, this is usually made on site; and*
- *where the development requires a detailed air quality assessment and biomass boilers are included, the assessment should forecast pollutant concentrations. Permission should only be granted if no adverse air quality impacts from the biomass boiler are identified."*

London Borough of Camden Core Strategy and Development Policies Document (Adoption Version 2010)

2.2.10 London Borough of Camden (LBC) adopted its Core Strategy (interim version) in 2010. This document forms a key part of the Local Development Framework (LDF) for the Borough and replaces the existing Unitary Development Plan's saved policies.

2.2.11 There is one policy in the Local Development Framework which specifically relates to air quality; Policy DP32 "*Air Quality and Camden's Clear Zone*" which states:

"The Council will require air quality assessments where development could potentially cause significant harm to air quality. Mitigation measures will be expected in developments that are located in areas of poor air quality.

The Council will also only grant planning permission for development in the Clear Zone region that significantly increases travel demand where it considers that appropriate measures to minimise the transport impact of development are incorporated. We will use planning conditions and legal agreements to secure Clear Zone measures to avoid, remedy or mitigate the impacts of development schemes in the Central London Area."

2.3 GUIDANCE

Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(09) (DEFRA, February 2009)

2.3.1 The Department for Environment, Food and Rural Affairs (DEFRA) (Ref 13) has published technical guidance for use by local authorities in their review and assessment work. This guidance, referred to in this document as LAQM.TG(09), has been used where appropriate in the assessment presented herein. This guidance contains a table (Box 1.4) providing examples of where the air quality objectives should/should not apply.

Local Air Quality Management Review and Assessment Policy Guidance LAQM.PG(09) (DEFRA, February 2009)

2.3.2 This Policy Guidance (Ref.14) is principally for local authorities in England to have regard to in carrying out their local air quality management under Part IV of the Environment Act 1995. The Environment Act 1995 introduced the Local Air Quality Management (LAQM) process to deal with localised 'hotspots' of poor air quality. A principle of LAQM is for local authorities to integrate air quality considerations with other policy areas, such as planning. LAQM.PG(09) states that 'any consideration of the quality of land, air or water and potential impacts arising from development, possible leading to impacts on health, is a material planning consideration where it arises from or affects land use.

London Councils Guidance for Air Quality Assessments

2.3.3 The London Councils have published guidance (Ref.15) for undertaking air quality assessments in the London Boroughs, the majority of which have declared AQMAs. The guidance sets out suggested methods for undertaking such an assessment within the London area and provides a methodology to assist in determining the impacts of a development proposal on air quality. The main message of the document is, as above, that the factor of greatest importance will generally be the difference in air quality as a result of the Proposed Development.

London Councils and Greater London Authority: The control of dust and emissions from construction and demolition – Best Practice Guidance (November 2006)

2.3.4 This guidance has been published by the Greater London Authority (Ref.16) in order to control dust and emissions where demolition and construction activities are taking place. The main aim of the guidance is to recommend the use of relevant mitigation measures to avoid potential issues in local air quality.

Institute of Air Quality Management: Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance (January 2012)

2.3.5 This document was produced to provide guidance (Ref. 17) 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 effects and to identify mitigation measures appropriate to the risks.

3 Scope & Methodology

3.1 SCOPE

3.1.1 The scope of the assessment has been determined in the following way:

- consultation with the Environmental Health Department of LBC to discuss the availability of monitoring data, the assessment methodology to be applied and obtain a copy of their latest review and assessment report;
- review of air quality data for the area surrounding the site, including data from DEFRA (Ref. 17) and the Environment Agencys (Ref.18);
- desk study to confirm the location of nearby areas that may be sensitive to changes in local air quality;
- review of the traffic flow data available on the Department of Transport (Ref. 19) which has been used as input to the air quality assessment; and
- review of scheme drawings to identify the location of future sensitive receptors to assess potential exposure of future residents of the Proposed Development.

3.2 DEFINITION OF THE SCOPE

Construction phase

Dust and PM_{10} arising from on-site activities

3.2.1 During the construction phase, activities undertaken on the application site may cause dust and particulate matter to be emitted to the atmosphere.

3.2.2 Dust comprises particles typically in the size range 1-75 micrometres (µm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials. The larger dust particles fall out of the atmosphere quickly after initial release and therefore tend to be deposited in close proximity to the source of emission. Dust therefore, is unlikely to cause long-term or widespread changes to local air quality; however, its deposition on property and cars can cause 'soiling' and discolouration. This may result in complaints of nuisance through amenity loss or perceived damage caused, which is usually temporary.

3.2.3 The smaller particles of dust (typically less than 10µm in aerodynamic diameter) are known as particulate matter (PM_{10}) and represent only a small proportion of total dust released. As these particles are at the smaller end of the size range of dust particles they remain suspended in the atmosphere for a longer period of time than the larger dust particles, and can therefore be transported by wind over a wider area. PM_{10} is small enough to be drawn into the lungs during breathing, which in sensitive members of the public could cause an adverse reaction. As a result of this potential impact on health, standards and objectives for PM_{10} are defined in the AQS and Regulations.

3.2.4 Traffic associated with the works for the construction phase of the Proposed Development will contribute to existing traffic levels on the surrounding road network. The greatest potential for impacts on air quality from traffic associated with these activities will be in the areas immediately adjacent to the principal means of site access for construction traffic. In addition, exhaust emissions from on-site plant operating during this phase will contribute to local pollutant concentrations in the vicinity of the equipment / plant.

Operational phase

Exposure of future residents to air pollution

3.2.5 At present, local authorities undertaking review and assessments of air quality are finding that, where road traffic is the dominant source of air pollution, the objectives for NO_2 and PM_{10} are likely to be the most difficult to achieve.

3.2.6 LBC has declared the entire Borough as an AQMA due to predicted exceedences of the objectives for NO_2 (annual mean) and PM_{10} (24 hour mean). This air quality assessment will therefore only consider these two pollutants.

3.3 METHODOLOGY

Construction phase

Dust and PM_{10} arising from on-site activities

3.3.1 A qualitative assessment of the potential impacts due to the generation and dispersion of dust and PM_{10} during the construction phase has been undertaken using information in guidance documents produced by the Institute of Air Quality Management (IAQM).

3.3.2 Details of the assessment procedure given in this guidance are summarised in **Appendix C** and include the consideration of potential dust and PM_{10} impacts from earthworks, general construction activities and track-out.

3.3.3 The impacts associated with the dust and particulate matter generated by on-site construction activities have been determined qualitatively by identifying and understanding:

- the size of the site, and the area of which construction activities are likely to take place;
- the construction activities associated with the Proposed Development that could generate dust and PM_{10} and their likely duration;
- the proximity and type of sensitive receptors (e.g. schools, residential properties) to the construction site boundary;
- the local meteorological conditions (wind speed, direction and rainfall) in the area in which the site is located;
- the current PM_{10} concentration in the area in which the site is located;
- the presence of vegetation surrounding the site, which might act as a buffer; and
- the potential distance which the construction traffic will travel across unpaved roads on the construction site, prior to accessing the local road network (referred to as 'trackout').

3.3.4 The following potential impacts of increased dust and PM_{10} generated during the construction phase have been considered:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to a significant increase in exposure to PM_{10}.

Exhaust emissions arising from construction traffic and plant on local air quality

3.3.5 Exhaust emissions from construction vehicles will have an impact on local air quality both on-site and adjacent to the routes used by these vehicles to access the site. As information on the number of vehicles associated with the construction phase is not available, a qualitative assessment of their impact on local air quality has been undertaken by considering:

- the level of construction traffic likely to be generated by this phase of the development;
- the number and distance of sensitive receptors in the vicinity of the site and along the likely routes to be used by construction vehicles; and
- the likely duration of the construction phase and the nature of the construction activities undertaken.

Operational phase

Exposure of future residents to air pollution

3.3.6 The Proposed Development site is located immediately adjacent to the Euston and Kings Cross railway lines. These railway lines are likely to influence the air quality within the site as it is used by diesel powered locomotives. However, the large majority of trains are powered by electricity. The LAQM.TG(09) specifically identifies a number of railway lines that are likely to influence air quality in areas adjacent to the lines and provides guidance on when these railway lines should be considered in an air quality assessment. None of the railway lines cited in LAQM.TG(09) run past the Proposed Development site. Therefore, only emissions from traffic using the surrounding road network have been considered in the assessment.

3.3.7 For the prediction of pollution concentrations at the site, the air dispersion model ADMS-Roads has been used. This model uses detailed information regarding traffic flows on the local road network and local meteorological conditions to predict pollution concentrations at specific locations selected by the user.

3.3.8 Meteorological data, such as wind speed and direction, are used by the model to determine pollutant transportation and levels of dilution by the wind. The meteorological data used in the model was obtained from the Met Office observing station at London City Airport. This station is considered to provide data representative of the conditions at the Proposed Development site. The meteorological data used for this assessment was from 2011.

3.3.9 For the assessment, two scenarios were modelled, as follows:

- 2011 “model verification”; and
- 2015 Opening Year ”future baseline”.

3.3.10 2011 is the most recent year for which monitoring data, traffic flow data and meteorological data are all available for the purposes of model verification. The opening year of the Proposed Development is anticipated to be 2015; however, to ensure a robust and conservative assessment, background concentrations and emissions factors for 2012 have been used for this assessment year.

3.3.11 A summary of the traffic data used in the assessment can be found in **Appendix D**. DEFRA’s Emission Factor Toolkit (Version 5.2c) was used to calculate the vehicle emission rates.

3.3.12 Given current uncertainties in both projected background concentrations and traffic emissions, a conservative approach was adopted in the assessment undertaken as follows:

- For the 2015 scenario, the emission rates were kept at 2012 levels to provide a worst case approach and yield conservative results;
- 2012 background pollutant concentrations were used for 2015 scenario. This will provide a conservative approach also as vehicle emissions for NO_X and PM_{10} are expected to reduce gradually in the future due to improved fuel and vehicle technology.

Model verification

3.3.13 The ADMS Roads dispersion model has been widely validated for this type of assessment and is considered to be fit for purpose.

3.3.14 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 it is therefore advisable to perform a comparison of modelled results with local monitoring data at one or more relevant locations. 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.

3.3.15 Model verification has been undertaken following the methodology specified in Annex 3 of LAQM.TG(09). Details of the verification calculations are presented in **Appendix E**.

3.3.16 A factor of **2.1** was obtained during the verification process and this factor has been applied to the modelled NO_x roads component before addition of the relevant background NO_x concentrations and conversion to annual mean NO_2 concentrations.

3.3.17 Local monitoring data are not available for concentrations of PM_{10} in close proximity to the site; as such final modelling results for this pollutant have been verified using the factor calculated for adjusting the modelled NOx roads concentrations. This approach is considered to be appropriate according to guidance given in LAQM.TG(09).

Processing of the Modelled Results

3.3.18 Following model verification, the modelled road contribution to oxides of nitrogen (NO_x) concentrations were converted to annual mean NO_2 concentrations using the methodology given in LAQM.TG(09) and the NO_x:NO_2 calculator. The calculator provides a method of calculating NO_2 from NO_x wherever NO_x emissions from road traffic are predicted using dispersion modelling.

3.3.19 For PM_{10}, the verified modelled road contribution to annual mean PM_{10} concentrations were added to the relevant background concentrations, which were then used to calculate the number of exceedences of the 24-hour mean objective for direct comparison with the relevant AQS objective, following the methodology given in LAQM.TG(09).

3.3.20 LAQM.TG(09) does not provide a method for the conversion of annual mean NO_2 concentrations to 1 hour mean NO_2 concentrations. However, research carried out in 2003 (Ref. 20), determined that exceedences of the 1 hour mean objective were unlikely to occur where annual mean concentrations were below 60µg/m^3. Further research carried out in 2008 (Ref. 21) generally supported this relationship and as a result this criterion has been adopted for the purposes of local air quality review and assessment.

3.3.21 Predicted concentrations have been compared against the current statutory standards and objectives for NO_2 and PM_{10} set out in **Appendix B**.

Background Concentrations

3.3.22 Suitable background concentration estimates have been taken from DEFRA's website (published August 2012), where estimated background concentrations of the pollutants included in the AQS have been mapped at a grid resolution of 1x1km grid squares for the whole of the UK for 2010 to 2030. It is important to note that for NO_x and PM_{10}, the background maps present both the 'total' estimated background concentrations and the individual contributions from a range of emission sources (for example, motorways, aircraft, domestic heating etc.). When detailed modelling of an individual sector is required as part of an air quality assessment, the respective contribution can be subtracted from the overall background estimate to avoid the potential for 'double-counting'. For this assessment, traffic data for all the A Roads within the study area have been included in the modelling. Therefore, contributions from this sector have been removed from the background concentrations using DEFRA's NO_2 Background Sector Tool (version 3.1 January 2012).

Emissions arising from the Onsite Energy Facilities

3.3.23 At the time of this assessment, preliminary information was available on the energy strategy for the Proposed Development. It indicated that the preferred option was the installation of photovoltaic solar panels (28 kWp) which is made up of 112 panels each with a maximum output of 250W to generate electricity and natural gas condensing boilers (approximately 450 kW_{th} in total) to supply heating and hot water to the Proposed Development.

3.3.24 The location and height of the stacks for condensing boilers is proposed above roof level (approximately 8 storeys). It will comply with guidance provided in the Chimney Height Memorandum 1981 to ensure adequate dispersal of emissions. Details of the proposed onsite energy facility will be available at detailed design stage.

3.3.25 Based on the proposal for the energy strategy, it is considered that impacts on local air quality are likely to be negligible and therefore no further assessment is required.

Significance criteria

3.3.26 The significance of impacts associated with the construction phase of the Proposed Development has been determined qualitatively using criteria provided in the IAQM guidance (**Appendix C**) and professional judgement.

3.3.27 For the exposure assessment, the flow chart method for determining the significance of the predicted air quality impacts of a Proposed Development published in the London Councils guidance has been used. A summary of the flow chart for determining significance is shown below in **Table 1**.

Table 1: Summary of the London Councils flow chart method for assessing the significance of air quality impacts

Effect of Development	Outcome
Will development interfere with or prevent implementation of measures in the AQAP	Air Quality is an overriding consideration.
Is development likely to cause a worsening of air quality or introduce new exposure into the AQMA?	Air Quality is a highly significant consideration.
Would the development contribute to air quality exceedences or lead to the designation of a new AQMA?	Air Quality is a highly significant consideration.
Is the development likely to increase emissions of or	Air Quality is a significant consideration.

Effect of Development	Outcome
increase/introduce new exposure to PM_{10}	
None of the above.	Air Quality is not a significant consideration but mitigation measures may still need to be considered.

3.3.28 In determining both the significance of exposure to air pollution and the levels of mitigation required, consideration has been given to the Air Pollution Exposure Criteria (APEC) given in **Table 2**.

Table 2: London Councils Air Pollution Exposure Criteria

APEC Level	Applicable Range Annual average NO_2	Applicable Range PM_{10}	Recommendation
A	> 5% below national objective	**Annual Mean** > 5% below national objective **24 hour mean** > 1 day less than the national objective	No air quality grounds for refusal; however mitigation of any emissions should be considered.
B	Between 5% below or above national objective	**Annual Mean** Between 5% below or above national objective **24 hour mean** Between 1 day above or below the national objective	May not be sufficient air quality grounds for refusal, however appropriate mitigation must be considered e.g., maximise distance from pollution source, proven ventilation systems, parking considerations, winter gardens, internal layout considered and internal pollutant emissions minimised.
C	> 5% above national objective	**Annual Mean** > 5% above national objective **24 hour mean** > 1 day more than the national objective	Refusal on air quality grounds should be anticipated, unless the Local Authority has a specific policy enabling such land use and ensure best endeavours to reduce exposure are incorporated. Worker exposure in commercial/industrial land uses should be considered further. Mitigation measures must be presented with air quality assessment, detailing anticipated outcomes of mitigation measures.

Sensitive Receptors

3.3.29 Sensitive receptors are locations where members of the public or sensitive ecological habitat may be exposed to pollutants emitted from the Site, including dust and particulate matter from on-site construction activities, or from the exhausts of construction site traffic and traffic the road network around the Proposed Development site, once it becomes operational. It should be noted that the sensitivity of each type of receptor (i.e. human receptors) to the different pollutants (i.e. gaseous pollutants or dust) will vary.

3.3.30 Examples of locations that are sensitive to dust and particulate matter generated by construction activities are shown in **Table 3**, which is based on a table of examples provided in the guidance published by the IAQM.

Table 3: Examples of Receptor Sensitivity to Construction Phase Impacts

Sensitivity of Area	Examples	
	Human Receptors	Ecological Receptors(1)
Very High	Very densely populated area More than 100 dwellings within 20m Local PM_{10} concentrations exceed the objective Very sensitive receptors nearby (e.g. hospitals) Construction works continuing in one area of the site for more than 1 year	European Designated site
High	Densely populated area 10-100 dwellings with 20m of the site Schools, Hi Tech & Food Processing industries nearby Local PM_{10} concentrations are within 10% of the objective Commercially sensitive horticultural land within 20m	Nationally Designated site
Medium	Suburban of edge of town area Less than 10 dwellings within 20m Local PM_{10} concentrations between 10-25% below the objective	Locally Designated site
Low	Rural area/industrial area No dwellings within 20m Local PM_{10} concentrations are below 75% of the objective Wooded area between site and receptors	No Designations

(1) Only if there are ecological habitats present that may be sensitive to an increase in dust and particulate deposition.

3.3.31 In terms of locations that are sensitive to pollutants emitted from engine exhausts, these will include places where users and occupiers of the Proposed Development will be exposed to pollution over the period of time that they are present, and therefore the most suitable AQS averaging period of the pollutant needs to be used for assessment purposes.

3.3.32 For instance, on a footpath or in the communal areas of the Proposed Development where exposure will be transient (for the duration of passage along that path or enjoying the outdoor area) comparison with a short-term standard (i.e. 15 minute mean or 1 hour mean) may be relevant. Adjacent to the accommodation component of the development, where exposure may be for longer periods, comparison with a long-term standard (such as 24 hour mean or annual mean) may be more appropriate. In general terms, long-term standards are lower than short-term standards owing to the chronic health effects associated with exposure to low level pollution for longer periods of time. LAQM.TG(09) provides examples of the locations where the air quality objectives should/should not apply.

4 Existing Conditions

4.1 LOCAL EMISSION SOURCES

4.1.1 The Proposed Development site is located in an area where air quality is mainly influenced by emissions from road transport. Chalk Farm Road passes close to the site and traffic emissions from this road are likely to influence the air quality at the site. There are also some minor roads in the vicinity of the site including Crogsland Road and Belmont Street. These sources will be accounted for in background pollutant concentrations in the area used for this assessment.

4.1.2 Emissions from diesel powered trains using the railway lines to the south of the Proposed Development site are also likely to have some level of effect on air quality at the site. However, the large majority of trains using the railway lines are electric and emissions from diesel powered trains are unlikely to significantly affect air quality at the Proposed Development site. Therefore, emissions from trains will be accounted as part of the background concentrations in the assessment.

4.1.3 There are no industrial pollution sources in the immediate vicinity of the site that will influence the local air quality.

4.2 AIR QUALITY MANAGEMENT AREA

4.2.1 The Proposed Development site is located within the LBC's AQMA.

4.3 BACKGROUND AIR QUALITY DATA

4.3.1 **Table 4** shows the estimated background concentrations of NO_2 and PM_{10} that were used in the assessment. The grid squares shown cover the Proposed Development site.

Table 4: 2012 Estimated background concentrations used in the assessment (µg/m^3)

Grid Square	Pollutant		
	NO_2	NO_x	PM_{10}
528500, 184500	34.6	61.9	20.7

4.3.2 The table above shows that estimated background concentrations of NO_2 are below the objective limit of 40µg/m^3 to be achieved by 2005 and thereafter. Estimated background concentrations of PM_{10} meet the objective limit of 40µg/m^3 to be achieved by 2004 and thereafter.

4.4 LOCAL AIR QUALITY MONITORING DATA

4.4.1 Concentrations of NO_2 and PM_{10} measured in the vicinity of the Proposed Development site by LBC are provided in **Table 5.**

Table 5: LBC Monitoring Data (µg/m^3)-NO_2 Diffusion Tubes

Site & Description	2009	2010	2011
Camden Road (roadside)	73.0	84.0	72.2
Kentish Town (roadside)	68.3	74.0	57.2

4.4.2 The results show the NO_2 concentrations exceed the objective (40µg/m^3) at these roadside monitoring locations.

4.5 SENSITIVE RECEPTORS

4.5.1 To complete the exposure assessment, pollution concentrations were predicted at a number of locations across the Proposed Development site and at different heights across the building storeys. The locations of the assessment receptors are shown on Figure 1 and details are provided in **Table 6**.

Table 6: Receptor Locations Used in the Assessment

Receptor No.	Description	OS Grid Coordinantes (X & Y)		Indicative Height above Ground Level (m)
1	Ground to 6th Floor	528331	184318	1.8, 6.3, 9.3, 12.3, 15.3,18.3, 21.3
2	Ground to 6th Floor	528318	184322	1.8, 6.3, 9.3, 12.3, 15.3,18.3, 21.3
3	Ground to 3rd Floor	528302	184321	1.8, 6.3, 9.3, 12.3
4	Ground to 2nd Floor	528285	184318	1.8, 6.3, 9.3
5	Ground to 7th Floor	528345	184293	1.8, 6.3, 9.3, 12.3, 15.3,18.3, 21.3, 24.3
6	Ground to 7th Floor	528346	184280	1.8, 6.3, 9.3, 12.3, 15.3,18.3, 21.3, 24.3
7	Ground to 7th Floor	528321	184287	1.8, 6.3, 9.3, 12.3, 15.3,18.3, 21.3, 24.3
8	Ground Floor	528308	184289	1.8
9	Ground to 3rd Floor	528292	184293	1.8, 6.3, 9.3, 12.3
10	Ground to 2nd Floor	528274	184300	1.8, 6.3, 9.3
11	Ground to 2nd Floor	528278	184308	1.8, 6.3, 9.3

5 Assessment of Impacts, Mitigation & Residual Effects

5.1 IMPACT

Construction phase

Dust and PM_{10} arising from on-site activities

5.1.1 The main sources of dust and PM_{10} during construction activities include:

- haulage routes, vehicles and construction traffic;
- materials handling, storage, stockpiling, spillage and disposal;
- exhaust emissions from site plant, especially when used at the extremes of their capacity and during mechanical breakdown;
- site preparation and restoration after completion;
- demolition;
- construction and fabrication processes; and
- internal and external finishing and refurbishment.

5.1.2 The majority of the releases are likely to occur during the 'working-week'. However, for some potential release sources, e.g. exposed soil produced from significant earthwork activities, in the absence of dust control mitigation measures, dust generation has the potential to occur 24 hours per day over the period during which such activities are to take place.

5.1.3 The Proposed Development site is surrounded by commercial, recreational and residential land use to the north, west and south of the site. The closest sensitive receptors are approximately 20m to the north-west and south of the site boundary. Local background PM_{10} concentrations (21µg/m^3) are approximately 50% of the objective. Overall, the site is considered to be an in area of high sensitivity to dust and PM_{10} emissions during the construction phase. There are no designated ecological sites in the vicinity of the Proposed Development site, and therefore consideration of construction phase effects on ecological receptors is not required.

5.1.4 The proposal includes demolition of the existing six storey building floor by floor. It is understood that new buildings would all be made of prefabricated material, which would therefore reduce the potential for dust generation. For this assessment, an indicative construction period of 24 months was assumed.

5.1.5 The meteorological data used in the dispersion modelling show that the prevailing wind directions in the area are from the west southwest and southwest. Sensitive receptors located to the northeast of the Proposed Development site are therefore most likely to be affected by dust generated by the construction activities.

5.1.6 Winds from the southwest sector (WSW, SW and SSW) occur for approximately 40% of all wind speeds. With respect to dust emissions, moderate to strong wind speeds (e.g. above 5 m/s) tend to generate dust emissions through entrainment. On the basis of the London City Airport meteorological data, wind speeds of this magnitude occur for around 24% of the time for all wind directions; however, for the large majority of wind directions, moderate to strong winds occur for less than 2% of the time. Moderate to strong winds from the southwest sector occur most frequently at approximately 15% of the time.

5.1.7 The IAQM assessment methodology considers the sources of dust generation in four categories: demolition; earthworks; construction and track-out. The generation of dust during these phases of

works are classed as large, medium or small. Criteria to determine which dust emission class the site falls into are detailed in **Appendix C**.

Demolition

5.1.8 The total volume of the building to be demolished is likely to be below 20,000m^3 in size, therefore the dust emission class for the demolition works is considered to be small.

Earthworks

5.1.9 The total area of the site is approximately greater than 2,500 m^2 in size, which is within the IAQM threshold for medium sites (2,500m^2 to 10,000 m^2), the soil type is assumed to be 'potentially dusty' and the total material moved is likely to be between 20,000 tonnes and 100,000 tonnes, therefore the dust emission class for the earthworks phase is considered to be medium.

Construction

5.1.10 The total volume of buildings to be constructed on site is likely to be between 25,000m^3 and 100,000m^3. Based on the IAQM guidance threshold, the dust emission class for the construction phase is therefore considered to be medium.

Trackout

5.1.11 No information could be provided regarding the likely daily HGV trips during the construction phase. Therefore it has been assumed that the number of HGV will be below 25 vehicles per day during the peak construction period, along moderately dusty surface material. Therefore, in the absence of definitive information, it is assumed that the dust emission class for trackout will be medium.

5.1.12 The main access points for construction traffic to enter and leave the site are via the Chalk Farm Road. The key route for construction traffic is likely to be from the same roads. Along this road, sensitive receptors are located at a distance of approximately 20m from the roadside.

5.1.13 According to the IAQM assessment procedure summarised in **Appendix C,** a low sensitivity area, the above dust emission classes, professional judgement and available information on the construction phase, the Proposed Development is considered to be a **Medium Risk Site** overall for earthworks, construction and trackout. **Table 7** provides a summary of the risk for each of the four sources of construction dust and PM_{10}.

Table 7: Summary Risk Effects for Each Construction Category

Construction Categories	Details of Each Activity	Potential Dust Emission Class	Distance to the nearest Receptors	Dust Risk Category
Demolition	Total building volume <20,000m^3	Small	<20m	Medium Risk
Earthworks	Total site area <2,500m^2	Medium	<20m	High Risk
Construction Activities	Total building volume between 25,000 and 100,000m^3	Medium	<20m	High Risk
Trackout	No data – assumed 25-100 HDV trips per day along moderately dusty surface material	Small	<20m	Medium Risk
Summary	**Medium to High Risk Site**			

5.1.14 Taking into account all of the above, the overall sensitivity of the surrounding area in terms of human receptors is high, and the overall magnitude of change prior to mitigation is considered to be medium to high. Therefore, there is likely to be a direct, temporary, medium-term effect on nearby residential properties of moderate to slight adverse significance prior to the implementation of mitigation measures (**Table 8**).

Table 8: Summary Construction Categories Significance Table Prior to Mitigation

Construction Categories	Dust Soiling and PM_{10} Effects (nuisance)	PM_{10} Effects (compliance)
Demolition	Moderate Adverse	Slight Adverse
Earthworks	Moderate Adverse	Slight Adverse
Construction Activities	Moderate Adverse	Slight Adverse
Trackout	Moderate Adverse	Slight Adverse
Overall Significance	**Moderate to Slight Adverse**	

Release of emissions to air from construction traffic

5.1.15 The impact on air quality from traffic associated with this phase of the Proposed Development will be in the areas immediately adjacent to the principal means of site access for construction traffic. Based on the current local air quality in these areas and the likely low volume of construction traffic, the impacts are therefore considered to be of **slight adverse** significance.

Operational phase

5.1.16 Full results of the dispersion modelling are presented in **Appendix F** and a summary is provided below.

Annual mean NO_2 concentrations

5.1.17 The objective for annual mean NO_2 concentrations is 40µg/m^3 to be achieved by the end of 2005 and thereafter. The results of the assessment show that in 2015 annual mean NO_2 concentrations exceed the objective at the location of the proposed residential receptors located on floors 1 and 2 facing Chalk Farm Road. The maximum predicted concentration (53.9µg/m^3) was identified between 1st and 3rd floors at receptors 1 and 2.

5.1.18 These results agree with the conclusions of the review and assessment work undertaken by LBC, which concluded that exceedences of the objective for this pollutant are occurring in the Borough in close proximity to busy roads. The highest predicted concentrations occur at the ground level of the façades of the proposed new building facing Chalk Farm Road. It should be noted that the objective would not apply at the building facades on the ground floor as this will be used for retail use and therefore members of the public will not be present over the annual mean averaging period of the objective.

5.1.19 According to the London Councils' exposure criteria, the Proposed Development is APEC C for annual mean NO_2 concentrations at the residential receptors areas between 1st and 3rd floors facing Chalk Farm Road i.e. appropriate mitigation must be presented in the air quality assessment

detailing anticipated outcomes of mitigation measures. For the rest of the proposed residential dwellings, APEC A will apply i.e. no air quality grounds for refusal.

Hourly mean NO_2 concentrations

5.1.20 At all of the proposed receptor locations, the annual mean NO_2 concentrations predicted by the model are well below 60µg/m^3. It can therefore be assumed that exceedences of the hourly mean NO_2 objective of 200µg/m^3 are unlikely to occur at the site.

Annual mean PM_{10} concentrations

5.1.21 The objective for annual mean PM_{10} concentrations is a concentration of 40µg/m^3 to be achieved by the end of 2004 and thereafter. The results of the assessment show that concentrations at all of the receptors considered are predicted to meet the objective. The highest predicted concentration on the Proposed Development site is 23.7µg/m^3 at the ground floor facade (receptor number 1 and 2). Therefore, based on the London Council exposure criteria, all receptor locations considered are classified as APEC Level A for the annual mean PM_{10} concentrations i.e. no air quality grounds for refusal.

24 hour mean PM_{10} concentrations

5.1.22 The objective for 24-hour mean PM_{10} concentrations is 50 µg/m^3 to be exceeded no more than 35 times a year by the end of 2004 and thereafter. The results of the dispersion modelling show that the number of days of exceedences of this level is a maximum of 10 days, which is below the objective. Therefore, all receptor locations considered are classified as APEC Level A for the number of days above the 24 hour mean PM_{10} concentrations i.e. no air quality grounds for refusal.

5.2 MITIGATION

Construction phase

5.2.1 A number of mitigation methods should be implemented, as appropriate including:

- erecting solid barriers to site boundary;
- vehicles carrying loose aggregate and workings should be sheeted at all times;
- implementation of design controls for construction equipment and vehicles and use of appropriately designed vehicles for materials handling;
- completed earthworks should be covered or vegetated as soon as is practicable;
- regular inspection and, if necessary, cleaning of local highways and site boundaries to check for dust deposits (and removal if necessary);
- minimising surface areas of stockpiles (subject to health and safety and visual constraints regarding slope gradients and visual intrusion) to reduce area of surfaces exposed to wind pick-up;
- where appropriate, windbreak netting/screening should be positioned around material stockpiles and vehicle loading/unloading areas, as well as exposed excavation and material handling operations, to provide a physical barrier between the Site and the surroundings;

- where practicable, stockpiles of soils and materials should be located as far as possible from sensitive properties, taking account of prevailing wind directions and seasonal variations in the prevailing wind;
- during dry or windy weather, material stockpiles and exposed surfaces should be dampened down using a water spray to minimise the potential for wind pick-up;
- use of dust-suppressed tools for all operations;
- ensuring that all construction plant and equipment is maintained in good working order and not left running when not in use; and
- Restricting on-site movements to well within site and not near the perimeter, if possible.

5.2.2 Detailed mitigation measures to control construction traffic should be discussed with LBC to establish the most suitable access and haul routes for the site traffic. The most effective mitigation will be achieved by ensuring that construction traffic does not pass along sensitive roads (residential roads, congested roads, via unsuitable junctions, etc.) where possible, and that vehicles are kept clean (through the use of wheel washers, etc.) and sheeted when on public highways. Timing of large-scale vehicle movements to avoid peak hours on the local road network will also be beneficial. It is recommended that liaison with the local authority be maintained throughout the construction process.

Operational phase

5.2.3 Based on the results presented in this assessment, it is recommended that the residential areas between 1st and 3th floors of the Proposed Development facing Chalk Farm Road are mechanically ventilated using a ventilation system that has the appropriate filters fitted to remove concentrations of NO_X/NO_2 from the incoming air. For the remaining of the residential dwellings, it is recommended that air inlets are located as far away as practicable from Chalk Farm Road. Details of the ventilation systems will be available at detailed design stage.

5.3 RESIDUAL EFFECTS

Construction phase

5.3.1 The overall significance of the effects arising from the construction phase of the Proposed Development following the appropriate use of mitigation measures and good site practice is shown in the **Table 9** below.

Table 9: Construction Phase Summary Significance Table with Mitigation

Source	Dust soiling effects	PM_{10} effects
Demolition	Slight Adverse	Negligible
Earthworks	Slight Adverse	Negligible
Construction	Slight Adverse	Negligible
Trackout	Slight Adverse	Negligible
Overall Significance	**Slight Adverse to Negligible**	

5.3.2 With appropriate use of mitigation measures and good site management the overall residual effects of dust and PM_{10} generation and deposition are considered to be **slight adverse** to **negligible**.

5.3.3 Construction traffic is likely to have some level of impact on local air quality, however the residual effects of emissions from these vehicles are considered to be of **negligible** significance.

Operational phase

5.3.4 With a suitable mechanical ventilation system including filtration for NO_x/NO_2 in place with a proven efficiency of pollutant removal, future residents/users of the Proposed Development will not be exposed to annual mean NO_2 concentrations that exceed the AQS objectives.

6 Conclusions

6.1.1 A qualitative assessment of the potential impacts on local air quality from construction activities on the Proposed Development has been carried out based on the available information on this phase of the development and the IAQM construction assessment procedure. This showed that the Proposed Development is considered to be a **Medium Risk Site** for demolition and trackout and **High Risk Site** for earthworks and general construction activities. Providing good site practice and the implementation of the mitigation measures described in this report, the impact of dust and PM_{10} releases will be reduced. The overall residual effects of the construction phase on air quality are considered to be **slight adverse** to **negligible**.

6.1.2 A qualitative assessment of the potential impacts of emissions from vehicles and plant associated with the construction phase has also been carried out. The overall residual effects of these emissions are considered to be **negligible** providing that suitable mitigation measures are in place.

6.1.3 The results of the assessment showed that there were no exceedences of the AQS objectives for PM_{10} concentrations on the Proposed Development. However, predicted annual mean NO_2 concentrations exceed the objective at the proposed residential receptors located between 1st and 3rd floors facing Chalk Farm Road. The highest predicted concentrations occur at the ground level of the façades of the new building facing Chalk Farm Road. However, it should be noted that the objective would not apply at the building facades on the ground floor as this will be used for retail purposes and therefore members of the public will not be present over the averaging period of the objective (annual mean).

6.1.4 Using the London Council's exposure criteria, the Proposed Development is APEC C for annual mean NO_2 concentrations at the residential receptors floor 1 and 3 facing Chalk Farm Road. For the rest of the proposed residential dwellings, APEC A will apply i.e. no air quality grounds for refusal.

6.1.5 For PM_{10} concentrations, APEC A will apply at all the proposed residential dwellings i.e. no air quality grounds for refusal; however mitigation of any emissions should be considered.

6.1.6 According to the London Councils' significance criteria, air quality is a highly significant consideration in the planning process as the Proposed Development is introducing new exposure onto this site.

6.1.7 Based on the results presented in this assessment, it is recommended that the residential areas between 1st and 3th floors of the Proposed Development facing Chalk Farm Road are mechanically ventilated using a ventilation system that has the appropriate filters fitted to remove concentrations of NO_X/NO_2 from the incoming air.

6.1.8 With the recommended mitigation measures in place, it is considered that the Proposed Development will comply with local planning policy for air quality.

References

[1] Air Quality Directive 2008/50/EC.

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[4] The Air Quality Standards Regulations 2010- Statutory Instrument 2010 No. 1001.

[5] The Environmental Protection Act 1990.

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[10] Mayor of London (July 2011) The London Plan: Spatial Development Strategy for Greater London.

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[15] London Council Guidance for Air Quality Assessments, 2010.

[16] London Councils and Greater London Authority (November 2006), The control of dust and emissions from construction and demolition – Best Practice Guidance.

[17] Institute of Air Quality Management (January 2012) Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance.

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[19] Environment Agency's 'What's in your backyard?' pollution register. Available at: http:// environment-agency.gov.uk.

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[21] D Laxen and B Marner (July 2003) Analysis of the relationship between 1-hour and annual mean nitrogen dioxide at UK roadside and kerbside monitoring sites.

[22] A Cook (2008) Analysis of the relationship between annual mean nitrogen dioxide concentration and exceedences of the 1-hour mean AQS Objective.

Figure & Appendices

Figure 1 Location of Assessment Receptors

Appendix A – Glossary of Terms

Term	Definition
AADF/T Annual Average Daily Flow/Total	A daily total traffic flow (24 hrs.), expressed as a mean daily flow across all 365 days of the year.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedences within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. This period avoids splitting winter season between 2 years, which is useful for pollutants that have higher concentrations during the winter months.
AQMA	Air Quality Management Area.
DEFRA	Department for Environment, Food and Rural Affairs.
DfT	Department for Transport.
Exceedence	A period of time where the concentrations of a pollutant is greater than, or equal to, the appropriate air quality standard.
HDV/HGV	Heavy Duty Vehicle/Heavy Goods Vehicle.
LAQM	Local Air Quality Management.
Model adjustment	Following model verification, the process by which modelled results are amended. This corrects for systematic error.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
Road link	A length of road which is considered to have the same flow of traffic along it. Usually, a link is the road from one junction to the next.
$\mu g/m^3$	A measure of concentration in terms of mass per unit volume. A concentration of 1$\mu g/m^3$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.

Appendix B – Key Air Quality Standards & Objectives

Air Quality Objectives currently included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the purpose of Local Air Quality Management (LAQM)						
Pollutant	**Applies to**	**Standard**		**Objective**		**2008/50/EC**
		Concentration	***Measured as***	***Annual exceedences allowed***	***Target date***	
Nitrogen dioxide (NO_2)	All UK	200µg/m^3	1 hour mean	18	31.12.2005	As objective. target: 01.01.2010
	All UK	40µg/m^3	annual mean		31.12.2005	As standard. target: 01.01.2010
Particulate Matter (PM_{10}) (gravimetric)[1]	All UK	40µg/m^3	annual mean		31.12.2004	As standard. target: 01.01.2005
	All UK	50µg/m^3	24 hour mean	35	31.12.2004	As objective. target: 01.01.2005

Appendix C – Summary of IAQM Construction Phase Impact Assessment Procedure

Step 1 – Screening the need for a Detailed Assessment

An assessment will normally be required where there are sensitive receptors within 350m of the site boundary and/or within 100m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s). Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is "negligible".

Step 2 – Assess the Risk of Dust Effects Arising

6.1.9 The tables below show the risk categories for the potential dust and PM_{10} impacts from demolition; earthworks; general construction activities and trackout. They assume that no mitigation measures are applied and are dependent on the available information on the construction phase and professional judgement. The risk categories should be used as guidance for determining the level of mitigation that must be applied.

1) Demolition

The following are examples of the potential dust emission classes (note that not all the criteria need to be met for a particular class). Other criteria may be used if justified in the assessment:

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

The potential dust emission class determined above should be used in the matrix in Table A to determine the demolition risk category with no mitigation applied (high, low or medium risk) based on the distance to the nearest receptors. This varies depending on the different effects under consideration.

Table A: Risk Category from Demolition Activities

Distance to nearest receptor (m) [(a)]		Dust Emission Class		
Dust Soiling and PM_{10}	**Ecological**	**Large**	**Medium**	**Small**
<20	-	High Risk Site	High Risk Site	Medium Risk Site
20 – 100	<20	High Risk Site	Medium Risk Site	Low Risk Site
100 – 200	20 - 40	Medium Risk Site	Low Risk Site	Low Risk Site
200 - 350	40 - 100	Medium Risk Site	Low Risk Site	Negligible

(a) Distance from dust emission source. Where this is not known then the distance should be taken from the site boundary. The risk is based on the distance to the nearest receptor.

2) Earthworks and Construction Activities

The following are examples of the potential dust emission classes (note that not all the criteria need to be met for a particular class). Other criteria may be used if justified in the assessment:

Earthworks

- Large: Total site area >10 000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100 000 tonnes;
- Medium: Total site area 2 500 m^2 – 10 000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m - 8 m in height, total material moved 20 000 tonnes – 100 000 tonnes; and,
- Small: Total site area <2 500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10 000 tonnes, earthworks during wetter months.

Construction Activities

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

The potential dust emission class determined above should be used in the matrix in Table B to determine the earthworks and construction activities risk categories with no mitigation applied (high, low or medium risk) based on the distance to the nearest receptors.

Table B: Risk Category from Earthworks & Construction Activities

Distance to nearest receptor (m) [(a)]		Dust Emission Class		
Dust Soiling and PM_{10}	**Ecological**	**Large**	**Medium**	**Small**
<20	-	High Risk Site	High Risk Site	Medium Risk Site
20 – 50	-	High Risk Site	Medium Risk Site	Low Risk Site
50 – 100	<20	Medium Risk Site	Medium Risk Site	Low Risk Site
100 – 200	20 - 40	Medium Risk Site	Low Risk Site	Negligible
200 - 350	40 - 100	Low Risk Site	Low Risk Site	Negligible

(a) Distance from dust emission source. Where this is not known then the distance should be taken from the site boundary. The risk is based on the distance to the nearest receptor.

3) Trackout

Factors which determine the magnitude class are vehicle size, vehicle speed, vehicle numbers, geology and duration. As with all other potential sources, professional judgement must be applied when classifying trackout into one of the magnitude categories. Only receptors within 100 m of the route(s) used by vehicles on the public highway and up to 500 m from the site entrance(s) are considered to be at risk and the risk classification distances shown below reflect this.

The following are examples of the potential dust emission classes (note that not all the criteria need to be met for a particular class); other criteria may be used if justified in the assessment:

- Large: >100 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;
- Medium: 25-100 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100m; and
- Small / Medium: <25 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50m.

These numbers are for vehicles that leave the site after moving over unpaved ground, where they will accumulate mud and dirt that can be tracked out onto the public highway.

These potential dust emission classes should be used in Table C to determine the trackout risk category with no mitigation applied.

Table C: Risk Category from Trackout

Distance to nearest receptor (m) [(a)]		Dust Emission Class		
Dust Soiling and PM_{10}	**Ecological**	**Large**	**Medium**	**Small**
<20	-	High Risk Site	Medium Risk Site	Medium Risk Site
20 – 50	<20	Medium Risk Site	Medium Risk Site	Low Risk Site
50 – 100	20 – 100	Low Risk Site	Low Risk Site	Negligible
(a) For the trackout the distance is from the roads used by construction traffic.				

There is an extra dimension to the assessment of trackout, as the distance over which it might occur depends on the site. As general guidance, significant trackout may occur up to 500m from large sites, 200m from medium sites and 50m from small sites, as measured from the site exit. These distances assume no site-specific mitigation.

The 'distance to receptor' in Table C relates to the distance from the road where mud may be deposited. Therefore in determining the risk from trackout, both distances need to be taken into account.

Step 3 – Identify the need for Site Specific Mitigation

Having determined the risk categories for each of the four activities it is possible to determine the site-specific measures to be adopted. These measures will be related to whether the site is a low, medium or high risk site.

Step 4 – Define Effects and their Significance

The significance is best determined using professional judgement, taking account of the factors that define the sensitivity of the surrounding area and the overall pattern of potential risks. The sensitivity of the area needs to be defined.

The sensitivity of the area surrounding the construction / demolition site is combined with the risk of the site giving rise to dust effects (from Step 2) to define the significance of the effects for each of the four activities (demolition, earthworks, construction and trackout).

The preference in the IAQM Guidance is to only assign significance to the impact with mitigation. The residual effects for most sites will be negligible as shown in Table D below.

Table D: Significance of Effects of Each Activity with Mitigation

Sensitivity of surrounding area	Risk of site giving rise of dust effects		
	High	Medium	Low
Very High	Slight adverse	Slight adverse	Negligible
High	Negligible	Negligible	Negligible
Medium	Negligible	Negligible	Negligible
Low	Negligible	Negligible	Negligible

6.1.10 When assessment of the significance of the effects without mitigation is required, the recommended significance criteria in Table E should be used.

Table E: Significance of Effects of Each Activity without Mitigation

Sensitivity of surrounding area	Risk of site giving rise of dust effects		
	High	Medium	Low
Very High	Substantial adverse	Moderate adverse	Moderate adverse
High	Moderate adverse	Moderate adverse	Slight adverse
Medium	Moderate adverse	Slight adverse	Negligible
Low	Slight adverse	Negligible	Negligible

The final step is to determine the overall significance of the effects arising from the construction phase of a Proposed Development. This will be based on professional judgement but should take account of the significance of the effects for each of the four activities.

Appendix D – Traffic Data Used in the Assessment

2011 Model Verification

ID	Road Link	Speed (kph)	Annual Average Traffic Flow (Total Vehicles)	Percentage Heavy Duty Vehicles (%)
1	Kentish Town	25	20593	9.7
2	Camden Road Central	25	31581	6.6
3	Camden Road East	38	27574	7.4
4	Camden Road West	38	21108	12.7
5	Royal College North	38	6977	7.5
6	Royal College South	38	11155	4.2
7	Camden Street	38	17914	10.9

Source: Department for Transport

2012 Opening Year

ID	Road Link	Speed (kph)	Annual Average Traffic Flow (vehicles per day)	Percentage Heavy Duty Vehicles (%)
1	Chalk Farm	30	16047	7.1

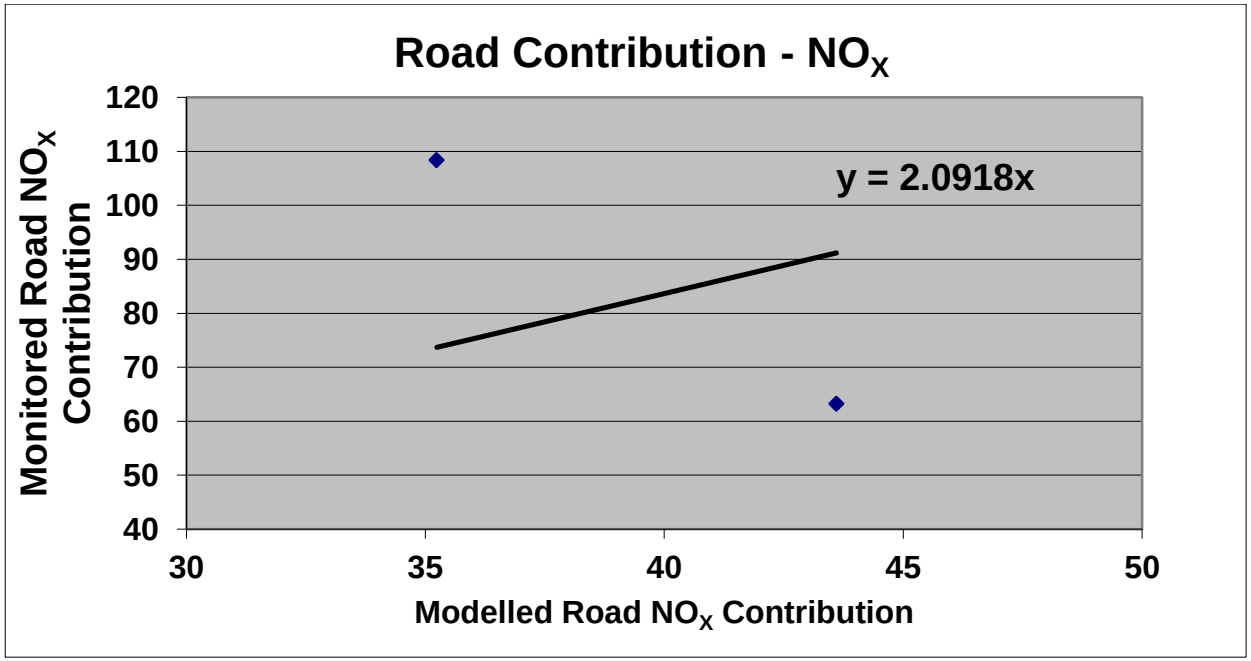
Source: Department for Transport

When relevant roads were divided into different links in order to take into account vehicle speeds 50m from junctions and roundabouts were selected using guidance provided in LAQM TG(09).

Appendix E – Model Verification Calculations

NO_x Verification

Site (ID)	Monitored Total NO_2	Background NO_2	Background NOx	Monitored Road NO_x Contribution (total - background)	Monitored Road Contribution NOx (total - background)	Modelled Road Contribution NOx (excludes background)
Camden Road (CA23)	72.2	36.3	65.8	35.9	108.37	35.24
Kentish Town Road (CA16)	57.2	33.6	59.0	23.6	63.2	43.60



Site (ID)	Ratio of monitored NOx road contribution /modelled road contribution NOx	Adjustment factor for modelled road contribution	Adjusted modelled road contribution NOx	Modelled Total NO2	Monitored Total NO2	% Difference
Camden Road (CA23)	3.1	2.1	73.71	62.63	72.21	-13.3
Kentish Town Road (CA16)	1.4		91.21	65.41	57.19	14.4

Appendix F – Sensitive Receptor Locations

ID	Description	Annual Mean Concentrations NO_2 ($\mu g/m^3$)	Annual Mean Concentrations PM_{10} ($\mu g/m^3$)	Number of Days of Exceedence of the Daily Mean PM_{10}
1	Ground Floor	53.68	23.68	9
	1st Floor	51.82	23.35	9
	2nd Floor	51.31	23.26	9
	3rd Floor	51.00	23.21	9
	4th Floor	35.37	20.84	5
	5th Floor	35.14	20.81	4
	6th Floor	35.00	20.79	4
2	Ground Floor	53.92	23.72	10
	1st Floor	51.91	23.37	9
	2nd Floor	51.37	23.27	9
	3rd Floor	51.05	23.22	9
	4th Floor	35.36	20.84	5
	5th Floor	35.14	20.81	4
	6th Floor	35.00	20.79	4
3	Ground Floor	41.26	21.67	6
	1st Floor	37.84	21.18	5
	2nd Floor	36.45	20.98	5
	3rd Floor	35.75	20.89	5
4	Ground Floor	39.06	21.35	5
	1st Floor	37.44	21.12	5
	2nd Floor	36.43	20.98	5
5	Ground Floor	38.49	21.27	5
	1st Floor	37.28	21.10	5
	2nd Floor	36.42	20.98	5
	3rd Floor	35.80	20.90	5
	4th Floor	35.42	20.84	5
	5th Floor	35.18	20.81	4
	6th Floor	35.02	20.79	4
	7th Floor	34.92	20.78	4
6	Ground Floor	37.43	21.12	5

ID	Description	Annual Mean Concentrations NO_2 ($\mu g/m^3$)	Annual Mean Concentrations PM_{10} ($\mu g/m^3$)	Number of Days of Exceedence of the Daily Mean PM_{10}
	1st Floor	36.80	21.03	5
	2nd Floor	36.25	20.96	5
	3rd Floor	35.78	20.89	5
	4th Floor	35.43	20.85	5
	5th Floor	35.20	20.81	4
	6th Floor	35.04	20.79	4
	7th Floor	34.93	20.78	4
7	Ground Floor	37.32	21.10	5
	1st Floor	36.73	21.02	5
	2nd Floor	36.22	20.95	5
	3rd Floor	35.77	20.89	5
	4th Floor	35.43	20.85	5
	5th Floor	35.20	20.81	4
	6th Floor	35.04	20.79	4
	7th Floor	34.94	20.78	4
8	Ground Floor	37.22	21.09	5
9	Ground Floor	37.15	21.08	5
	1st Floor	36.63	21.01	5
	2nd Floor	36.17	20.95	5
	3rd Floor	35.75	20.89	5
10	Ground Floor	37.11	21.08	5
	1st Floor	36.61	21.01	5
	2nd Floor	36.16	20.94	5
11	Ground Floor	37.71	21.16	5
	1st Floor	36.93	21.05	5
	2nd Floor	36.29	20.96	5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