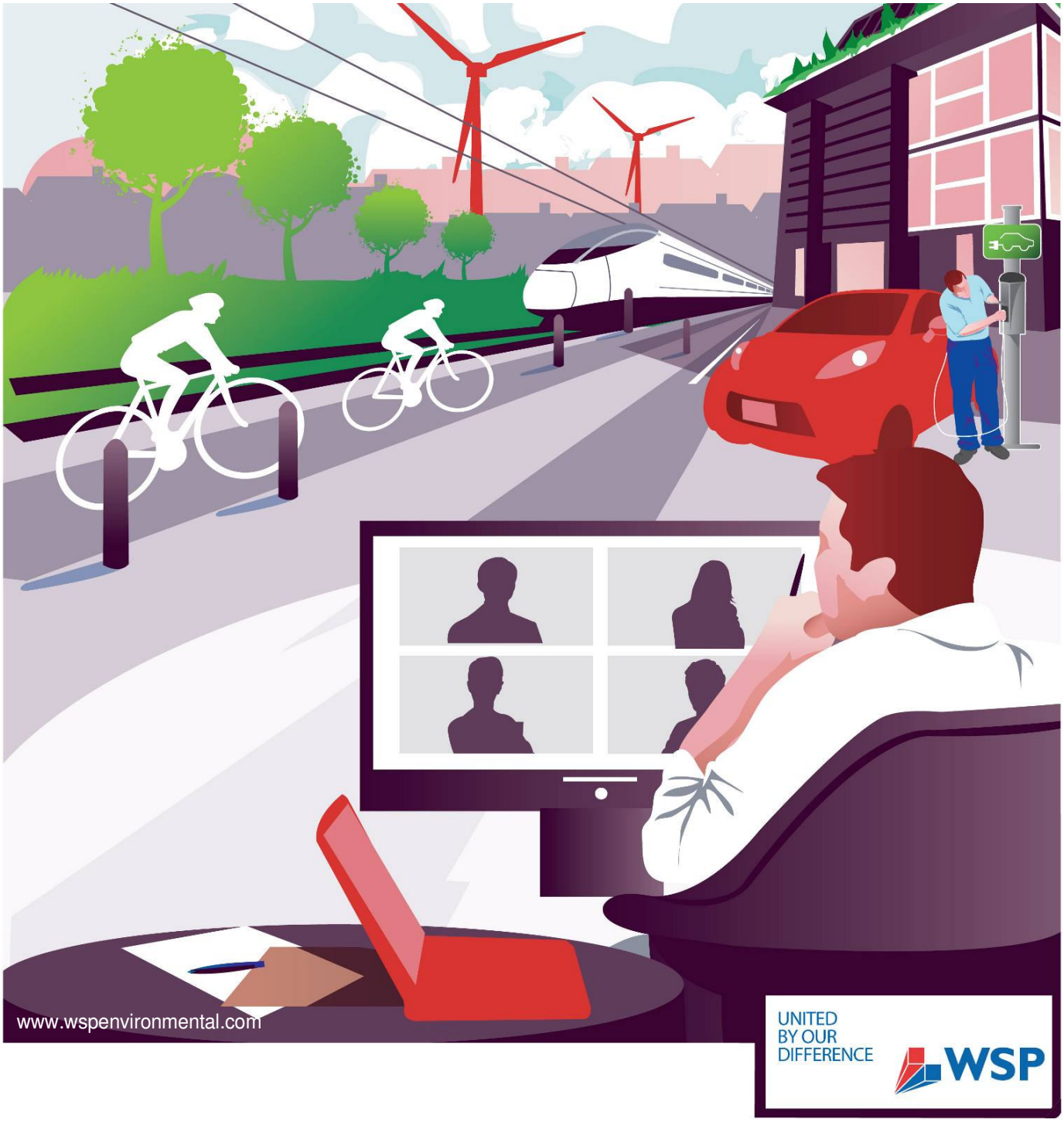

St Pancras Way - Air Quality Assessment

UNITE Group plc. and Travis Perkins plc.

March 2011

QUALITY MANAGEMENT

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Remarks	Draft			
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Prepared by	Chris Brownlie			
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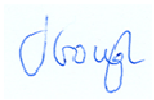
Signature				
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1 INTRODUCTION

1.1 PROJECT BACKGROUND

1.1.1 WSP Environmental Ltd (WSPE) has been commissioned to carry out an assessment of the potential air quality impacts arising from the proposed redevelopment at 11-13 St Pancras Way for nine storeys of student residential accommodation above a new Travis Perkins builders' yard and store. The proposed redevelopment will be car free.

1.1.2 As the proposed redevelopment will not generate any traffic, this assessment focuses only on the exposure of future occupants of the development to air pollution. In addition, this report discusses the potential air quality impacts that may arise during the construction phase and describes the mitigation measures that should be employed to minimise these.

2 RELEVANT LEGISLATION AND GUIDANCE

2.1 AIR QUALITY STRATEGY FOR ENGLAND, SCOTLAND, WALES & NORTHERN IRELAND

2.1.1 The Government's policy on air quality within the UK is set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS) published in July 2007[1]. 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.

2.1.2 The AQS sets standards and objectives for nine main air pollutants to protect health, vegetation and ecosystems. These are benzene (C_6H_6), 1,3 butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2), ozone (O_3), and polycyclic aromatic hydrocarbons (PAHs).

2.1.3 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.

2.1.4 The air quality objectives are medium-term policy based targets set by the Government which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e. a limited number of permitted exceedences of the standard over a given period.

2.1.5 For some pollutants, (e.g. NO_2), there is both a long-term (annual mean) standard and a short-term standard. In the case of NO_2, the short-term standard is for a 1-hour averaging period, whereas for PM_{10} it is for a 24-hour averaging period. These periods reflect the varying impacts 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.

2.1.6 The AQS published in 2007 replaces the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (January 2000) and Addendum (February 2003). The majority of objectives set out in the previous version of the AQS have been retained; however, the provisional objectives previously proposed for PM_{10} have been replaced in England, Wales and Northern Ireland with a new framework for considering the effects of a finer group of particles known as '$PM_{2.5}$'. The introduction of this framework is based on increasing evidence that this size of particles can be more closely associated with observed adverse health affects than PM_{10}. For $PM_{2.5}$ the objectives will take the form of a limit value ('backstop objective') and an 'exposure reduction' target. Although a target for $PM_{2.5}$ is included in the AQS, these objectives have not yet been incorporated into the Regulations. Consequently there is currently no requirement for local authorities to assess this pollutant as part of their statutory obligations.

2.1.7 Of the pollutants included in the AQS, NO_2 and PM_{10} will be particularly relevant to this assessment as road traffic is a major source and concentrations of these pollutants tend to be close to air quality objectives in urban locations such as the proposed redevelopment site. 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 these pollutants are likely to be the most difficult to achieve. It is also generally considered that, where concentrations of NO_2 and PM_{10} meet their respective objectives, and there are no other local sources of air pollution, such as from industrial processes, objectives for the other pollutants included the regulations will also be achieved.

2.2 AIR QUALITY (ENGLAND) REGULATIONS

2.2.1 Many of the objectives in the AQS have been made statutory in England with the Air Quality (England) Regulations 2000[2] and the Air Quality (England) (Amendment) Regulations 2002[3] for the purpose of Local Air Quality

[1] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2) – July 2007.

[2] The Air Quality (England) Regulations 2000 - Statutory Instrument 2000 No.928

[3] The Air Quality (England) (Amendment) Regulations 2002 - Statutory Instrument 2002 No.3043

Management (LAQM). The standards and objectives for each pollutant in the AQS and the Regulations are given in **Appendix A**.

2.3 THE ENVIRONMENTAL PROTECTION ACT 1990 - CONTROL OF DUST AND PARTICULATES ASSOCIATED WITH CONSTRUCTION

2.3.1 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'.

2.3.2 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.

2.3.3 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.

2.4 LOCAL AIR QUALITY MANAGEMENT (LAQM)

2.4.1 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.

2.4.2 The Department for Environment, Food and Rural Affairs (DEFRA) has published technical guidance for use by local authorities in their review and assessment work[4]. This guidance, referred to in this report as LAQM.TG(09), has been used where appropriate in the assessment presented herein.

London Borough of Camden's review and assessment of air quality

2.4.3 The London Borough of Camden (LBC) has declared the entire Borough an AQMA due to exceedences of the AQS objectives for NO_2 and PM_{10}.

The Mayor's Air Quality Strategy

2.4.4 In 2010 the GLA/Mayor of London published a new Mayor's Air Quality Strategy for London[5]. 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.

2.4.5 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.

[4] Department for Environment, Food and Rural Affairs (DEFRA): *Part IV The Environment Act 1995 and Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(09)* (Feb 2009).

[5] Mayor of London: Cleaning London's air, *The Mayor's Air Quality Strategy* (December 2010)

2.5 NATIONAL PLANNING POLICY

Planning Policy Statement 23 (PPS23): Planning and Pollution Control

2.5.1 Policy guidance for local planning authorities (in England only) regarding local air quality and new development is provided in PPS23[6]. PPS23 advises on the policies and practices that should be taken into account by those involved in the planning of any development that has the potential to cause pollution.

2.5.2 With regard to emissions to air, and specifically local air quality management, Appendix 1G of Annex 1 in PPS23 states that 'any air quality consideration that relates to land use and its development is capable of being a material planning consideration'. This is most likely to be the case in situations where the proposed development could produce an exceedence of the AQS objectives and result in an AQMA designation, or where development is proposed in an AQMA, or where a proposed development renders a Local Authority's AQAP unworkable. PPS23 also re-iterates that the presence of an AQMA should not result in the sterilisation of a site from development.

2.6 LOCAL PLANNING POLICY

The London Plan (Consolidated with Alterations since 2004)

2.6.1 Policy 4A.19 Improving air quality states:

'The Mayor will and boroughs should, implement the Mayor's Air Quality Strategy and achieve reductions in pollutant emissions and public exposure to pollution by:

- *improving the integration of land use and transport policy and reducing the need to travel especially by car;*
- *promoting sustainable design and construction;*
- *promoting sustainable construction to reduce emissions from the demolition and construction of buildings;*
- *ensuring at the planning application stage, that air quality is taken into account along with other material considerations, and that formal air quality assessments are undertaken where appropriate, particularly in designated Air Quality Management Areas;*
- *seeking to reduce the environmental impacts of transport activities by supporting the increased provision of cleaner transport fuels, including hydrogen, particularly with respect to the refuelling infrastructure;*
- *working in partnership with relevant organisations, taking appropriate steps to achieve an integrated approach to air quality management and to achieve emissions reductions through improved energy efficiency and energy use.*

The Mayor will work with strategic partners to ensure that the spatial, transport and design policies of this plan support his Air Quality Strategy'.

Consolidated Draft Replacement London Plan (December 2010)

2.6.2 Policy 7.14 of the Draft Replacement Plan is specific to air quality and states that development proposals should promote sustainable design and construction in order to reduce emissions associated with the demolition and construction of buildings. The policy also states a detailed air quality assessment is required where biomass boilers are included within the development proposals and that developments should aim to be 'air quality neutral' and not lead to further deterioration of existing poor air quality, such as areas designated as AQMAs.

London Councils Guidance for Air Quality Assessments

2.6.3 The London Councils have published guidance[7] 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.

[6] Communities and Local Government: *Planning Policy Statement 23: Planning and Pollution Control* (Oct 2004).

[7] London Councils (January 2007) *Air Quality and Planning Guidance – Revised version*.

3 SCOPE AND 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 and the assessment methodology to be applied;
- review of air quality data for the area surrounding the site, including data from DEFRA[8] and the Environment Agency (EA) websites[9];
- desk study to confirm the location of nearby areas that may be sensitive to changes in local air quality; and
- review of the traffic flow data provided by WSP Development and Transportation Ltd (WSPDT) and from the Department for Transport (DfT) website[10], which has been used as an input to the air quality assessment.

3.2 METHODOLOGY

Construction phase

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 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 following organisations:

- Building Research Establishment (BRE)[11]; and
- Quality of Urban Air Review Group (QUARG)[12].

3.2.5 The Greater London Authority and London Councils have produced guidance[13] for the London Boroughs that looks at best practicable means to control dust and emissions from construction sites. This guidance has been referred to in this assessment.

[8] http://laqm1.defra.gov.uk/review/tools/background.php

[9] http://www.environment-agency.gov.uk

[10] http://www.dft.gov.uk/matrix/

[11] Kukadia, V., Upton, S. L. and Hall, D. J.; *Control of dust from Construction and Demolition Activities.* BRE (Feb 2003).

[12] Quality of Urban Air Review Group: *Airborne Particulate Matter in the United Kingdom – Third Report of the Quality of Urban Air Review Group.* Prepared for the Department of the Environment (May 1996).

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

3.2.6 As there are no formal assessment criteria for dust and PM_{10} generation and dispersion during construction, the significance of impacts associated with this phase of the proposed redevelopment has been determined qualitatively by:

- identifying the construction activities associated with the proposed redevelopment which could generate dust and PM_{10} and their likely duration;
- identifying sensitive receptors (e.g. schools, residential properties) within 200m of the construction site boundary; and
- the prevailing wind direction;

3.2.7 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 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

3.2.8 The proposed redevelopment will not generate any traffic once operational. Therefore the assessment of the operational phase will only focus on the exposure of the future residents of the redevelopment to air pollution concentrations that may exceed the AQS objectives. LBC has declared the whole of the Borough as an AQMA due to predicted exceedences of the objectives for NO_2 and PM_{10}. This air quality assessment will therefore only consider concentrations of these two pollutants at the Site.

3.2.9 For the prediction of pollution concentrations at the Site, the air pollutant dispersion model Breeze 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.

3.2.10 Meteorological data, such as wind speed and direction, is used by the model to determine pollutant transportation and levels of dilution by the wind. Meteorological data used in the model was obtained from the Met Office observing station at Heathrow Airport. This station is considered to provide data representative of the conditions at the proposed redevelopment site. The meteorological data used for this assessment was from 2009.

3.2.11 For the assessment, two scenarios were modelled. These scenarios are as follows:

- 2009 “model verification”; and
- 2014 “future baseline”.

3.2.12 2014 is the proposed opening year of the redevelopment. 2009 was used for model verification as it was the most recent year for which emissions data, traffic data and monitoring data are all available.

3.2.13 A summary of the traffic data and pollutant emission factors used in the assessment can be found in **Appendix B**. It includes details of Annual Average Hourly Traffic flows (AAHTs), average vehicle speeds and the percentage of Heavy Goods Vehicles (HGVs) for the local road network in the assessment years considered.

3.2.14 Modelled annual mean 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 available from DEFRA’s website. The calculator provides a method of calculating NO_2 from NO_x wherever NO_x emissions from road traffic are predicted using dispersion modelling.

3.2.15 For PM_{10}, the modelled annual mean concentrations were 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).

3.2.16 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[14], 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[15] generally supported this relationship and as a result this criterion has been adopted for the purposes of local air quality review and assessment.

3.2.17 Quantitative assessments of the impacts on local air quality from road traffic emissions associated with the operation of the redevelopment have been completed against the current statutory standards and objectives for NO_2 and PM_{10} set out in **Appendix A**.

Model validation and verification

3.2.18 The Breeze Roads dispersion model has been widely validated for this type of assessment and is considered to be fit for purpose. The model is also listed in Government guidance document LAQM.TG3(00) – Review and Assessment: Selection and Use of Dispersion Models[16]

3.2.19 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.

3.2.20 Suitable local monitoring data for the purpose of model verification is available for concentrations of NO_2 at the location shown in **Table 1**.

Table 1 Local monitoring data sources suitable for model verification

Location & Site Classification	O.S. Grid Reference	Distance to Site (km)	2009 Monitored NO_2 Concentration (µg/m^3)
Camden Road (Roadside Diffusion tube)	529173, 184129	0.6	73.0

3.2.21 Model verification has been undertaken following the methodology specified in Annex 3 of LAQM.TG(09) using the NO_x:NO_2 calculator available from DEFRA's website to calculate the roadside NO_x component of the annual mean NO_2 concentrations measured at the diffusion tube site. Details of the verification calculations are presented in **Appendix C**.

3.2.22 A factor of **8.7** 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.

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

Significance criteria

3.2.24 In determining both the significance of exposure to air pollution and the levels of mitigation required, consideration should be given to the Air Pollution Exposure Criteria (APEC) provided in the guidance published by the London Councils and provided in **Table 2** overleaf.

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

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

[16] Review and Assessment: Selection and Use of Dispersion Models; Part IV The Environment Act 1995 Local Air Quality Management LAQM.TG(00) May 2000.

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

3.2.25 Sensitive locations are those where the public may be exposed to pollutants from the Site. These will include locations sensitive to an increase in dust deposition as a result of on-site construction activities, or exposure to gaseous pollutants from exhaust emissions from construction site traffic and traffic associated with the proposed redevelopment, once it becomes operational.

3.2.26 Locations with a high sensitivity to dust generated by construction activities include hospitals and clinics, hi-tech industries, painting and furnishing and food processing. Locations classed as being moderately sensitive to dust include schools, residential areas and food retailers.

3.2.27 In terms of locations that are sensitive to gaseous pollutants emitted from engine exhausts, these will include places where members of the public 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.

3.2.28 For instance, on a footpath where exposure will be transient (for the duration of passage along that path) comparison with a short-term standard (i.e. 15 minute mean or 1 hour mean) may be relevant. In a school or adjacent to a private dwelling, 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.

3.2.29 To complete the exposure assessment, pollution concentrations were predicted at a number of locations across the proposed redevelopment site. The locations of the assessment receptors are shown on **Figure 1** and in **Table 3**.

Table 3: Receptor Locations Used in the Assessment

Receptor No.	Receptor Name	Grid Reference	Height above ground level (m)
1-8	North St Pancras Way Façade Ground Floor – 7th Floor	529568, 183763	1.8, 9.55, 12.32, 15.09, 17.86, 20.63, 23.4, 26.17
9-16	North Rear Façade Ground Floor – 7th Floor	529541, 183760	1.8, 9.55, 12.32, 15.09, 17.86, 20.63, 23.4, 26.17
17-26	Middle St Pancras Way Façade Ground Floor – 9th Floor	529582, 183718	1.8, 9.55, 12.32, 15.09, 17.86, 20.63, 23.4, 26.17, 28.94, 31.71
27-36	Middle Rear Façade Ground Floor – 9th Floor	529562, 183696	1.8, 9.55, 12.32, 15.09, 17.86, 20.63, 23.4, 26.17, 28.94, 31.71
37-43	South St Pancras Way Façade Ground Floor – 6th Floor	529595, 183639	1.8, 9.55, 12.32, 15.09, 17.86, 20.63, 23.4
44-50	South Rear Façade Ground Floor – 6th Floor	529578, 183616	1.8, 9.55, 12.32, 15.09, 17.86, 20.63, 23.4

4 EXISTING CONDITIONS

4.1 LOCAL EMISSION SOURCES

4.1.1 The proposed redevelopment site is located in an area where air quality is mainly influenced by emissions from road transport. A number of roads (such as St Pancras Road and Royal College St) pass close to the site and these sources will have a significant influence on pollutant concentrations at the proposed redevelopment site.

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

4.2 BACKGROUND AIR QUALITY DATA

4.2.1 There are no automatic monitoring stations located within the immediate vicinity of the proposed redevelopment site from which appropriate background concentrations can be obtained. Suitable estimates have therefore been taken from DEFRA's website, 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 the years between 2008 and 2020.

4.2.2 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, the total background concentrations have been used to provide a worst case assessment.

4.2.3 Recent analysis of historical monitoring data has identified a disparity between measured concentrations and the projected decline in concentrations associated with the Defra estimates. This disparity is currently being investigated by Defra and once the reasons are understood updated guidance will be issued. A review of historical monitoring data within the borough of Camden indicates that pollutant concentrations have remained relatively constant. Therefore, total NO_2 and PM_{10} concentrations for 2014 were predicted using the 2009 background concentrations.

4.2.4 **Table 4** shows the estimated background concentrations of NO_2, and PM_{10} that were used in the assessment.

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

Pollutant	2009
NO_x	66.7
NO_2	38.4
PM_{10}	22.1

4.2.5 The table above shows that current background concentration of NO_2 is just below the objective limit of 40µg/m^3 to be achieved by 2005 and thereafter. The estimated background concentration for PM_{10} meets the objective limit of 40µg/m^3 to be achieved by 2004 and thereafter.

4.3 LOCAL AIR QUALITY MONITORING DATA

4.3.1 LBC undertook diffusion tube monitoring at 23 locations within the Borough during 2009. Concentrations of NO_2 measured at the monitoring sites located within 1km of the proposed redevelopment site are provided in **Table 5**.

Table 5:LBC Monitoring Data

Site ID	Grid Reference	Distance to site (km)	2009 Annual Mean Concentration (µg/m^3)
CA20 Brill Place (Roadside)	529914, 183147	0.6	51.9
CA23 Camden Road (Roadside)	529173, 184129	0.6	73.0
CA19 Inverness St (Roadside)	528815, 183909	0.8	45.7
CA18 Corner Gloucester Ave/Parkway (Kerbside)	528672, 183642	0.9	61.7
CA13 British Library (Urban Background)	529977, 182809	0.9	54.1
CA4 Euston Rd (Roadside)	530110, 182795	1.0	87.1
CA2 Robert St (Roadside)	529133, 182695	1.0	49.4

4.3.2 The monitoring data in the table above shoes that concentrations exceed the objective (40µg/m^3) at all locations.

5 ASSESSMENT OF IMPACTS, MITIGATION AND RESIDUAL EFFECTS

5.1 IMPACT

Construction phase

Construction sources of dust and PM_{10}

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 Depending on wind speed and turbulence it is likely that the majority of dust generated by construction activities will be deposited in the area immediately surrounding the source (up to 200 metres away).

5.1.4 By consideration of the factors described above the overall impact of dust deposition would therefore be temporary, short-medium term, local in effect and of a **minor adverse** significance. Any adverse impacts resulting from the generation and dispersion of PM_{10} during construction are likely to be temporary, short-term and of **minor adverse** significance.

Release of emissions to air from construction traffic

5.1.5 The impact on air quality from traffic associated with this phase of the proposed redevelopment will be in the areas immediately adjacent to the principal means of site access for construction traffic. The impacts are therefore considered to be temporary, short-medium term, local and of **minor adverse** significance.

Operational phase

5.1.6 Full results of the dispersion modelling are presented in **Appendix D**, and a summary is provided below.

Annual mean NO_2 concentrations

5.1.7 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 for 2014 show that this objective is exceeded across the redevelopment site on all floors up to and including the third floor (assumed to be 15.1m above ground level) of the proposed redevelopment.

5.1.8 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 may occur in their areas.

5.1.9 The highest predicted concentration in 2014 is 43.64µg/m^3on the ground floor and at the façade closest to St Pancras Way (receptor number 17); however this is a commercial unit where the objective does not apply as there is no relevant exposure over the averaging period. The highest predicted concentration where the objective would apply is 40.65µg/m^3 at the first floor of the northern façade fronting St Pancras Way (receptor number 2). The predicted concentrations can be classified as APEC Level B at all of the residential receptor locations.

Hourly mean NO_2 concentrations

5.1.10 The annual mean NO_2 concentrations predicted by the model were all below 60µg/m^3, and therefore exceedences of the hourly mean NO_2 concentration objective are unlikely to occur. These results again agree with the conclusions of the review and assessment work undertaken by LBC, which concluded that no AQMAs needed to be designated for this pollutant.

Annual mean PM_{10} concentrations

5.1.11 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 dispersion modelling show that in 2014 the objective is met at all assessment receptors on the proposed redevelopment.

5.1.12 The highest predicted concentration in 2014 is 23.59µg/m^3 at the ground floor of the façade closest to Newington Causeway (receptor number 1). The predicted concentrations can be classified as APEC Level A at all receptor locations.

5.1.13 These results agree with the conclusions of the review and assessment work undertaken by LBC, where monitoring data has indicated that there have been no exceedences for this pollutant over the annual mean period since 1997.

24 hour mean PM_{10} concentrations

5.1.14 The objective for 24 hourly mean PM_{10} concentrations is 50µg/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 in 2014 the number of days of exceedence is a maximum of 9 days which is below the objective.

5.1.15 These results again agree with the conclusions of the review and assessment work undertaken by LBC, where monitoring data has indicated that there have been no exceedences for this pollutant.

Mitigation

Construction phase

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

- 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);
- minimise 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;
- 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;
- Restrict on-site movements to well within site and not near the perimeter, if possible; and
- no unauthorised burning of any material anywhere on site.

5.1.17 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.) and that vehicles are kept clean (through the use of wheel washers, etc.) where possible 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.

5.1.18 It is recommended that liaison with the local authority be maintained throughout the construction process.

Operational phase

5.1.1 The results show exceedences of the annual mean NO_2 objective up to and including the third floor level (assumed to be 15.1m above ground level) of the proposed redevelopment.

5.1.2 A mechanical ventilation system should be incorporated into the design of the proposed redevelopment to provide 'cleaner' air to parts of the proposed redevelopment predicted to be in an area of exceedence. The intakes for the ventilation system should be located above the third floor (15.1m above ground) of the St Pancras Way façade so that they are outside the predicted area of exceedence. Mechanical ventilation is only required for the residential floors of the proposed redevelopment. Alternatively the intakes can be located at any point in the façade of the proposed redevelopment below third flow level, provided they contain filters to remove a certain amount of NO_2 from the incoming air.

Residual effects

Construction phase

5.1.3 The greatest potential for an increase in dust deposition to occur will be within 200 metres of the construction site perimeter. There may be limited incidences of increased dust deposited on property beyond this distance. With appropriate use of mitigation measures and good site management the residual effects of dust generation and deposition would be **minor adverse** to **negligible**.

5.1.4 The potential for short-term releases of PM_{10} from materials handling and site plant will remain following mitigation. However, reducing the use of site plant and equipment near sensitive receptors and implementing the mitigation measures outlined above would result in **minor adverse** to **negligible** residual effects.

5.1.5 The residual effects of emissions from construction vehicles will be **negligible**.

Operational phase

5.1.6 With the incorporation of the mitigation measures described above, future residents will not be exposed to annual mean NO_2 concentrations in exceedence of the objective. The residual effects of the proposed redevelopment will be **negligible**.

6 SUMMARY

6.1.1 A qualitative assessment of the potential impacts on local air quality from construction activities on the proposed redevelopment has been carried out. This showed that during site activities releases of dust and PM_{10} were likely to occur. However, through good site practice and the implementation of suitable mitigation measures, the impact of dust and PM_{10} releases will be reduced and excessive releases prevented. The residual effects of the construction phase on air quality are considered to be **minor adverse** to **negligible**.

6.1.2 In addition, a quantitative assessment of the potential for future residents to be exposed to poor air quality has also been undertaken using Breeze Roads. The results of this assessment showed that in 2014, annual mean concentrations of NO_2 exceed the objective up to the third floor (approximately 15.1m above ground level) of the proposed redevelopment.

6.1.3 A mechanical ventilation system should be incorporated into the design of the proposed redevelopment to provide 'cleaner' air to parts of the proposed redevelopment predicted to be in an area of exceedence. The intakes for the ventilation system should be located above the third floor (15.1m above ground) of the St Pancras Way façade so that they are outside the predicted area of exceedence. Mechanical ventilation is only required for the residential floors of the proposed redevelopment. Alternatively the intakes can be located at any point in the façade of the proposed redevelopment below third flow level, provided they contain filters to remove a certain amount of NO_2 from the incoming air.

6.1.4 Based on the assessment results, the Proposed Development is considered to comply with local planning policy for air quality.

FIGURE & APPENDICES

Figure 1 Location of Assessment Receptors

Appendix A Air Quality Standards & Objectives

A summary of the current air quality objectives for the seven pollutants detailed in the *Air Quality Regulations 2000 and (Amendment) Regulations 2002* for the purpose of Local Air Quality Management is provided below.

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**		**EU AQ Daughter Directive**
		Concentration	*Measured as*	*Annual exceedences allowed*	Target date	
Benzene (C_6H_6)	All UK	16.25µg/m^3	running annual mean		31.12.2003	
	England and Wales	5µg/m^3	annual mean		31.12.2010	As standard. target: 01.01.2010
	Scotland	3.25µg/m^3	running annual mean		31.12.2010	
1,3-Butadiene (C_4H_6)	All UK	2.25µg/m^3	running annual mean		31.12.2003	
Carbon monoxide (CO)	All UK	10mg/m^3	maximum daily running 8 hour mean		31.12.2003	As standard. target: 01.01.2005
Lead (Pb)	All UK	0.5µg/m^3	annual mean		31.12.2004	As standard. target: 01.01.2005[8]
	All UK	0.25µg/m^3	annual mean		31.12.2008	
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
	Scotland	50µg/m^3	24 hour mean	7	31.12.2010	As objective. target: 01.01.2010
	Scotland	18µg/m^3	annual mean		31.12.2010	
Sulphur dioxide (SO_2)	All UK	266µg/m^3	15 minute mean	35	31.12.2005	
	All UK	350µg/m^3	1 hour mean	24	31.12.2004	As objective. target: 01.01.2005
	All UK	125µg/m^3	24 hour mean	3	31.12.2004	As objective. target: 01.01.2005

Provisional Air Quality Objectives currently NOT 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**		**EU AQ Daughter Directive**
		Concentration	*Measured as*	*Annual exceedences allowed*	Target date	
Polycyclic aromatic hydrocarbons (PAHs)[2]	All UK	0.25ng/m^3 B[a]P[3]	annual mean		31.12.2010	
Particulate Matter ($PM_{2.5}$) (gravimetric)[1,2]	UK (except Scotland)	25µg/m^3	annual mean	-	2020	As standard Target 2010
	Scotland	12µg/m^3	annual mean	-	2020	25µg/m^3 Target 2015
	UK urban areas	Target of 15% reduction in concentrations at urban background	annual mean	-	Between 2010 and 2020	Target 20% reduction in concentrations at urban background Target Between 2010 and 2020

Other Air Quality Strategy Objectives						
Pollutant	**Applies to**	**Standard**		**Objective**		**EU AQ Daughter Directive**
		Concentration	*Measured as*	*Annual exceedences allowed*	Target date	
For the protection of human health						
Ozone (O_3)[4]	All UK	100µg/m^3	maximum daily running 8 hour mean	10	31.12.2005	As objective; but 25 annual exceedences target: 01.01.2010
For the protection of vegetation and ecosystems5						
Nitrogen oxides (NO_X)[6]		30µg/m^3	annual mean		31.12.2000[7]	As standard. target: 19.07.2001
Sulphur dioxide (SO_2)		20µg/m^3	annual mean		31.12.2000[7]	As standard. target: 19.07.2001
		20µg/m^3	winter mean (1 October to 31 March)		31.12.2000[7]	As standard. target: 19.07.2001

Explanation:

ng/m^3 = nanogram per cubic metre;

µg/m^3 = microgram per cubic metre;

mg/m^3 = milligrams per cubic metre (i.e. microgram per cubic meter x 1,000);

1 Measured using the European gravimetric transfer sampler or equivalent.

2 Objective to be set in regulations in the future.

3 Concentration of Benzo[a]pyrene (B[a]P) to be measured as a marker for the total mixture of PAHs.

4 The objective for this pollutant is provisional and must be tackled at a national level due to its trans-boundary nature.

5 Only applies to those parts of the UK > 20km from an agglomeration; and > 5km from Part A processes, motorways and built up areas of > 5,000 people.

6 Assuming NO_X is taken as NO_2.

7 These objectives have successfully been achieved.

8 Also an EU AQ Directive Limit Value of 1µg/m^3 to be achieved by 01.01.2010 in the immediate vicinity (1000 m) of certain named industrial sources situated on sites contaminated by decades of industrial activities.

The Air Quality Strategy states that further review and assessment and consultation in relation to air quality will be a rolling process, with additional revisions to the objectives for selected pollutants as appropriate, or where there is new evidence in relation to the effects of pollutants on health or ecosystems. New pollutants may be introduced through future reviews.

Appendix B Summary of Traffic Data used in the Assessment

The tables below show the data that was used in the assessment of traffic impacts on local air quality. The emission factors were obtained from spreadsheet available on DEFRA's website.

2009 Verification

Road link	Speed (km/hour)	Annual Average Hourly Flows (AAHT)	%HGV	Emission rate g/km/veh	
				NO_x	PM_{10}
Camden Road (N)	40	1335	6.08	0.5556	0.0407
Camden Road (M)	40	1298	5.97	0.5506	0.0406
Camden Road (S)	40	1353	6.32	0.5669	0.0409
St Pancras Way	51	305	2	0.3515	0.0360
Royal College St	40	499	3.76	0.4463	0.0383
Camden Road	40	1164	12.19	0.8442	0.0470
Camden Street (S)	40	630	4.24	0.4687	0.0388
Camden Street (N)	40	858	11.53	0.8127	0.0463

2014 Future Baseline

Road link	Speed (km/hour)	Annual Average Hourly Flows (AAHT)	%HGV	Emission rate g/km/veh	
				NO_x	PM_{10}
Camden Road (N)	40	1335	6.08	0.3036	0.0328
Camden Road (M)	40	1298	5.97	0.3011	0.0327
Camden Road (S)	40	1353	6.32	0.3092	0.0329
St Pancras Way	51	305	2	0.1989	0.0298
Royal College St	40	499	3.76	0.2488	0.0313

Appendix C Model Verification Calculations

Model verification has been undertaken following the methodology specified in Annex 3 of the Technical Guidance LAQM.TG(09). The NO_x:NO_2 calculator available from DEFRA's website was used to calculate the roadside NO_x component of the annual mean NO_2 concentrations measured at the diffusion tube sites summarised in the table below.

A correction factor of 8.7 was obtained during the verification process. This factor has been applied to the modelled Road-NO_x contribution before addition of the appropriate background concentration to determine total predicted annual mean NO_2 concentrations.

Monitoring Site	Type	2009 Monitored Annual Mean NO_2 Conc. (µg/m^3)	Background		Monitored Road-NO_x (µg/m^3)	Modelled Road NO_x (µg/m^3)	Ratio
			NO_x	NO_2			
Camden Road	Diffusion Tube	73.0	63.1	36.7	131.6	15.1	8.7

Appendix D Assessment Results

NO_2 Annual Mean	**2005**	**Source**
AQS Objective ($\mu g/m^3$)	40	UK Air Quality Strategy
PM_{10} Annual Mean	**2004**	**Source**
AQS Objective ($\mu g/m^3$) 2004	40	UK Air Quality Strategy
PM10 Daily Mean	**2004**	Source
AQS Objective days allowed in exceedences per annum	35	UK Air Quality Strategy

Receptor Number	Receptor Name/Description	2014 Annual Mean NO_2 ($\mu g/m^3$)	2014 Annual Mean PM_{10} ($\mu g/m^3$)	2014 Daily Mean Exceedence (No.)
1	North Front Façade Ground Floor	42.97	23.39	9
2	North Front Façade Floor 1	40.65	22.71	8
3	North Front Façade Floor 2	40.21	22.58	7
4	North Front Façade Floor 3	39.94	22.50	7
5	North Front Façade Floor 4	39.74	22.45	7
6	North Front Façade Floor 5	39.60	22.40	7
7	North Front Façade Floor 6	39.48	22.37	7
8	North Front Façade Floor 7	39.38	22.34	7
9	North Rear Façade Ground Floor	40.75	22.74	8
10	North Rear Façade Floor 1	40.40	22.64	7
11	North Rear Façade Floor 2	40.22	22.59	7
12	North Rear Façade Floor 3	40.02	22.53	7
13	North Rear Façade Floor 4	39.84	22.48	7
14	North Rear Façade Floor 5	39.68	22.43	7
15	North Rear Façade Floor 6	39.54	22.39	7
16	North Rear Façade Floor 7	39.41	22.35	7
17	Middle Front Façade Ground Floor	43.64	23.59	9
18	Middle Front Façade Floor 1	40.56	22.68	8
19	Middle Front Façade Floor 2	40.14	22.56	7
20	Middle Front Façade Floor 3	39.87	22.49	7
21	Middle Front Façade Floor 4	39.68	22.43	7
22	Middle Front Façade Floor 5	39.54	22.39	7
23	Middle Front Façade Floor 6	39.42	22.35	7
24	Middle Front Façade Floor 7	39.32	22.32	7
25	Middle Front Façade Floor 8	39.23	22.30	7
26	Middle Front Façade Floor 9	39.16	22.27	7
27	Middle Rear Ground Floor	40.80	22.76	8
28	Middle Rear Façade Floor 1	40.39	22.64	7
29	Middle Rear Façade Floor 2	40.18	22.58	7
30	Middle Rear Façade Floor 3	39.97	22.52	7
31	Middle Rear Façade Floor 4	39.78	22.46	7
32	Middle Rear Façade Floor 5	39.60	22.41	7
33	Middle Rear Façade Floor 6	39.46	22.36	7
34	Middle Rear Façade Floor 7	39.33	22.33	7
35	Middle Rear Façade Floor 8	39.23	22.30	7
36	Middle Rear Façade Floor 9	39.14	22.27	7
37	South Front Façade Ground Floor	43.52	23.57	9
38	South Front Façade Floor 1	40.52	22.68	7
39	South Front Façade Floor 2	40.08	22.55	7
40	South Front Façade Floor 3	39.80	22.47	7
41	South Front Façade Floor 4	39.59	22.41	7
42	South Front Façade Floor 5	39.44	22.36	7
43	South Front Façade Floor 6	39.31	22.32	7
44	South Rear Façade Ground Floor	40.94	22.81	8
45	South Rear Façade Floor 1	40.42	22.66	7
46	South Rear Façade Floor 2	40.15	22.58	7
47	South Rear Façade Floor 3	39.90	22.50	7
48	South Rear Façade Floor 4	39.68	22.43	7
49	South Rear Façade Floor 5	39.48	22.38	7
50	South Rear Façade Floor 6	39.33	22.33	7