Eden Green Environmental



Air Quality Assessment

Site: St Matthews Lodge, 50 Oakley Square, NW1 1NB

Client

Echlin

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1. Introduction

1.1 Overview

Echlin Ltd is seeking consent for two storey extension to add a collection of new build apartments on top of the roof to the existing St Matthews Lodge located at 50 Oakley Square, NW1 1NB (hereafter referred to as the 'proposed development').

Eden Green Environmental (EGE) was instructed by Echlin to produce an Air Quality Assessment to accompany the planning application to the London Borough of Camden (LBC) for consent to undertake the extension.

The existing St Matthews Lodge is a 5-storey residential development and the proposed extension will be a two-storey roof top development.

The potential local air quality effects of the proposed development have been assessed using the latest planning guidance from Environmental Protection UK (EPUK), the Institute of Air Quality Management (IAQM)[1] and the Department for Environment, Food and Rural Affairs (Defra)[2].

A construction dust risk assessment has been undertaken, to consider the potential risk from dust generating activities during the construction phase of the development. This has been carried out in accordance with the latest IAQM guidance on construction dust[3].

An Air Quality Neutral Assessment has been also considered to support the planning application. This has been undertaken in line with the methodology outlined in the Sustainable Design and Construction SPG[4]

1.2 Objective

This report provides an assessment on the following key impacts associated with the constructional and operational phase of the proposed development:

- Nuisance, loss of amenity and health impacts associated with the construction phase of the development on sensitive receptors;
- Changes in traffic related pollutant concentrations associated with the operational phase of the proposed development; and
- Residential suitability of the proposed development location to introduce new receptors.

1.3 Site Location

Figure 1.1 shows the proposed site location. The proposed development is within the borough-wide Air Quality Management Area (AQMA), designated by LBC in 2002 for

[1] IAQM (2017): 'Land Use Planning and Development Control: Planning for Air Quality v1.2'
[2] Defra (2016): 'Local Air Quality Management – Technical Guidance (TG16)'
[3] IAQM (2016): 'Guidance on the Assessment of Dust from Demolition and Construction v1.1'.
[4] Mayor of London (2014): 'Sustainable Design and Construction Supplementary Planning Guidance'

exceedance of the NO_2 annual mean and PM_{10} 24 hour mean objectives. There are no nationally designated ecological sites within close proximity to the proposed development. Further site drawings are presented in Appendix F.

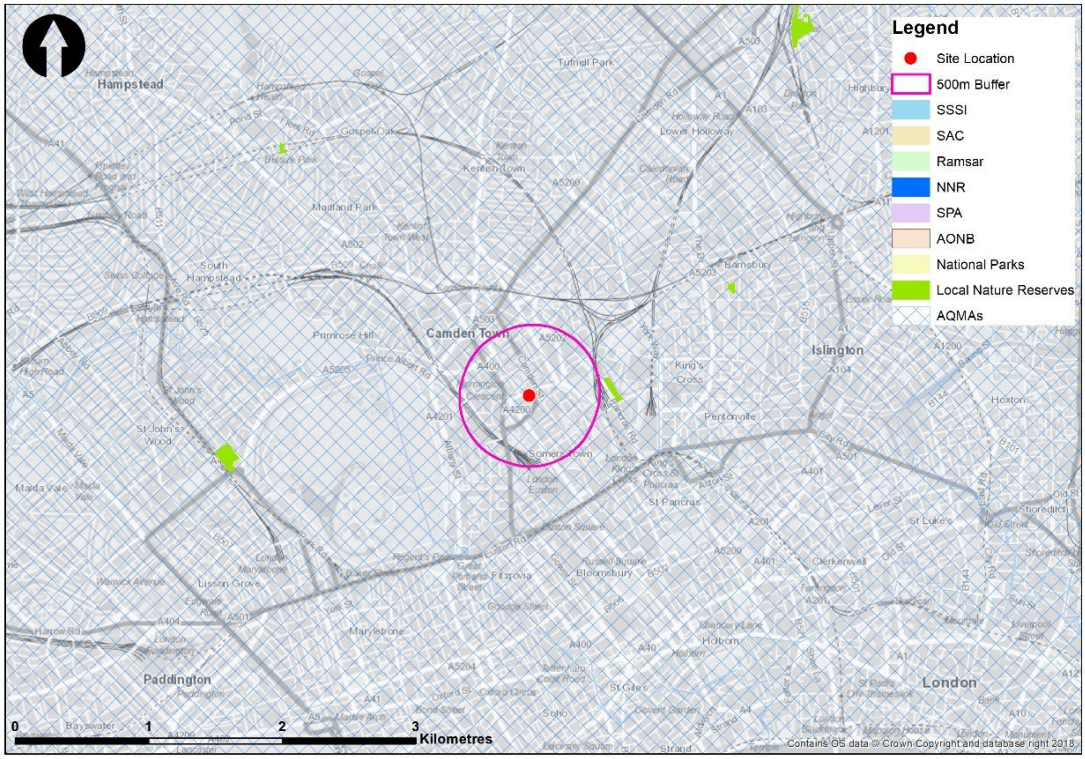

Figure 1.1: Proposed site location

1.4 Key Pollutants

The key pollutants associated with the construction phase of the project will be 'disamenity' or 'nuisance' dust. The key pollutants associated with the operational phase of the proposed development will be road traffic emissions including nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$). These pollutants are therefore considered as part of this assessment. Further details of the key pollutants are presented in Appendix A.

2. Legislation and Policy

This section summarises all legislation, policy, statutory and non-statutory guidelines relevant to the proposed development. Furthermore, the latest regional and local planning policy guidance specifically applicable to the proposed development has been reviewed.

2.1 European Union

The EU sets legally binding limit values for outdoor air pollutants to be met by EU countries by a given date. These limit values are based on the World Health Organisation (WHO) guidelines on outdoor air pollutants. These are legally binding and set out to protect human health and the environment by avoiding, preventing or reducing harmful air pollution effects.

The current air quality directive is the Directive 2008/50/EC[5] on ambient air quality and cleaner air for Europe entered into force in June 2008.This merged most of the existing 'Daughter' Directives[6] (apart from the fourth Daughter Directive); maintaining existing air quality objectives set out by 'Daughter' Directives for sulphur dioxide (SO_2), nitrogen dioxide (NO_2), and oxides of Nitrogen (NO_x), particulate matter (PM_{10} and $PM_{2.5}$), lead (Pb), benzene(C_6H_6), carbon monoxide (CO), ozone (O_3). It also includes related objectives, exposure concentration obligation and exposure reduction targets for $PM_{2.5}$ (fine particles). The 'Daughter' Directives were based upon requirements set out in the first EU Ambient Air Quality Framework Directive 96/92/EEC[7].

2.2 National Level – England

The UK government has a legal responsibility to meet the EU limit values. Part IV of the 1995 Environment Act[8] sets guidelines for protecting air quality in the UK and forms the basis of the local air quality management. The Environment Act requires local authorities in the UK to review air quality in their area periodically and designate 'Air Quality Management Area' (AQMAs) if improvements are necessary. Where an AQMA is designated, local authorities are also required to produce an 'Air Quality Action Plan' (AQAP) detailing the pollution reduction measures that need to be adopted to achieve the relevant air quality objectives within an AQMA.

As part of the Environment Act, the UK Government was required to publish a National Air Quality Strategy (NAQS) to establish the system of 'local air quality management' (LAQM) for the designation of AQMAs. This led to the introduction of the first Air Quality Strategy (AQS) in 1997[9] which since has progressed through several revisions until it was replaced by the Air Quality Strategy for England,

[5] European Union (2008): 'Ambient air quality assessment management', Framework Directive 2004/50/EC.
[6] European Union. (1999), 'Ambient air quality assessment management', Framework Directive 1999/30/EC;
European Union. (2000), 'Ambient air quality assessment management', Framework Directive 2000/3/EC;
European Union. (2002), 'Ambient air quality assessment management', Framework Directive 2002/3/EC;
European Union. (2004), 'Ambient air quality assessment management', Framework Directive 2004/107/EC.
[7] European Union. (1996), 'Ambient air quality assessment management', Framework Directive96/62/EC.
[8] Parliament of the United Kingdom. (1990), 'Environmental Protection Act', Chapter 43. Queen's Printer of Acts of Parliament.
[9] Department for Environment Food and Rural Affairs. (1997), 'The United Kingdom National Air Quality Strategy', Cm 3587, Department for Environment Food and Rural Affairs.

Scotland, Wales and Northern Ireland 2007[10]. Each revision introduced strategies and regulations that considered measures for different pollutants by tightening existing objectives and by introducing new ones to establish a common framework to protect human health and the environment by achieving ambient air quality improvements.

The 2008 EU ambient air quality directive 2008/50/EC was transposed to England law through the introduction of the Air Quality (Standards) Regulations in 2010[11] which also incorporated the fourth EU Daughter Directive (2004/107/EC) that set target values for certain toxic heavy metals and polycyclic aromatic hydrocarbons, (PAH).

2.2.1 National Planning Policy Framework

The principal national planning policy guidance in respect of the proposed development is the National Planning Policy Framework (NPPF)[12]. The most recent update of the NPPF was published in March 2012 by Department for Communities and Local Government (DCLG). The NPPF Section 109 states that:

"The planning system should contribute to and enhance the natural and local environment by:…….. preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability……..."

Section 120 states that:

"To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account……..." and

Section 124 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."

[10] Department for Environment Food and Rural Affairs. (2007), 'The Air Quality Strategy for England, Scotland, Wales and Northern Ireland', Cm 7169, Department for Environment Food and Rural Affairs.
[11] Statutory Instrument. (2010), 'The Air Quality Standards Regulations', No. 1001. Queen's Printer of Acts of Parliament.
[12] National Planning Practice Guidance 'Air Quality Section'. Accessible at: http://planningguidance.planningportal.gov.uk/blog/guidance/air-quality-new/why-should-planning-beconcerned-about-air-quality/

2.2.2 Relevant National Planning Practice Guidance

The DCLG published a number of supporting web based resources of Planning Practice Guidance (PPG)[13] to supplement the NPPF. With respect to air quality PPG provide guidance on when air quality is relevant to a planning application. It states that:

"Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife)."

The PPG also states that, when deciding whether air quality is relevant to a planning application, the applicant should consider whether the proposal will:

"Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. Introduce new point sources of air pollution…..,

Expose people to existing sources of air pollutants…..,

Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations…..,

- *Affect biodiversity….."*

2.2.3 Statutory Nuisance

It is recognised that the planning system presents a way of protecting amenity. However, in cases where planning conditions are not applicable to a development/installation, the requirements of the Environmental Protection Act 1990 still apply. Under Part III of the Environmental Protection Act 1990, local authorities have a statutory duty to investigate any complaints of:

- *"any premises in such a state as to be prejudicial to health or a nuisance*
- *smoke emitted from premises so as to be prejudicial to health or a nuisance*
- *fumes or gases emitted from premises so as to be prejudicial to health or a nuisance*
- *any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance*
- *any accumulation or deposit which is prejudicial to health or a nuisance"*

Where the local authority establishes any one of these issues constitutes a statutory nuisance and believes it to be unreasonably interfering with the use or enjoyment of someone's premises and/or is prejudicial to health, an abatement notice will be served on the person responsible for the offence or the owner / occupier. Failure to

[13] National Planning Practice Guidance web-based resource. Accessible at: http://planningguidance.planningportal.gov.uk/

comply with the notice could lead to a prosecution. However, it is considered as a defence if the best practicable means to prevent or to counteract the effects of the nuisance are employed.

2.2.4 Relevant National Air Quality Standards

A summary of the relevant Air Quality Standards/Objectives (henceforth referred to as 'AQO') and the types of receptors that are relevant to this assessment are presented in Table 2.1 and Table 2.2. The AQO listed in Table 2.1 applies only at locations with relevant exposure where a member of the public could be exposed to a level of pollution concentration for the specific averaging periods for that pollutant as stated in Table 2.2.

Table 2.1: AQO Relevant to the Proposed Development

Pollutant	Air Quality Objectives		Concentration measured as:	Applicable to:
	Concentration	**Allowance**		
Nitrogen Dioxide (NO_2)	200 µg/m^3	18 per calendar year	1 hour mean	All local authorities
	40 µg/m^3		Annual mean	All local authorities
Particulate Matter (PM_{10})	50 µg/m^3	35 per calendar year	24 hour mean	All local authorities
	40 µg/m^3		Annual mean	All local authorities
Particulate Matter ($PM_{2.5}$) Exposure reduction[(a)]	25 µg/m^3 [(a)]		Annual	England only

Notes: [(a)] This is a target value set for a 15% reduction in concentrations at urban background aimed to achieve between 2010 and 2020

Source: Department for Environment Food and Rural Affairs (2014): 'Local Air Quality management Technical Guidance' (TG.16).

Table 2.2: Examples of Where the AQO Should Apply

Averaging period	*Objectives should apply at*	*Objectives should not apply at*
Annual	*All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.*	*Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence.* *Gardens of residential properties.*

		Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
24 Hour	*All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties.*[(a)]	*Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.*
1 Hour	*All locations where the annual mean and 24 and 8-hour mean objectives apply.* *Kerbside sites (for example, pavements of busy shopping streets).* *Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more.* *Any outdoor locations where members of the public might reasonably expected to spend one hour or longer.*	*Kerbside sites where the public would not be expected to have regular access.*

Note: [(a)] "*Such locations should represent parts of the garden where relevant public exposure to pollutants is likely, for example where there is seating or play areas. It is unlikely that relevant public exposure to pollutants would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied.*"

Source: Department for Environment Food and Rural Affairs (2014): 'Local Air Quality Management Technical Guidance' (TG.16).

2.3 Regional (London)

2.3.1 The Mayor of London's Air Quality Strategy

The Mayor of London's Air Quality Strategy[14] was published in December 2010 which includes transport and non-transport related policy measures. The document also include guidance on how regional and local planning processes will be used to enable future developments to be 'air quality neutral or better'.

Policy 15 within the Mayor's air quality strategy is committed to reporting back regularly on the progress made since the strategy has been delivered. The latest progress report was published in July 2015[15] and includes:

- Analysis of recent trends in air pollution in London;

[14] Greater London Authority (2010). Clearing the Air: The Mayor's Air Quality Strategy.
[15] Greater London Authority (2015). Cleaner Air for London: Progress Report on the Delivery of the Mayor's Air Quality Strategy.

- An update on the latest understanding of health impacts of air pollution in London;
- An update on the implementation of the transport and non-transport policies included in the Mayor's Air Quality Strategy, including measures announced by the Mayor in February 2013 such as the Ultra-Low Emission Zone;
- Setting out what further action the Mayor will take to improve air quality.

2.3.2 London Plan

The London Plan[16] is the spatial development strategy for London which was first published by then-Mayor Ken Livingstone in 2004. The document has gone through number of alterations and the with most recent alterations published in March 2016.

The London Local Plan sets out the overall strategic plan for London with an integrated approach for economic, environmental, transport and social framework for the development of London over the next 20–25 years and covers a number of strategies including transport and environmental issues such as climate change and air quality.

Policy 3.2 "Improving Health and Addressing Health Inequalities" states:

- *"The policies in this Plan are intended to enable Londoners to live in well designed, high quality homes…limiting…exposure to poor air quality."*
- *"The Mayor…has also produced other strategies related to…Air Quality…The Mayor will ensure that policies in this Plan are complemented by those in other mayoral strategies (particularly the Mayor's Transport Strategy, which sets carbon dioxide reduction targets to be achieved in the transport system)."*

Policy 5.1 "Climate Change Mitigation" states:

- *"The Mayor seeks to achieve an overall reduction in London's carbon dioxide emissions of 60 per cent (below 1990 levels) by 2025. It is expected that the GLA Group, London boroughs and other organisations will contribute to meeting this strategic reduction target, and the GLA will monitor progress towards its achievement annually."*

Policy 5.3 "Sustainable design and Construction" states:

- *"Minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems)"*
- *"Minimising pollution (including…air)"*

Policy 7.14 "Improving Air Quality" states that:

[16] Greater London Authority (2016). The London Plan: Spatial Development Strategy for London Consolidated with Alterations Since 2011.

- *"Minimise increased exposure to existing poor air quality and make provision to address local problems of air quality (particularly within Air Quality Management Areas (AQMAs) and where development is likely to be used by large numbers of those particularly vulnerable to poor air quality, such as children or older people) such as by design solutions, buffer zones or steps to promote greater use of sustainable transport modes through travel plans…;*
- *Promote sustainable design and construction to reduce emissions from the demolition and construction of buildings following the best practice guidance in the GLA and London Councils' 'The control of dust and emissions from construction and demolition';*
- *Be at least 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as areas designated as Air Quality Management Areas (AQMAs));*
- *Ensure that where provision needs to be made to reduce emissions from a development, this is usually made on-site. Where it can be demonstrated that on-site provision is impractical or inappropriate, and that it is possible to put in place measures having clearly demonstrated equivalent air quality benefits, planning obligations or planning conditions should be used as appropriate to ensure this, whether on a scheme by scheme basis or through joint area based approaches*
- *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."*

2.3.3 The Mayor of London Transport Strategy

On the 21st June 2017 the Mayor of London published the draft, The Mayors Transport Strategy[17] setting out the Mayor's "policies and proposals", enabling transport in London to be reshaped over the next 25 years.

The key themes within the strategy are; healthy streets and healthy people, good public transport experiences, new homes and jobs.

Chapter 3, section C "Improving air quality and the environment" includes policy 5 and 6 which relate to transport and air quality."

Policy 5 states:

"The Mayor, through TfL and working with the boroughs, will take action to reduce emissions – in particular diesel emissions – from vehicles on London's streets, to improve air quality and support London reaching compliance with UK and EU legal limits as soon as possible. Measures will include retrofitting vehicles with equipment to reduce emissions, promoting electrification, road charging, the imposition of parking charges/ levies, responsible procurement, the making of traffic restrictions/ regulations and local actions."

[17] Greater London Authority (2017). Mayor's Transport Strategy.

Policy 6 states:

"Boroughs, and working with other transport providers, will seek to make London's transport network zero carbon by 2050, which will also deliver further improvements in air quality, by transforming London's streets and transport infrastructure so as to enable zero emission operation, and by supporting and accelerating the uptake of ultra-low and zero emission technologies."

2.4 Local Level – (London Borough of Camden)

2.4.1 London Borough of Camden Local Plan

The LBC Local Plan, adopted on 3rd July 2017, sets out LBC's planning policies and replaces the Core Strategy and Development Policies planning documents. The LBC local Plan contains two policies relating to dust and air quality.

Policy A1 states:

'*The Council will seek to protect the quality of life of occupiers and neighbours. We will grant permission for development unless this causes unacceptable harm to amenity. We will:*

a) seek to ensure that the amenity of communities, occupiers and neighbours is protected;

b) seek to ensure development contributes towards strong and successful communities by balancing the needs of development with the needs and characteristics of local areas and communities;

c) resist development that fails to adequately assess and address transport impacts affecting communities, occupiers, neighbours and the existing transport network; and

d) require mitigation measures where necessary.

The factors we will consider include:

e) visual privacy, outlook; sunlight, daylight and overshadowing; artificial lighting levels;

f) transport impacts, including the use of Transport Assessments, Travel Plans and Delivery and Servicing Management Plans;

g) impacts of the construction phase, including the use of Construction Management Plans;

h) noise and vibration levels;

i) odour, fumes and dust;

j) microclimate;

k) contaminated land; and

l) *impact upon water and wastewater infrastructure.*'

Policy CC4 states that:

'The Council will ensure that the impact of development on air quality is mitigated and ensure that exposure to poor air quality is reduced in the borough.

The Council will take into account the impact of air quality when assessing development proposals, through the consideration of both the exposure of occupants to air pollution and the effect of the development on air quality. Consideration must be taken to the actions identified in the Council's Air Quality Action Plan.

Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution. Where the AQA shows that a development would cause harm to air quality, the Council will not grant planning permission unless measures are adopted to mitigate the impact. Similarly, developments that introduce sensitive receptors (i.e. housing, schools) in locations of poor air quality will not be acceptable unless designed to mitigate the impact.

Development that involves significant demolition, construction or earthworks will also be required to assess the risk of dust and emissions impacts in an AQA and include appropriate mitigation measures to be secured in a Construction Management Plan.'

2.4.2 London Borough of Camden Air Quality Action Plan

LBC has produced is own Air Quality Action Plan (AQAP) for the period 2016 to 2018[18] to replace the previous action plan which was in place from 2013 to 2015.

The key objectives for the plan are to:

- *"Encourage reductions in fossil fuel use, the adoption of clean fuels and low emission technology and promote energy efficiency;*
- *Raise awareness about air quality in Camden and promote lifestyle changes which can help reduce levels of air pollution and minimise exposure to air pollution;*
- *Improve the health and well-being of the local population, including those that work and visit Camden;*
- *Work in partnership with national and regional bodies, and with local public and private organisation, to foster and drive improvements in air quality;*
- *Lead by example and reduce NO_2 and PM_{10} emissions associated with the Council's own buildings and transport services; and*
- *Ensure actions which serve to reduce NO_2 and PM_{10} emissions complement actions to mitigate CO_2 emissions."*

Section 2 of the AQAP applies to emissions from buildings and new developments. Camden has a requirement for *"new developments to meet all best practise planning guidance available, including GLA 2014 Control of Dust and Emissions during*

[18] London Borough of Camden (2016): 'Camden's Clean Air Action Plan 2016-2018'

Construction and Demolition SPG, and the GLA's 2014 Sustainable Design and Construction SPG, which requires new developments to be 'air quality neutral'."

The AQAP sets out a number of actions relating to new developments which include:

- **Action 12:** *"Continue to work with developers and King's College London to explore best in class dust mitigation measures on Camden's construction sites."*
- **Action 14:** *"Minimise emissions from the construction and operation of new developments by requiring developers to adhere to current and any superseding best practise guidance and supplementary planning guidance."*
- **Action 15:** *"Continue to use planning conditions and obligations to require developers to adopt measures which will reduce transport emissions during operational phase of developments."*
- **Action 16:** *"Require developers to undertake an air quality assessment (AQA) in circumstances where a new development could have a negative impact on air quality where the development is adjacent to sensitive receptors such as schools, nurseries, hospitals and doctors' surgeries, or where the development will introduce new receptors into an area of existing poor air quality."*
- **Action 18:** *"Ensure the enforcement of Non Road Mobile Machinery (NRMM) air quality polices for new developments."*

Camden have also set out a transport strategy for 2011 – 2031[19] which outlines the actions the borough will take to deliver transport policies and environmental objectives including reducing air pollution.

[19] London Borough of Camden (2011): 'Camden's Transport Strategy'

3. Methodology

3.1 Overview

This section provides the details of the methodological approach taken to assess the impacts on air quality from the construction and operation of the proposed development; addressing the following key elements:

- Scope of the assessment;
- Dispersion modelling approach;
- Modelled scenarios; and
- Model parameters - such as emission factors, NO_x to NO_2 conversion, estimating background concentrations, meteorology, and criteria used to assess the residential suitability of the proposed development, addressing uncertainties, model assumptions and limitations.

3.2 Scope of the Assessment

The assessment is based on the following scope of work presented in Table 3.1:

Table 3.1: Scope of Work

Scope	Phase	Consideration
Spatial	Construction	Based on the IAQM Guidance, sensitive receptors within 350 m of the proposed development have been considered. For trackout IAQM guidance suggest without site specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. It is considered that the trackout impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50 m from the edge of the road.
	Operation	The assessment considers those roads which has potential to significantly change traffic as a result of the proposed development. Impacts on air quality arising from traffic related emissions are considered unnoticeable above background concentrations beyond 200 m from the source[20]. Hence, this assessment only considered receptors within 200 m from a road source. Sensitive receptors that are likely to experience greatest change in concentration in terms of traffic related emission as a result of the proposed development are considered within this assessment.

[20] Highways England (2007), Design Manual for Roads and Bridges (DMRB), Volume 11 Section 3 Part 1 Air Quality. Available at: http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/ha20707.pdf.

Temporal	Construction	The construction phase effects resulting from the proposed development for all key phases of construction have been considered for the duration of the construction period.
	Operational	The operational phase effects resulting from the proposed development have been considered for the earliest possible year of occupation, 2018.

3.3 Construction Phase Assessment

3.3.1 Site Traffic Emissions on Local Roads

The IAQM planning guidance suggests construction road traffic emissions should be assessed using the same methodology and significance criteria used for assessing operational traffic impacts. Therefore, this assessment used the EPUK operational traffic criteria presented in Appendix B to assess the impact of construction road traffic emissions as a result of the proposed development.

It is not anticipated that the development will generate construction related traffic movement greater than 100 AADT[21] or 25 daily HDV[22] within the AQMA. Therefore, the impacts of exhaust emissions from construction site traffic are not considered significant and, on this basis, no further consideration has been given to the effects of construction traffic on ambient air quality.

3.3.2 Construction Site Plant Emissions

The IAQM guidance for construction dust assessments suggests that the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) are unlikely to have a significant impact on local air quality, and in the vast majority of cases, they will not need to be quantitatively assessed. In the context of the proposed development site, construction site plant emissions are considered to be negligible when compared to the local road traffic contribution of exhaust emission. Consequently, any impact on the AQO for NO_2 and PM_{10} arising from construction plant are considered insignificant and have been scoped out of the assessment.

3.3.3 Construction Dust Assessment

A construction dust assessment was carried out to consider impacts from 'disamenity' (or 'nuisance') dust as discussed in Section 1.4.3, associated with annoyance. The development has potential to generate dust during the construction phase of the project. Although there are no standards (such as AQO) for dust disamenity or annoyance, various 'custom and practice' criteria have become established.

For the purpose of this assessment, the IAQM construction dust risk guidance has been used.

The IAQM guidance provides a methodology (Appendix C) to evaluate potential risk of dust generation for a development and the level of mitigation required. The impact

[21] Annual Average Daily Traffic
[22] Heavy Duty Vehicle

of the development is described using one of the following three categories: 'Low Risk', 'Medium Risk' and 'High Risk'. Based on the risk level, appropriate mitigation measures can be considered to minimise any effects of dust from the construction phase.

3.4 Operational Phase Assessment

The proposed development will not introduce any additional parking provisions and therefore based on the EPUK criteria set out in Appendix A, the need for detailed operational traffic modelling can be scoped out of this assessment. However, an assessment for residential suitability has been carried out by assessing the impact of existing traffic on the proposed development.

The proposed development will not include any new plant or associated flue stacks, therefore the need for stack dispersion modelling can be scoped out.

Policy within the London Plan requires developments to be 'air quality neutral', the aim of which is to bring forward developments that are air quality neutral or better and that do not degrade air quality in areas where air quality objectives are not currently being achieved. Guidance for undertaking the assessment are given in the following two documents:

- *The Air Quality Neutral Planning Support Update 2014*
- *Mayor of London Sustainable Design and Construction Supplementary Planning* Guidance 2014

The Sustainable Design and Construction SPG provides typical emission rates of NO_x and PM_{10} for transport and building emissions for each land-use class. The Transport Emission Benchmarks (TEB) are location dependant and considers whether a development is located within inner or outer London. The Buildings Emissions Benchmark (BEB) is not location dependant.

Based on the Energy and Sustainability Statement prepared by EAL Consultants (Dated: August 2018), the proposed development will be using air source heat pumps with high energy efficiency ratios for both heating and cooling in the occupied spaces. No additional fuel is to be used, therefore fugitive NO_x and PM_{10} emissions are not expected. Therefore, an assessment of the proposed development plant against BEB is not required. The proposed development will not introduce any additional parking spaces and therefore an assessment against the TEB is also not required. Hence, the need for an Air Quality Neutral Assessment can be scoped out.

3.4.1 Modelled Scenarios

Based on above the following scenarios have been considered to assess residential suitability:

- 2016 Base Year and
- 2019 Earliest Year of Occupation.

The model verification has been carried out using 2016 base year traffic data. Further details of the model verification process are presented in Appendix E.

According to the guidance provided by Defra in their Air Quality Strategy, vehicle emissions are expected to decrease in future years as a result of advancement in abatement technologies. It is also expected that more stringent emission limits will be imposed upon manufacturers. Hence, the 2019 operational year scenario was considered to be the worst case and therefore no future year scenario was considered in this assessment.

3.4.2 Dispersion Model Used

The assessment on identifying the impact of current traffic related emissions sources in the area of the proposed development has been carried out using the latest version of 'ADMS-Roads' Dispersion Modelling PC based software (version 4.1.1.0) developed by Cambridge Environmental Research Consultants (CERC). This model is commonly used in planning application and regulatory assessment of traffic related emissions.

3.4.3 Road Traffic Data

Key facts for the traffic data used are:

- Traffic flow data are based on the DfT Traffic counts[23] and data received from LBC Highways Team;
- Speed at junctions has been reduced as advised in Defra Technical Guidance (TG16) for a robust assessment; and
- The Trip End Model Presentation Program (TEMPRro), DfT's traffic forecasting software was used to obtain annual factors to calculate the 2019 future year assessment scenario.

Table 3.2 shows the traffic data for the proposed development and Figure 3.1 shows the extent of the ADMS-Roads dispersion modelling network.

Table 3.2: Relevant traffic data for the proposed development

Link Name	Base year (2016)			Opening year (2019)		
	AADT	HDV%	Speed (kph)	AADT	HDV%	Speed (kph)
A400				14,657	5%	20[a]
A4200				8,467	3%	20[a]
Crowndale Road				9,098	9%	20[a]
Oakley Square				2,153	11%	20[a]
A503 (Verification)	29,851	4%	20[a]			
A5202 (verification)	10,914	3%	20[a]			

Note: [a] this is a conservative assumption for a robust assessment

[23] Available at - https://www.dft.gov.uk/traffic-counts/cp.php?la=Ealing

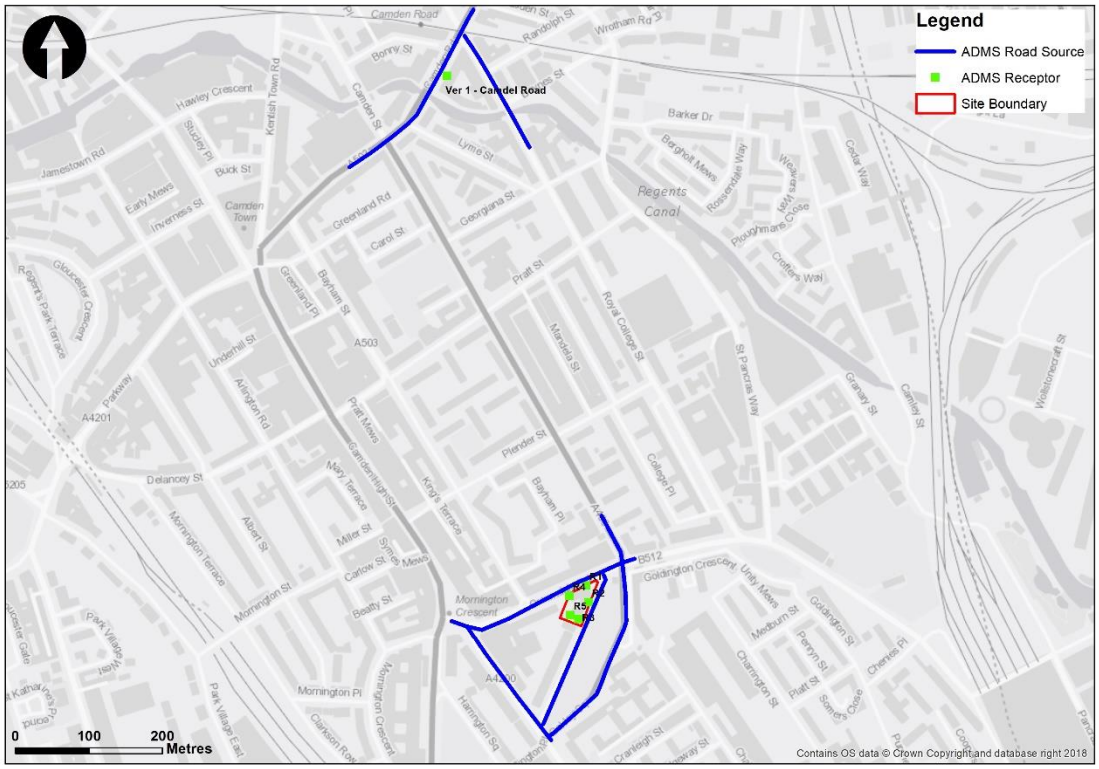

Figure 3.1: Modelled Road Network

3.4.4 Meteorological Data

The key meteorological parameters for dispersion modelling are wind speed and wind direction. There are other meteorological parameters, which also need to be taken into account such as cloud cover, surface temperature, precipitation rate and relative temperature.

For dispersion modelling purposes, data are required on an hourly resolution and local sites cannot always provide reliable data for all the meteorological parameters on an hourly basis.

Based on above, the most representative meteorological monitoring station identified is the London City Airport meteorological monitoring site which is located approximately 12.5 km from the proposed development site.

In order to undertake a worst-case meteorological assessment, the dispersion modelling has been carried out with meteorological data from the period 2015 to 2017. Data are presented on a receptor by receptor basis for the maximum annual mean concentrations predicted across the modelled years. Figure 3.2 below presents the windrose for each modelling year:

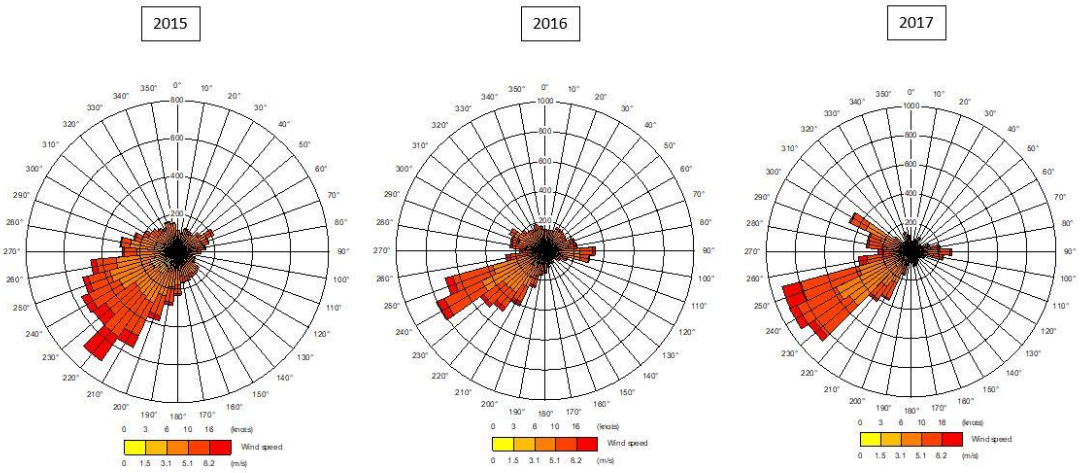

Figure 3.2: Windrose for London City Airport Meteorological Station 2015-2017

3.4.5 Assessment of Background Concentrations

This assessment considers road traffic emission sources in detail, and as part of the predictive process, all non-road traffic related emission sources in the Defra data set were assigned appropriate 'background' concentrations at the modelled receptors. Further details regarding the assignment of background pollution concentration are presented in Section 4.3.

3.4.6 Emission Factors

For the purpose of this assessment, the latest Defra Emission Factor Toolkit (EFT 8.0.1, December 2017) has been used for the earliest opening year. The EFT Version 8.0.1 has been developed for the UK by the National Atmospheric Emissions Inventory (NAEI) and Transport for London (TfL). The EFT is based on data collected from a number of sources including the European Environment Agency (EEA) COPERT (Computer Programme to calculate Emissions from Road Transport) emission calculator.

3.4.7 NO_x to NO_2 Conversion Method

This assessment uses the latest NO_x to NO_2 conversion factor toolkit for the operational phase of this development (Version 6.1 released October 2017), provided by Defra as a Microsoft Excel based calculation tool which is available from Defra's web-based air quality resource centre[24]. This method is considered to be the most appropriate technique of determining NO_2 concentrations from road NO_x contributions.

3.4.8 Estimating Hourly and Daily Mean Concentrations

The latest Local Air Quality Management (LAQM) Technical Guidance (TG 16) has been used for predicting 1 hourly and 24-hourly pollutant concentrations.

[24] Department for Environmental Food and Rural Affairs. Accessible at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015

The guidance suggests that the short term hourly NO_2 AQO of 200 µg/m^3 (not to be exceeded more than 18 times per year) is not likely to exceed at any roadside locations if the annual mean concentration is below 60 µg/m^3. Based on this guidance, the hourly mean NO_2 AQO is only considered when the annual mean NO_2 concentrations are over 60 µg/m^3.

In accordance with the guidance, the short term 24 hourly PM_{10} mean concentration can be calculated using the following equation as presented below:

$$Number\ \ of\ 24\ hour\ mean\ exceedences = 18.5 + 0.00145\ x\ annual\ mean^3 + (\frac{206}{annual\ mean})$$

3.4.9 Relevant Sensitive Receptors

Table 3.3 below presents the locations of sensitive receptors considered within this assessment.

LAQM technical guidance (TG16) clarifies where likely exceedances of the objectives should be assessed and states that Review and Assessment should focus on:

"Locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the relevant air quality objective".

Table 2.2 above provides details of where the respective objectives should and should not apply and therefore the types of receptors that are relevant to the assessment.

Based on the above, the greatest impact on a human health receptor situated within the proposed development is considered to be at the closet point of the proposed building facade to the Crowndale Road and Oakley Square Road.

Table 3.3: Sensitive receptors Identified for the proposed development

Receptor Name	Receptor Number	National Grid Reference[(a)]		Height (m)
		X	Y	
Residential Receptor – 5th Floor	R1	529365	183432	11.5
Residential Receptor – 5th Floor	R2	529369	183410	11.5
Residential Receptor – 5th Floor	R3	529355	183387	11.5
Residential Receptor – 5th Floor	R4	529343	183418	11.5
Residential Receptor – 5th Floor	R5	529344	183392	11.5
Residential Receptor – 6th Floor	R6	529365	183432	13.5
Residential Receptor – 6th Floor	R7	529369	183410	13.5
Residential Receptor – 6th Floor	R8	529355	183387	13.5
Residential Receptor – 6th Floor	R9	529343	183418	13.5
Residential Receptor – 6th Floor	R10	529344	183392	13.5

Note: [a] British National Grid Reference. Height is from the ground level.

3.4.10 Criteria Used to Assess Significance

For the purpose of this assessment, residential suitability has been assessed by comparing the modelled data against the relevant AQO as presented within Section 2.2.4.

3.4.11 Model Uncertainties, assumptions and limitations

The assessment has been carried out based on the following assumptions:

- The earliest possible year of occupation is 2019;
- The mitigation measures proposed in Section 6 will be implemented in order to mitigate construction related dust nuisance;
- Emissions from vehicles are expected to decrease in the future as mentioned in Section 3.4.1. Hence, the 2018 operational year scenario was considered to be the worst case and therefore no further future year scenario was considered in this assessment;
- For the construction dust risk assessment, it has been assumed that all construction activities will be carried out for the duration of the construction period in order to assess a worst-case scenario;
- No assessment of any potential onsite energy plants has been carried out as it is assumed that Principal of Good Practice as stated in the IAQM guidance will be used when selecting the appropriate energy plant for the required design.

Dispersion modelling has associated uncertainties related to emission data, meteorological data and model algorithms. In order to address these uncertainties a model verification has been carried out by comparing the modelled concentrations with the monitored concentrations as described within the verification methodology presented in Appendix E.

4. Baseline Conditions

4.1 Overview

The following section sets out the baseline conditions in relation to air quality for the proposed development. Baseline air quality information is available from a number of sources including local and national monitoring data reports and websites. For the purposes of this assessment, data has been obtained from the Defra air quality resource website[25] and from the latest LBC Annual Status Report (ASR)[26].

4.2 Existing Baseline Conditions

LBC declared a borough wide AQMA in 2002 for exceedance of the annual mean NO_2 and the 24-hour mean PM_{10} objective.

LBC undertook automatic (continuous) monitoring of NO_2 and PM_{10} at four monitoring locations in 2016. LBC also monitored NO_2 using diffusion tubes at 14 sites across the borough. No $PM_{2.5}$ monitoring data were available.

The nearest automatic monitoring station to the proposed development is Euston Road monitor (Ref: CD9) which is at a roadside location approximately 895 m southeast of the site. The nearest urban background monitor is London Bloomsbury (Ref: LB) which is 1.5 km southeast of the site. The nearest non-automatic monitors are the Brill Place (Ref: CA20) located approximately 600 m southeast of the site and the Camden Road monitor (Ref: CA23) located approximately 770m north of the proposed site. The locations of these monitors are shown in Figure 4.1. However, none of the nearby existing monitoring is considered representative for the proposed development based on the distance from the site. The proposed development is located on a B road away from the nearby busy A roads, whereas, the two nearby monitoring sites CA20 and CA23 are located next to the Major London St Pancras/ Kings Cross stations and A503 respectively. As discussed in section 3.2.2 the proposed building extension at the site is located on the fifth-floor level, therefore, likely to experience lower concertation when compared to ground level monitoring sites. Based on this, no data has been presented below from existing monitoring sites.

[25] Department for Environmental Food and Rural Affairs. Accessible at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015
[26] London Borough of Camden (2017): 'LB Camden Air Quality Annual Status Report for 2016'

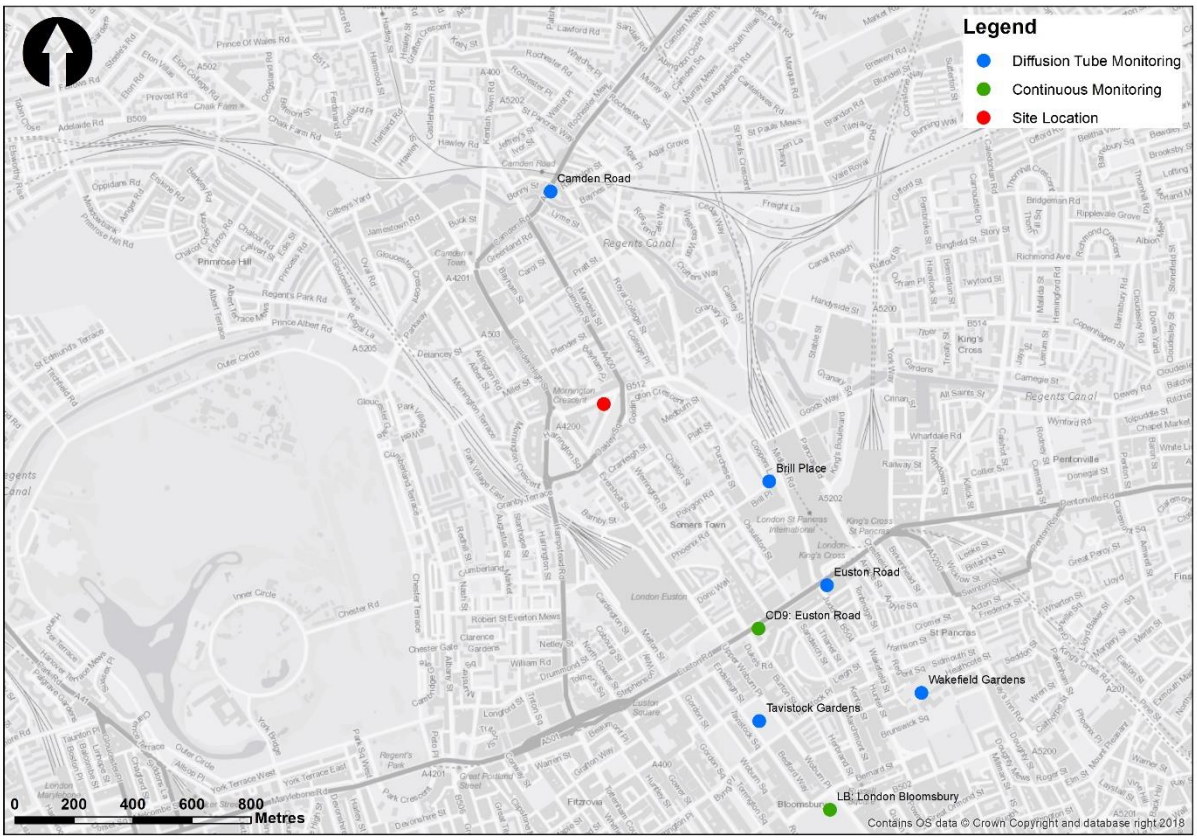

Figure 4.1: Existing nearby monitoring sites

4.3 Defra Background Pollution Concentrations

Defra provides background pollution concentration estimates to assist local authorities undertake their 'Review and Assessment' work. This data is available to download from Defra air quality resource website for NO_x, NO_2, PM_{10} and $PM_{2.5}$ for every 1 km X 1 km grid square for all local authorities. The current dataset is based on 2015 background data and the future year projections are available for 2015 to 2030. The background dataset provides breakdown of pollution concentrations by different sources (both road and non-road sources).

Table 4.3 presents the predicted background concentrations for the study area for the earliest year of occupation (2018) for the relevant receptor locations.

Table 4.1: Defra Projected Background Concentrations (for all receptors)

Pollutant	Concentration (µg/m^3)
NO_2	33.39
PM_{10}	19.73
$PM_{2.5}$	12.37

Note: Data presented within the table are derived from the following ordinance survey grid squares: 529500, 183500.

5. Potential Impacts

5.1 Construction Phase

The construction phase of the proposed development is yet to be decided. For the purpose of this assessment the earliest construction year is assumed to be 2018. The impacts from earthworks, construction and track-out have been considered. It is understood that there will be no demolition involved during the construction phase of the project. In order to assess the worst-case scenario, it has been assumed that all activities will be carried out for the duration of the construction period. Figure 5.1 shows the construction dust assessment study area based on the recommended distances by IAQM.

Magnitude and sensitivity descriptors that have been applied to assess the overall impact of the construction phase are presented in Appendix C.

Table 5.1 presents the potential dust emission magnitude based on project specific construction activities and is based on the criteria presented in Table C 1 within Appendix C. The proposed development will not involve any demolition work; therefore, this has not been considered any further. There are no ecological designated sites within or in close proximity to the study area. Therefore, ecological effects are not considered any further within close proximity.

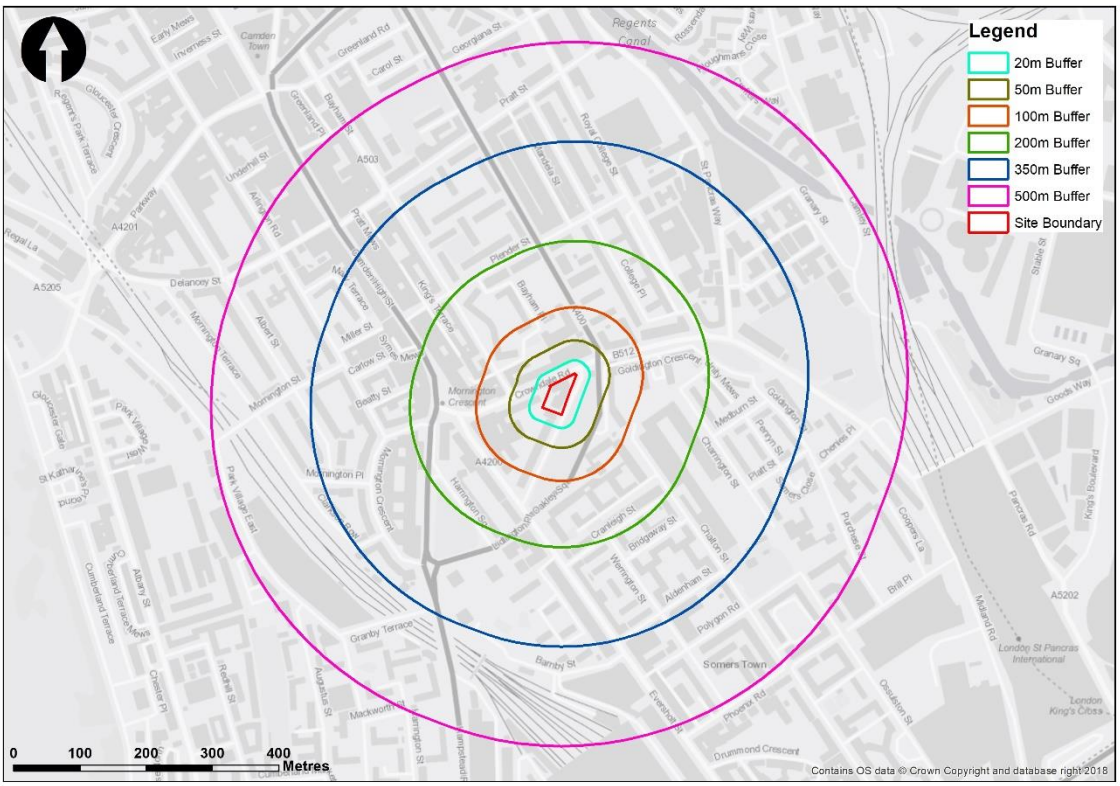

Figure 5.1: Construction assessment buffers

Table 5.1: Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	No emissions from this activity
Earthworks	No emissions from this activity
Construction	Small
Track Out	Medium

Table 5.2 presents the sensitivity of receptors to effects caused by construction activities and is based on the criteria presented in Table C 2 within Appendix C.

Table 5.2: Sensitivity of Study Area

Potential Impact	Sensitivity of the surrounding area			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Dust Soiling	N/A	N/A	High	High
Human Health	N/A	N/A	Low	Low

The overall risk of receptors to dust soiling effects and PM_{10} effects are presented in Table 5.3. Risk is based on the criteria presented in Table C 3 to Table C 6 within Appendix C.

Table 5.3: Summary of the Risk of Construction Effects

Sensitivity of Area	Risk			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Dust Soiling	N/A	N/A	Low Risk	Medium Risk
Human Health	N/A	N/A	Negligible	Low Risk

Based on the above, the largest risk associated with all construction activities are considered to be 'Medium Risk' with regards to dust soiling and 'Low Risk' with regards to human health. Based on the outcome of the construction dust assessment, mitigation measures appropriate for the proposed development have been presented in Section 6 Overall, the impacts from disamenity dust and PM_{10} from the construction phase of the proposed development are considered to be not significant.

5.2 Operational Impacts

As discussed in section 3.4, the proposed extension is not anticipated to generate any additional traffic. Therefore, based on the IAQM planning guidance (Appendix B), the operational impacts as a result of the trip generation associated with the proposed development are considered to be negligible.

5.3 Residential Suitability

Based on the methodology described in Section 3, the following section provides the results of the predicted operational phase impact on the proposed new residents.

Table 5.4 to Table 5.6 present forecast NO_2, PM_{10} and $PM_{2.5}$ pollutant concentrations respectively for all residential floors of the proposed development.

Table 5.4 shows the forecast annual mean NO_2 concentrations are below the annual mean AQO for the proposed 5th Floor.

According to Defra LAQM.TG (16) guidance, exceedance of the one-hour NO_2 mean objective is generally unlikely to occur where annual mean concentrations do not exceed 60 µg/m^3. The annual mean NO_2 concentration at all modelled receptors is comfortably lower than 60 µg/m^3 and it is unlikely the one-hour mean will be exceeded for any modelled receptor locations.

Table 5.5 and Table 5.6 show that both PM_{10} and $PM_{2.5}$ predicted annual mean concentrations for all residential floors are well below the relevant AQO.

Defra guidance also provides guidance on calculating the number of exceedances, as a 24-hour mean PM_{10} concentration, of 50 µg/m^3. At all modelled receptors the number of exceedances is below the limit of 35.

Table 5.4: Annual Mean NO_2 Predicted Pollutant Concentrations (µg/m^3) (2019)

Receptor Number	Receptor Number	Receptor Name	NO_2 Average Concentration (µg/m^3)	Relevant AQO (µg/m^3)
R1	1	Residential Receptor – 5th Floor	34.67	40
R2	2	Residential Receptor – 5th Floor	34.62	40
R3	3	Residential Receptor – 5th Floor	34.44	40
R4	4	Residential Receptor – 5th Floor	34.48	40
R5	5	Residential Receptor – 5th Floor	34.39	40
R6	6	Residential Receptor – 6th Floor	31.43	40
R7	7	Residential Receptor – 6th Floor	31.18	40
R8	8	Residential Receptor – 6th Floor	31.27	40
R9	9	Residential Receptor – 6th Floor	30.97	40
R10	10	Residential Receptor – 6th Floor	30.91	40

Table 5.5: Annual Mean PM_{10} Predicted Pollutant Concentrations (µg/m^3) (2019)

Receptor Number	Receptor Number	Receptor Name	PM_{10} Average Concentration (µg/m^3)	Relevant AQO (µg/m^3)

R1	1	Residential Receptor – 5th Floor	19.64	40
R2	2	Residential Receptor – 5th Floor	19.64	40
R3	3	Residential Receptor – 5th Floor	19.63	40
R4	4	Residential Receptor – 5th Floor	19.63	40
R5	5	Residential Receptor – 5th Floor	19.63	40
R6	6	Residential Receptor – 6th Floor	18.96	40
R7	7	Residential Receptor – 6th Floor	18.96	40
R8	8	Residential Receptor – 6th Floor	18.94	40
R9	9	Residential Receptor – 6th Floor	18.94	40
R10	10	Residential Receptor – 6th Floor	18.94	40

Table 5.6: Annual Mean $PM_{2.5}$ Predicted Pollutant Concentrations (µg/m³) (2019)

Receptor Number	Receptor Number	Receptor Name	$PM_{2.5}$ Average Concentration (µg/m³)	Relevant AQO (µg/m³)
R1	1	Residential Receptor – 5th Floor	12.22	25
R2	2	Residential Receptor – 5th Floor	12.22	25
R3	3	Residential Receptor – 5th Floor	12.22	25
R4	4	Residential Receptor – 5th Floor	12.22	25
R5	5	Residential Receptor – 5th Floor	12.21	25
R6	6	Residential Receptor – 6th Floor	12.06	25
R7	7	Residential Receptor – 6th Floor	12.06	25
R8	8	Residential Receptor – 6th Floor	12.06	25
R9	9	Residential Receptor – 6th Floor	12.06	25
R10	10	Residential Receptor – 6th Floor	12.04	25

6. Proposed Mitigation Measures

6.1 Construction Phase Mitigation Measures

Mitigation measures have been set out in Appendix E in accordance with mitigation measures set out in the IAQM guidance for construction dust to reduce the potential impacts presented in Section 5.

The risks of construction activities in relation to dust soiling were deemed 'Low Risk' to 'Medium Risk' and all risks to human health were also deemed 'Low Risk'. Therefore, it is recommended that the mitigation measures appropriate to mitigate 'Low Risk' to 'Medium Risk' effects as proposed in Appendix E are applied during the construction phase. It is understood that the measures listed in Appendix D will be formally agreed with LBC as part of a Construction Management Plan (CMP) through a planning condition.

As part of the overall management of dust effects, air quality monitoring will be undertaken during the construction phase in liaison with the Council's Environmental Protection Team, to enable on-going and proactive management of any adverse effects.

Continuous unattended dust monitoring will be undertaken at 2no. locations on site, with final locations selected in agreement with LBC.

It is proposed that continuous unattended PM_{10} monitoring is carried out using Environment Agency MCERT certified continuous monitoring systems fitted with internet servers. In addition, the monitoring system should be capable of the following:

- real-time analysis of particle concentrations;
- webserver internet access allowing access to current and historic levels;
- programmable alert messages if power or connection is lost; and
- programmable site actions levels to enable alert messages to be sent if action levels are exceeded.

Monitoring data will be communicated in a monthly report containing presentation of the continuous monitoring data, with assessment of measured dust levels against agreed site thresholds.

The Mayor of London's SPG - The Control of Dust and Emissions during Construction and Demolition advises that a trigger level of 250 μgm^{-3} set as a 15-minute mean should be adopted.

In addition to a site trigger level, PM_{10} monitoring results can also be compared with pre- construction ambient levels and with AQO limit values, whereby the daily mean limit value of 50 μgm^{-3} must not be exceeded more than 35 times in a calendar year, and an annual mean level of 40 μgm^{-3} must not be exceeded.

The timescale for the proposed construction phase is yet to be determined and this will be confirmed within the EMP. It is proposed that a minimum of 1-month baseline monitoring should be carried out followed by the construction phase monitoring for the duration of the construction period.

As discussed in section, 2.2.4, AQO are based upon exposure to PM_{10} concentrations in those locations where members of the public are regularly present for the averaging period of the objective. The health of people in the workplace is addressed through health and safety legislation.

6.2 Operational Phase Mitigation Measures

No specific mitigation measures are considered necessary beyond that already included in the project design.

7. Conclusion

This report provides an assessment of the following potential key impacts associated with the construction and operational phases of the proposed residential development at St Matthews Lodge, 50 Oakley Square, NW1 1NB:

- Nuisance, loss of amenity and health impacts associated with the construction phase of the development on sensitive receptors;
- Changes in traffic related pollutant concentrations associated with the operational phase of the proposed development; and
- Residential suitability of the proposed development location to introduce new receptors.

A qualitative assessment of construction dust effects has been undertaken for the proposed scheme. The construction phase is predicted to have a 'Low Risk' to 'Medium Risk' of nuisance and/or loss of amenity impacts due to dust nuisance. However, the risk of dust nuisance can be mitigated by implementing the appropriate mitigation measures listed in Appendix D. In summary, the impact of construction dust is not considered significant.

The development will not generate significant additional road traffic during the operational phase as there will be no changes to the existing car parking provision.

Proposed residential receptors will be located on the fifth floor and away from nearby busy roads. Based on the air quality dispersion modelling results, the proposed development is considered appropriate for the introduction of new receptors.

It can therefore be concluded that the proposed development is not considered to conflict with any national, regional, or local planning policy in relation to construction and operation phase dust and air quality nuisance.

Appendix A: Key Pollutants

A1. Nitrogen Dioxide (NO_2)

Nitrogen dioxide (NO_2) and nitric oxide (NO) are collectively referred as oxides of nitrogen (NOx). During fuel combustion, atmospheric nitrogen combines with oxygen to form nitric oxide (NO), which is not considered harmful. Through, a chemical reaction with ozone (O_3), however NO can further combine with oxygen to create NO_2 which is harmful to human health and vegetation. The foremost sources of NO_2 in the UK are from combustion sources produced mainly by road traffic and power generation.

A2. Particulate Matter

Particulate matter is a term which refers to a mixture of solid particles and liquid droplets found in the air. These particles come in many sizes and shapes and can be made up of hundreds of different chemicals. Some particles, such as dust, dirt, soot, or smoke, are large or dark enough to be seen with the naked eye. Others can be so small that they can only be detected using an electron microscope. Fine dust, essentially particles up to 10 micron (µm), is commonly referred to as PM_{10}.

PM_{10} is known to arise from a number of sources such as construction sites, road traffic movement, industrial and agricultural activates. Very fine particles ($PM_{2.5}$ – $PM_{0.1}$) are known to be associated with pollutants such as oxides of nitrogen (NOx) and sulphur dioxide (SO_2) emitted from power plants, industrial installation and road transport sources.

PM2.5 is generally associated with combustion and traffic sources and is more likely to be associated with the operational phase of the proposed development.

A3. 'Disamenity' Dust

'Dust' is generally regarded as particulate matter up to 75 µm (micron) diameter and in an environmental context can be considered in two categories, according to size: coarser dust (essentially particles greater than 10 µm) and fine particulate matter (PM_{10} and $PM_{2.5}$) as set out above.

Coarser dust (essentially particles greater than 10 µm) is generally regarded as 'disamenity dust' and can be associated with annoyance, although there are no official standards (such as AQO) for dust annoyance. Disamenity dust is more readily described than defined as it relates to the visual impact of short-lived dust clouds and the long-term soiling of surfaces.

Although it is a widespread environmental phenomenon, dust is also generated through many human activities including industrial and materials handling sites, construction and demolition sites and roads. Dust is generally produced by mechanical action on materials and is carried by moving air when there is sufficient

energy in the airstream. More energy is required for dust to become airborne than for it to remain suspended.

Appendix B: Operational Impact Assessment Methodology

The EPUK & IAQM guidance refers to the Town and Country Planning (Development Management Procedure) Order (England) 2010 [(Wales) 2012] for a definition of a 'major' development when scoping assessments required for the planning process. Based on the guidance, a 'major' development is such development where:

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

It is recommended that consideration should be given to reduce impacts from any 'major' developments by considering:

- The impact of existing sources in the local area on the proposed development; and
- The impacts of the proposed development on the local area.

The assessment process involves two stages where:

Stage 1 scope out the need for an air quality assessment and **Stage 2** provide guidance of determining the level of assessment required for a project.

Table B 1 below sets out the Stage 1 criteria to determine the need to assess impacts arising from small developments and Table B 2 provides more specific guidance as to when an air quality assessment is likely to be required to assess the impacts of the proposed development on the local area.

Table B 1: Stage 1 Criteria to proceed to Stage 2

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

Table B 2: Indicative Criteria for Requiring an Air Quality Assessment

The development will	Indicative Criteria to Proceed to an Air Quality Assessment
1. Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors. (LDV = cars and small vans <3.5t gross vehicle weight).	A change of LDV flows of: - more than 100 AADT within or adjacent to an AQMA - more than 500 AADT elsewhere.
2. Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors. (HDV = goods vehicles + buses >3.5t gross vehicle weight).	A change of HDV flows of: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere.
3. Realign roads, i.e. changing the proximity of receptors to	Where the change is 5m or more and the road is within an AQMA.
4. Introduce a new junction or remove an existing junction near to relevant receptors.	Applies to junctions that cause traffic to significantly change vehicle accelerate/decelerate, e.g. traffic lights, or roundabouts.
5. Introduce or change a bus station.	Where bus flows will change by: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere.
6. Have an underground car park with extraction system.	The ventilation extract for the car park will be within 20 m of a relevant receptor. Coupled with the car park having more than 100 movements per day (total in and out).
7. Have one or more substantial combustion processes, where there is a risk of impacts at relevant receptors. **NB. this includes combustion plant associated with standby emergency generators (typically associated with centralised energy centres) and shipping.**	Typically, any combustion plant where the single or combined NO_x emission rate is less than 5 mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion. In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates. Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable.

Appendix C: Construction Dust Assessment Criteria

IAQM guidance framework on assessing the risk of dust proposes the construction phase should be split into phases dependent on their potential impacts, determining the risk for each individually. Therefore, this assessment has determined the risk of the four construction categories put forward by the IAQM guidance:

- Demolition;
- Earthworks;
- Construction; and
- Track out (transport of dust and dirt onto the public road network).

The IAQM guidance framework states that the risk of dust impacts from the four categories can be defined as 'negligible', 'low risk', 'medium risk' or 'high risk' depending upon the scale and nature of the construction activity and the sensitivity and proximity of receptors to the construction site boundary. This categorisation is used to put forward appropriate mitigation measures, reducing the level of effects from the dust impacts so they are not significant.

The assessment of dust impacts using the IAQM guidance considers three separate effects from dust:

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

Step 1 of the assessment is set out to screen for the requirement for a more detailed assessment for the proposed development. The screening criteria states:

A 'human receptor' within:

- 350 m of the boundary of the application site; or
- 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

An 'ecological receptor' within:

- 50 m of the boundary of the application site; or
- 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

Where there are no receptors and the level of risk is deemed 'negligible', there is no need for further assessment.

Step 2A of the assessment enables the overall dust emission magnitude (small, medium or large) from each dust source (demolition, earthworks, construction and trackout) to be identified in relation with the criteria outlined in Table C 1.

Table C 1: Dust emission magnitude

Source	Large	Medium	Small
Demolition	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.	Total building volume 20,000 m^3 – 50,000 m^3, potentially dusty construction material, demolition activities <10 – 20 m above ground level.	Total building volume <20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months.
Earthworks	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.	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.	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 <20,000 tonnes, earthworks during wetter months.
Construction	Total building volume >100,000 m^3, on site concrete batching or sandblasting.	Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete), on site concrete batching.	Total building volume <25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).
Track out	>50 HDV (>3.5t) outward movements[a] in any one day[b], potentially dusty surface material (e.g. high clay content), unpaved road length >100 m.	10-50 HDV (>3.5t) outward movements[a] in any one day[b], moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m.	<10 HDV (>3.5t) outward movements[a] in any one day[b], surface material with low potential for dust release, unpaved road length <50 m.

Notes: [a] Vehicle movement is a one-way journey. i.e. from A to B, and excludes the return journey.

[b] HDV movements during a construction project vary over its lifetime, and the number of movements is the maximum not the average.

Step 2B allows for the sensitivity of the area (high, medium or low) to be assessed and takes into account a number of factors:

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

Receptor sensitivity has been based on the highest of any criteria being met thus, the assessment is considered as robust. The sensitivity of the area is further determined for dust soiling, human health and ecosystem effects by considering the criteria presented in Table C 2.

Table C 2: Magnitude of Receptor Sensitivity

Source	High	Medium	Low
Sensitivities of people to dust soiling effects	• Users can reasonably expect enjoyment of a high level of amenity; or • The appearance, aesthetics or value of their property would be diminished by soiling; and • The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. • Indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks[b] and car showrooms.	• Users would expect[a] to enjoy a reasonable level of amenity, but would not reasonably expect[a] to enjoy the same level of amenity as in their home; or • The appearance, aesthetics or value of their property could be diminished by soiling; or • The people or property wouldn't reasonably be expected[a] to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. • Indicative examples include parks and places of work.	• The enjoyment of amenity would not reasonably be expected[a]; or • Property would not reasonably be expected[a] to be diminished in appearance, aesthetics or value by soiling; or • There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. • Indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks[b] and roads.

Sensitivities of people to health effects of PM_{10}	• Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).[c] • Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	• Locations where the people exposed are workers[d], and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • Indicative examples include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.	• Locations where human exposure is transient.[e] • Indicative examples include public footpaths, playing fields, parks and shopping streets.
Sensitivities of receptors to ecological effects	• Locations with an international or national designation and the designated features may be affected by dust soiling; or • Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain. • Indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site	• Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or • Locations with a national designation where the features may be affected by dust deposition. • Indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.	• Locations with a local designation where the features may be affected by dust deposition. • Indicative example is a local Nature Reserve with dust sensitive features.

	containing concrete (alkali) buildings.

Notes: [a] People's expectations will vary depending on the existing dust deposition in the area, see Section 4.2.

[b] Car parks can have a range of sensitivities depending on the duration and frequency that people would be expected to park their cars there, and the level of amenity they could reasonably expect whilst doing so. Car parks associated with work place or residential parking might have a high level of sensitivity compared to car parks used less frequently and for shorter durations, such as those associated with shopping. Cases should be examined on their own merits.

[c] This follows Defra guidance as set out in LAQM.TG (09).

[d] Notwithstanding the fact that the air quality objectives and limit values do not apply to people in the workplace, such people can be affected to exposure of PM_{10}. However, they are considered to be less sensitive than the general public as a whole because those most sensitive to the effects of air pollution, such as young children are not normally workers. For this reason workers have been included in the medium sensitivity category.

[e] There are no standards that apply to short-term exposure, e.g. one or two hours, but there is still a risk of health impacts, albeit less certain.

[f] Cheffing C. M. & Farrell L. (Editors) (2005), The Vascular Plant. Red Data List for Great Britain, Joint Nature Conservation Committee.

The final step, step 2C allows for the risk of impacts to be defined. The dust emission magnitude derived in step 2A is combined with the sensitivity of the area defined in step 2B to determine the risk of effects on:

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

The criteria for each of the dust sources are presented in Table C 3, Table C 4, Table C 5 and Table C 6.

Table C 3: Demolition

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

Table C 4: Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk

Low	Low Risk	Low Risk	Negligible

Table C 5: Construction

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

Table C 6: Track out

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

Appendix D: Mitigation Measures for Construction Impacts

Mitigation measures set out are from IAQM guidance for construction dust and are appropriate for the mitigation of 'Low Risk' to 'Medium Risk' effects as proposed below:

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Develop a Dust Management Plan.
- Display the name and contact details of person(s) accountable for air quality pollutant emissions and dust issues on the site boundary.
- Display the head or regional office contact information.
- Record and respond to all dust and air quality pollutant emissions complaints.
- Make a complaints log available to the local authority when asked.
- Carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the local authority when asked.
- Increase the frequency of site inspections by those accountable for dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions and dust are being carried out, and during prolonged dry or windy conditions.
- Record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and the action taken to resolve the situation is recorded in the log book.
- Plan site layout: machinery and dust causing activities should be located away from receptors.
- Erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on site.
- Fully enclosure site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Install green walls, screens or other green infrastructure to minimise the impact of dust and pollution.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials from site as soon as possible.
- Cover, seed or fence stockpiles to prevent wind whipping.
- Carry out regular dust soiling checks of buildings within 100m of site boundary and cleaning to be provided if necessary.
- Agree monitoring locations with the Local Authority.
- Where possible, commence baseline monitoring at least three months before phase begins.
- Put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly.
- Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone.
- Ensure all non-road mobile machinery (NRMM) comply with the standards set within this guidance.
- Ensure all vehicles switch off engines when stationary – no idling vehicles.
- Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where possible.

- Impose and signpost a maximum-speed-limit of 10mph on surfaced haul routes and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).
- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter mitigation (using recycled water where possible).
- Use enclosed chutes, conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
- Reuse and recycle waste to reduce dust from waste materials.
- Avoid bonfires and burning of waste materials.
- Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- Regularly use a water-assisted dust sweeper on the access and local roads, as necessary, to remove any material tracked out of the site.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are securely covered to prevent escape of materials during transport.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems and regularly cleaned.
- Inspect haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10m from receptors where possible.
- Apply dust suppressants to locations where a large volume of vehicles enter and exit the construction site.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery'.
- For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

Appendix E: Model Verification

The model verification process includes checks which are carried out to determine the performance of a dispersion model and ensure monitoring results are not bias due to any model uncertainties. Uncertainties are associated with multiple modelling inputs including:

- traffic flows,
- speeds and vehicle splits;
- emissions estimates;
- background concentrations;
- meteorological data; and
- surface roughness, length and terrain.

Model verification is mainly undertaken by comparing modelled results with monitoring data. Uncertainties and differences in data can be identified and resolved by model refinement or adjustment of the model output using a verification factor. The verification factor can be calculated in accordance with the LAQM TG (16) guidance. Model verification was only carried out for nitrogen dioxide (NO_2) as no suitable background concentrations for PM_{10} and $PM_{2.5}$ were found for the modelled road network.

D1. Methodology

Based on the LAQM TG (16) guidance produced by Defra, verification of NO_2 concentrations has been carried out using data collected at diffusion tube monitoring sites near the proposed development. Table D.1 presents the monitoring data used within the model verification for NO_2.

Table D.1: Relevant NO_2 Monitoring Data Used for Model Verification

Site name	Monitor type	2016 NO_2 Annual Mean ($\mu g/m^3$), annualised and bias corrected
CA23 - Camden Road	Diffusion tube	61.7

Table D.2 presents the Defra background concentrations used within the model. Road contributions were not removed from background concentrations to ensure a worst-case scenario.

Table D.2: Relevant Background Concentrations Used for Model Verification

Verification Site Name	2016 NO_x Background Annual Mean ($\mu g/m^3$)	2016 NO_2 Background Annual Mean ($\mu g/m^3$)
CA23 - Camden Road	56.1	22.1

C2. Verification Results

Table D 3 presents the monitored and modelled annual mean NO_2 concentrations along with the percentage difference after verification method was applied. An adjustment factor was then derived by comparing the modelled road NO_x contribution against the monitored road NO_x contribution.

Table D 3: Comparison of monitored and modelled road NO_2 contribution

Site name	Monitored NO_2 ($\mu g/m^3$)	Modelled NO_2 ($\mu g/m^3$)	Difference in percentage
CA23 - Camden Road	61.7	34.8	-43.6

Based on the methodology presented in LAQM TG (16) guidance, an adjustment factor of 3.73 was estimated and applied to all road NO_x contributions to take account for systematic bias.

Appendix F: Site Drawings

[Please see the latest submitted drawings as part of this planning application package]