125 Shaftesbury Avenue

Air Quality Assessment

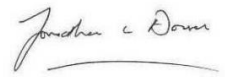
SEPTEMBER 2016

Client Name:	Almacantar Shaftesbury S.á.r.l
Document Reference:	WIE10216-6-3-1-ES
Project Number:	WIE10216

Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2008, BS EN ISO 14001: 2004 and BS OHSAS 18001:2007)

Issue	Date	Prepared by	Checked by	Approved by
Second	August 2016	Guido Pellizzaro Associate Director	Chris Brownlie Principal Consultant	Jonathan Dosser Technical Director



Comments

Comments

Disclaimer

This report has been prepared by Waterman Infrastructure & Environment Limited, with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporation of our General Terms and Condition of Business and taking account of the resources devoted to us by agreement with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

Contents

Tables

Appendices

Executive Summary

Almacantar Shaftesbury S.á.r.l is seeking to obtain full planning permission for the proposed refurbishment and extension of the existing building at 125 Shaftesbury Avenue located within the London Borough of Camden.

A qualitative assessment of dust effects arising during the demolition and construction phase has been carried out. With the implementation of a range of appropriate site management practices to control dust emissions, the likely effects associated with construction activities are not significant.

The air quality effect of construction vehicles entering and leaving the site during the construction period would be not significant, in the context of local background pollutant concentrations and existing local road traffic emissions.

In accordance with the London Plan all construction plant would need to adhere to the emissions standards for NO_2 and PM_{10} set out for Non-Road Mobile Machinery (NRMM). The NRMM emissions standards are likely to be included as part of the planning conditions attached to a planning permission for the development, as such it is considered the likely effect on local air quality would be not significant.

All construction effects would in any event be localised and temporary.

The development would retain two car parking spaces. In addition, the development would retain office and flexible retail uses which are similar to the existing Site. Based on the Transport Statement the development once operational is only predicted to result in an additional 14 vehicular trips per day relating to additional servicing vehicles but a reduction of six vehicles for the retail element (resulting in an overall change of eight vehicles). This change is unlikely to increase road traffic emissions, and as such an air quality assessment of the traffic emissions has not been undertaken because the likely effect of the development on air quality is not significant.

The existing heating and energy plant at the site would be replaced by newer / more efficient plant. Consequently, computer modelling has been carried out to predict the likely effect of the heating and energy plant emissions from the operation of the completed development and the likely effects of these plant on local air quality. The effect of the development on air quality has been predicted for the closest residential receptor to the development located on Phoenix Street and Charing Cross Road, and across a 1km grid centred on the site. The detailed design of the heating and energy plant is not complete at this stage; however, the assessment has been undertaken based on the maximum plant required to operate the development, as recommended by the M&E consultants.

The results of the computer modelling demonstrate that the overall likely effect of the development on local air quality is not significant.

1. Introduction

Waterman Infrastructure & Environment Limited ('Waterman') was instructed by Almacantar Shaftesbury S.á.r.l (the 'Applicant') to undertake an Air Quality Assessment for the proposed refurbishment and extension of the existing building (the 'Development') at 125 Shaftesbury Avenue (the 'Site'), located within the London Borough of Camden (LBC).

The Site is approximately 0.354ha in area, centred on Ordnance Survey Grid Reference 529930, 181120. It is currently occupied by a split level six to nine storey building, with a lower ground floor and lower basement level. The site is bound by Phoenix Street to the north, Stacey Street to the east, Shaftesbury Avenue to the south-east and Charing Cross Road to the west.

The Development would comprise land uses that would be of a similar nature to those currently existing at the Site (flexible retail and office use), albeit that the Development would result in a net increase in 5,216m^2 (B1) office land use; and a net decrease in 1,102m^2 (A1-A3) flexible retail land uses.

The Development would retain two car parking spaces. Based on the Transport Statement the development once operational is only predicted to result in an additional 14 vehicular trips per day associated with servicing vehicles but a reduction of six vehicles for the retail element. Overall there would be a change of eight vehicles per day. This change is unlikely to lead to any increase in road traffic exhaust emissions. Consequently, the air quality assessment does not include an assessment of the traffic emissions because the likely effect of the Development from this source is not significant.

This report provides a review of the existing air quality at and surrounding the Site and assesses the potential effect of the Development on local air quality during construction and on completion. In particular, consideration is given to the effects of potential emissions from construction activities, as well as the effect of emissions from heating and energy plant associated with the completed and operational Development on the surrounding area. As above, an assessment of road traffic emissions is excluded from the air quality assessment. The assessment is based on indicative heating plant data provided by the Project M&E Consultants (Long and Partners). The most significant pollutants associated with gas-fired heating and energy plant are nitrogen oxides (NO_X) from which nitrogen dioxide (NO_2) is produced which has the potential to lead to adverse health effects; therefore, the assessment focuses on these pollutants.

Section 2 of this report provides a summary of legislation and planning policy relevant to air quality. Section 3 provides details of the assessment methodology and significance. Section 4 sets out the baseline conditions at and around the Site. The results of the assessment are presented in Section 5 and Section 6 describes any required mitigation measures. A summary of the main findings and conclusions of the assessment is provided in Section 7.

2. Air Quality Legislation and Planning Policy

2.1 Legislation

2.1.1 EU Framework Directive 2008/50/EC, 2008

Air pollutants at high concentrations can have adverse effects on the health of humans and ecosystems. European Union (EU) legislation on air quality forms the basis for UK legislation and policy on air quality.

The EU Framework Directive 2008/50/EC[1] on ambient air quality assessment and management came into force in May 2008 and was implemented by Member States, including the UK, by June 2010. The Directive aims to protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants.

2.1.2 Air Quality Standards Regulations, 2010

The Air Quality Standards Regulations[2] implement Limit Values prescribed by the EU Framework Directive 2008/50/EC. The Limit Values are legally binding and the Secretary of State, on behalf of the UK Government, is responsible for their implementation.

2.1.3 The UK Air Quality Strategy, 2007

The current UK AQS was published in July 2007[3] sets out new objectives for local planning authorities (LPA) in undertaking their LAQM duties. The 2007 UK AQS introduced a national level policy framework for exposure reduction for fine particulate matter. Objectives in the UK AQS are in some cases more onerous than the Limit Values set out within the relevant EU Directives and the Air Quality Standards Regulations 2010. In addition, objectives have been established for a wider range of pollutants.

Currently it is a LPA's responsibility to determine the effect of a development against the UK AQS objectives, as such the UK Air Strategy Objectives of air pollutants relevant to this assessment are summarised in **Table 1**.

1 Council Directive 2008/50/EC of 21 May 2008 on ambient air quality and cleaner air for Europe.
2 Defra, (2010) The Air Quality Standards (England) Regulations.
3 Department of the Environment, Food and Rural Affairs (Defra), (2007). 'The Air Quality Strategy for England, Scotland, Wales & Northern Ireland'.

Table 1: Summary of Relevant Air Quality Limit Values and UK AQS Objectives

Pollutant	Objective / Limit Value		Date by which Objective to be Met
	Concentration	Measured As	
Nitrogen Dioxide (NO_2)	200µg/m^3	1 hour mean not to be exceeded more than 18 times per year	31/12/2005
	40µg/m^3	Annual Mean	31/12/2005
Particulate Matter (PM_{10}) [(a)]	50µg/m^3	24 hour mean not to be exceeded more than 35 times per year	31/12/2004
	40µg/m^3	Annual Mean	31/12/2004
Particulate Matter ($PM_{2.5}$) [(b)]	Target of 15% reduction in concentrations at urban background locations*	Annual Mean	Between 2010 and 2020
	25µg/m^3	Annual Mean	01/01/2020

Notes: [a)] Particulate matter with a mean aerodynamic diameter less than 10 microns (µm).

[(b)] Particulate matter with a mean aerodynamic diameter less than 2.5 microns (µm).

* Aim to not exceed 18µg/m^3 by 2020.

There are currently no statutory UK standards in relation to deposited dust and its propensity to cause nuisance. However, a deposition rate of 200mg/m^2/day (averaged over a month) is sometimes used as a threshold value for potentially significant nuisance effects[4].

2.1.4 Environment Act, 1995

In a parallel process, the Environment Act 1995[5], required the preparation of a national air quality strategy setting health-based air quality objectives for specified pollutants and outlining measures to be taken by LPAs in relation to meeting these objectives (the Local Air Quality Management (LAQM) system).

Part IV of the Environment Act 1995 provides a system of LAQM under which LPAs are required to review and assess the future quality of the air in their area by way of a staged process. Should this process suggest that any of the AQS objectives will not be met by the target dates, the LPA must consider the declaration of an Air Quality Management Area (AQMA) and the subsequent preparation of an Air Quality Action Plan (AQAP) to improve the air quality in that area in pursuit of the AQS objectives.

LBC has designated the entire Borough as an AQMA for annual mean NO_2 and 24-hour mean PM_{10}. Details of LBC's Air Quality Action Plan and a summary of the LBC review and assessment of air quality are provided later in this Chapter.

4 Bate, K.J. and Coppin, N.J. (1991), 'Dust effects from mineral workings', Mine and Quarry, 20 (3), 1991, pp31 - 35.
5 Office of the Deputy Prime Minister (ODPM), 1995, 'The Environment Act' 1995.

2.2 National Planning Policy

2.2.1 National Planning Policy Framework, 2012

Paragraph 109 of the National Planning Policy Framework (NPPF)[6] identifies that the planning system should aim to conserve 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 land, air, water or noise pollution or land instability.*"

Furthermore, paragraph 124 states:

"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 effects 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."

2.2.2 National Planning Policy Framework Planning Practice Guidance, 2014

The Government's online Planning Practice Guidance[7] (PPG) states that air quality concerns are more likely to arise where development is proposed within an area of existing poor air quality, or where it would adversely affect the implementation of air quality strategies and / or action plans.

The PPG notes that when deciding whether air quality is relevant to a planning application, considerations would include whether the development would lead to:

- significant effects on traffic, such as volume, congestion, vehicle speed, or composition;
- the introduction of new point sources of air pollution, such as furnaces, centralised boilers and Combined Heat and Power (CHP) plant; and
- exposing occupants of any new developments to existing sources of air pollutants and areas with poor air quality.

2.3 Regional Planning Policy

2.3.1 The 2015 London Plan with Minor Alterations 2016, Spatial Development Strategy for Greater London

Policy 7.14 'Improving air quality' of the London Plan[8] states that development proposals should:

"A. 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 (see Policy 6.3);

B. 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';

6 Department for Communities and Local Government (DCLG) (2012), 'National Planning Policy Framework', Department for Communities and Local Government, London.
7 DCLG (2014), 'Planning Practice Guidance: Air Quality (ID 32)' (06 March 2014).
8 Greater London Authority (2016): The 2015 London Plan with Minor Alterations 2016, Spatial Development Strategy for Greater London, GLA, London.

C. 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);

D. 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 approach; and

E. 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 effects from the biomass boiler are identified."

2.4 Local Planning Policy

2.4.1 London Borough of Camden's Site Allocations Proposed Submission Document, 2012

The LBC Site Allocations Document[9] states that:

"As set out in the Core Strategy, the Council will support and promote the Central London area of Camden as a successful and vibrant part of the capital to live in, work in and visit. We will:

…continue to designate Central London as a Clear Zone Region to reduce congestion, promote walking and cycling and improve air quality."

2.4.2 London Borough of Camden Core Strategy 2010-2025, 2010

The LBC Core Strategy[10] sets out the key elements of the Council's vision for the Borough. Policy CS9 – 'Achieving a successful Central London' states:

"The Council will support and promote the Central London Area of Camden as a successful and vibrant part of the capital to live in, work in and visit. We will:

…k) continue to designate Central London as a Clear Zone Region to reduce congestion, promote walking and cycling and improve air quality;"

Policy CS16 - Improving Camden's health and well-being states:

"The Council will seek to improve health and well-being in Camden. We will:

…e) recognise the effect of poor air quality on health and implement Camden's Air Quality Action Plan which aims to reduce air pollution levels."

2.4.3 London Borough of Camden Development Policies 2010-2025, 2010

The LBC Development Policies 2010-2025[11] sets out the detailed planning criteria that LBC will use to determine applications for planning permission in the Borough. 'Policy DP32: 'Air quality and Camden's Clear Zone' states:

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

9 LBC, March 2012, 'Camden Site Allocations Proposed Submission Document'
10 LBC, 2010, 'Camden Local Development Framework Camden Core Strategy 2012-2025 - Adopted Version 2010'
11 LBC, November 2010, 'Camden Development Policies 2010-2025 Local Development Framework'

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

The Site is located within the Clear Zone.

2.5 Guidance

2.5.1 Improving Air Quality in the UK: Tackling nitrogen dioxide in our towns and cities UK Overview Document

Defra adopted the 'Improving Air Quality in the UK: Tackling nitrogen dioxide in our towns and cities UK Overview Document' in January 2016[12]. This sets out the plan to improve air quality in the UK by reducing NO_2 emissions in towns and cities as part of the UK's commitment for cleaner air. The air quality improvement plan sets out targeted local, regional and national measures in order to meet the UK's legal obligations to achieve the NO_2 limit values set out in the EU Framework Directive 2008/50/EC. There are 31 specific measure for LBC. The following measures are applicable to the Development:

- Measure 4 - Work in partnership with schools and businesses by providing advice to encourage the adoption of travel plans.
- Measure 14 - Require developers to undertake an air quality assessment (AQA) in circumstances where a new development could have a negative effect on air quality, and provide an air pollution mitigation plan where necessary.
- Measure 15 - Require developers to submit Construction Management Plans in accordance with the London Best Practise Guidance to Control Dust and Emissions from Construction and Demolition. Through onsite pollutant monitoring, ensure that large developments are adhering to the CMP requirements.
- Measure 16 - Continue to use planning conditions and obligations to require developers to adopt measures which will reduce transport emissions, such as requesting travel and business plans, installing electric vehicle recharging infrastructure, and allocating car club bays.
- Measure 18 - Require development sites to meet the Mayor of London's energy hierarchy, with high standards of sustainable building design and construction, and consideration of CHP and renewables. Developers must ensure that best practice requirements for controlling NO_X and PM_{10} emissions from biomass boilers and CHP are met.
- Measure 23 - Reduce emissions from NRMM and other construction sources through best practice measures

2.5.2 Environmental Protection UK & Institute of Air Quality Management Guidance; Land-Use Planning & Development Control: Planning for Air Quality, 2015

Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) Guidance[13] provide guidance for air quality considerations within local development control processes; promoting a consistent approach to the treatment of air quality issues.

12 Defra (2016), 'Improving Air Quality in the UK: Tackling nitrogen dioxide in our towns and cities UK Overview Document' (18 January 2016)

13 Environmental Protection UK & Institute of Air Quality Management (IAQM) (2015), 'Land-use Planning & Development Control: Planning for Air Quality.' May 2015. IAQM, London

The EPUK and IAQM guidance explains how development proposals could adopt good design principals to reduce emissions and contribute to better air quality. The guidance also provides a method for screening the need for an air quality assessment and a consistent approach for describing the effects at individual receptors.

The EPUK and IAQM Guidance advises that:

"*In arriving at a decision about a specific proposed development the local planning authority is required to achieve a balance between economic, social and environmental considerations. For this reason, appropriate consideration of issues such as air quality, noise and visual amenity is necessary. In terms of air quality, particular attention should be paid to:*

- *Compliance with national air quality objectives and of EU Limit Values;*
- *Whether the development will materially affect any air quality action plan or strategy;*
- *The overall degradation (or improvement) in local air quality; or*
- *Whether the development will introduce new public exposure into an area of existing poor air quality.*"

2.5.3 The Mayor's Air Quality Strategy 'Clearing the Air', 2010

The Greater London Authority (GLA) Act 1999[14] required the GLA to produce an Air Quality Strategy (AQS) for Greater London that sets out air quality objectives (to be no less than national objectives) and present measures that the Mayor, GLA and London Boroughs will take towards meeting these objectives. The Mayor's AQS[15] aims to improve air quality within London by targeting the reduction of emissions related to transport and construction. Some of the initiatives proposed include:

- targeted measures for areas with poor air quality; and
- use of the planning system to reduce air pollutant emissions from new developments.

2.5.4 Mayor of London's Supplementary Planning Guides: Sustainable Design and Construction, 2014

The 'Sustainable Design and Construction' Supplementary Planning Guidance[16] (SPG) provides guidance to support the implementation of the London Plan.

Section 4.3 of the SPG focusses on air pollution and the effects from the construction and operation of new developments to ensure that they are 'air quality neutral'. Emission benchmarks are provided within the SPG for:

- emissions from buildings; and
- transport emissions.

Section 4.3.17 and Appendix 5 of the SPG note that two sets of Building Emission Benchmarks (BEBs) have been defined for a series of land-use classes, one for NO_X (nitrogen oxides) and one for PM_{10}. Section 4.3.18 and Appendix 6 of the SPG note that the design of a development should encourage and facilitate walking, cycling and the use of public transport, thereby minimising the generation of air pollutants. The Development would retain only two car parking spaces and the existing building services plant would be replaced by newer / more efficient plant. However, an Air Quality Neutral Assessment has been completed. This concludes the Development would be Air Quality Neutral and that no further

14 Greater London Authority (GLA) (1999) 'Greater London Authority Act 1999' London, 1999.
15 Greater London Authority (2010), 'Clearing the air – The Mayor's Air Quality Strategy', GLA, London.
16 Greater London Authority (2014), 'Sustainable Design and Construction - Supplementary Planning Guidance', Greater London Authority, London.

mitigation measures are required. Details of the Air Quality Neutral Assessment are provided in **Appendix A**.

2.5.5 Mayor of London: 'The Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance', 2014

The 'Control of Dust and Emissions during Construction and Demolition' SPG[17] seeks to reduce emissions of dust, PM_{10} and $PM_{2.5}$ from construction and demolition activities in London. It also aims to manage emissions of NO_X from construction and demolition machinery by means of a new non-road mobile machinery Ultra-Low Emissions Zone (ULEZ). The SPG provides guidance on the implementation of London Plan Policy 7.14 – 'Improving Air Quality', as well as a range of policies that deal with environmental sustainability, health and quality of life.

2.5.6 Local Air Quality Management Policy Guidance LAQM PG(09), 2009

The LAQM Policy Guidance (PG) (09)[18] provides additional guidance on the links between transport and air quality. LAQM.PG(09) describes how road transport contributes to local air pollution and how transport measures may bring improvements in air quality. Key transport-related Government initiatives are set out, including regulatory measures and standards to reduce vehicle emissions and improve fuels, tax-based measures and the development of an integrated transport strategy.

LAQM.PG(09) also provides guidance on the links between air quality and the land use planning system. The guidance advises that air quality considerations should be integrated within the planning process at the earliest stage, and is intended to aid LPAs in developing action plans to deal with specific air quality issues and create strategies to improve air quality. LAQM.PG(09) summarises the means by which the land use planning system can help deliver compliance with the air quality objectives.

2.5.7 Institute of Air Quality Management: Guidance on the Assessment of Dust from Demolition and Construction, 2014

The IAQM Construction Dust Guidance[19] provides guidance to consultants and Environmental Health Officers (EHOs) on how to assess air quality effects from construction related activities. The guidance provides a risk based approach based on the potential dust emission magnitude of the site (small, medium or large) and the sensitivity of the area to dust effects. The importance of professional judgement is noted throughout the guidance. The guidance recommends that once the risk class of the site has been identified, the appropriate level of mitigation measures are implemented to ensure that the construction activities have no significant effects.

2.5.8 London Borough of Camden Air Quality Action Plan, 2013

The LBC Air Quality Action Plan (AQAP), Camden's Clean Air Action Plan 2013-2015 (updated in 2013)[20] sets out a number of measures to deliver improvements to air quality within the Borough. The Plan comprises four themes which are:

- "*Reducing transport emissions;*
- *Reducing emissions associated with new development;*
- *Reducing emissions from gas boilers and industrial processes; and*

17 Mayor of London (2014) 'The Control of Dust and Emissions During Construction and Demolition Supplementary Planning Guidance'
18 Defra (2009), 'Local Air Quality Management Policy guidance PG(09)', DEFRA, London.
19 Institute of Air Quality Management (2014) 'Guidance on the Assessment of dust from demolition and construction.'
20 LBC, 2013, 'Camden's Clean Air Action Plan 2013-2015'

- *Air quality awareness-raising initiatives."*

Within each of these themes are a number of objectives and actions LBC will take to reduce emissions within the Borough.

LBC are currently consulting on their new Draft Clean Air Action Plan for 2016-2018[21].

2.5.9 London Borough of Camden Guide for Contractors Working in Camden, 2008

LBC have produced a guide[22] to reduce disturbances due to dust and smoke arising from demolition and construction work on all building sites within the Borough. The document sets out Best Practice Means (BPM) to mitigate dust emissions from construction sites these include:

"a. Carry out demolition and construction work in accordance with the Best Practise Guidance Note 'The control of dust and emissions from construction and demolition' (2006). This outlines BPM to effectively manage construction work in order to mitigate air pollution emissions.

b. When carrying out demolition or construction work during periods of dry or windy weather, there can often be dust problems on sites bordered by homes. You must take measures to reduce the formation and spread of dust. You must control dust at source by using a continuous fine-water spray. You must provide a suitable water supply, and make sure there are enough hoses to reach all parts of the site and a way of getting rid of wastewater.

c. There must be adequate screening and damping down during all demolition activities, sandblasting, clearance work, breaking up of existing ground services and other site preparations and activities. You must use existing features of the site, such as boundary walls to provide screening where practicable.

d. You must enclose scaffolding with appropriate sheeting material.

e. You must provide easy-to-clean hard-standings for vehicles.

f. You must keep heavily used areas clean by brushing vehicles and spraying them with water regularly.

g. You must control the cutting or grinding of materials on the site.

i. Buildings or structures that are being demolished, or small areas of land that are being prepared for development must be damped down using high-pressure hoses.

k. On sites where a large amount of dust has been produced and is laying on the ground, you must use a specialist vehicle to remove dust (by vacuuming) before you damp down the site.

l. Major haul routes on the site must be watered as necessary to reduce dust. Where practical, you must compact the route to reduce the amount of soil and other material that is moved around the site. This applies especially near to exits. If machinery movements produce dust, you must set effective speed limits and reschedule work if necessary. If the development involves machinery moving across open land, you must create a suitable track to reduce the amount of dust produced.

m. You must enclose materials at all times, and damp down dusty materials using water sprays during dry weather.

n. All materials that create dust, including soil, must be stored away from the site boundary, screened to prevent wind spreading the dust and damped down where practical. You will need to consider the size and shape of stockpiles to reduce dust.

o. Paved roads near to exits must be kept clean. Vehicles transporting materials onto or off the site must be suitably covered where necessary to prevent dust.

21 LBC, 2016, ' Camden Clean Air Action Plan 2016-18, Draft Action Plan for public consultation, February 2016'.
22 LBC, 2008, 'Guide for Contractors Working in Camden'

p. You must use rubble chutes and skips where appropriate. There must be an effective close-fitting cover over the skip to contain all the dust and other rubbish. The chutes must be continuous until they reach the skip, with no gaps, and maintained in good condition.

q. You must not allow rubbish and waste materials to build up on the site.

r. You must plant, turf or securely cover completed earthworks to stabilise the surface.

s. Reducing dust, fumes or other nuisance or environmental effects, which may cause offence to the local community or environment.

t. Reduce environmental effects which may cause offence to the local community by promoting proactive community relations."

Central London Air Quality Cluster Group, 14 Cost Effective Actions to Cut Central London Air Pollution, 2012The Central London Air Quality Cluster Group consists of the amalgamation of eight central London Boroughs, including LBC, to improve air quality within central London. The 'Cost Effective Actions to Cut Central London Air' guidance23 provides action measures which London Boroughs can implement to improve air quality. Such measures range from business engagement, car clubs, encouraging cycling, to energy efficiency in buildings and ultra-low NOX boilers. The following measures are applicable to the proposed Development:

- New buildings to be air quality neutral;
- New buildings to include a Level 4 BREEAM assessment; and
- Boilers are replaced by ultra-low NO_X models instead of Class 4 or 5.

23 Central London Air Quality Cluster Group, 2012, 'Cost Effective Actions to Cut Central London Air Pollution'

3. Assessment Methodology and Significance

3.1 Assessment Methodology

This air quality assessment was undertaken using a variety of information and procedures as follows:

- review of LBC's air quality Review and Assessment statutory reports published as part of the LAQM regime in order to quantify baseline conditions in the area of the Site;
- review of the local area to identify potentially sensitive receptor locations that could be affected by changes in air quality arising from the construction works and the operation of the Development;
- application of atmospheric dispersion modelling using the ADMS™ model[24] to predict the effects of the Development on local air quality due to the additional emissions that would be generated by the proposed heating and energy plant;
- comparison of the predicted air pollutant concentrations with the relevant AQS objectives;
- determination of the likely significant effects of the operational phase of the Development on air quality, based on the application of the EPUK / IAQM significance criteria to modelled results;
- determination of the effects of proposed demolition and construction activities; and
- identification of mitigation measures, where appropriate.

The main pollutants of concern from the combustion of natural gas are oxides of nitrogen (NO_X) - which consist of nitric oxides (NO) and nitrogen dioxide (NO_2) – and particulate matter (PM), although PM emissions are typically not significant.

Of NO_X, it is NO_2 that is the main pollutant of concern due to its potentially adverse effects on human health. Typically, the proportion of NO_2 in NO_X exhaust emissions from boilers and CHP units is small, as NO_X is mostly emitted as NO. However, once released in the atmosphere, additional NO_2 is formed by the chemical reactions between emitted NO and atmospheric ozone (O_3).

For gas-fired plants emission factors are not provided for PM_{10} because gas-fired plants do not emit any significant quantity of particulates. As shown in **Table A6** of **Appendix B**, the proposed heating and energy plant consist of three gas-fired boilers and one gas-fired CHP, and therefore no emissions have been provided for particulates. Accordingly, the assessment only focuses on NO_X and NO_2 only.

3.1.1 Demolition and Construction Phase Assessment Methodology

Dust Emissions

In line with the Mayor of London's SPG for Sustainable Design and Construction, the assessment of the effects of demolition and construction activities in relation to dust is based on the guidance published by the IAQM (2014) and the following:

- a consideration of planned demolition and construction activities and their phasing; and
- a review of the sensitive uses in the area immediately surrounding the Site in relation to their distance from the Site.

Following the IAQM guidance, demolition and construction activities can be divided into the following four distinct activities:

- Demolition – any activity involved in the removal of an existing building;

24 Cambridge Environmental Research Consultants (CERC), November 2012, Atmospheric Dispersion Modelling System (ADMS) v5.0

- Earthworks – the excavation, haulage, tipping and stockpiling of material, which may also involve levelling the site and landscaping;
- Construction – any activity involved with the provision of a new structure; and
- Trackout – the movement of vehicles from unpaved ground on a site, where they can accumulate mud and dirt, onto the public road network where dust might be deposited.

The IAQM guidance considers three separate dust effects, with the proximity of sensitive receptors being taken into consideration for:

- annoyance due to dust soiling;
- potential effects on human health due to significant increase in exposure to PM_{10}; and
- harm to ecological receptors.

A summary of the four step process that was undertaken for the dust assessment of demolition and construction activities as set out in the IAQM guidance is presented in **Table 2.**

Table 2: Summary of the IAQM Guidance for Undertaking a Construction Dust Assessment

Step		Description
1	Screen the Need for a Detailed Assessment	Simple distance-based criteria are used to determine the requirement for a detailed dust assessment. An assessment will normally be required where there are 'human receptors' within 350m of the boundary of the site and / or within 50m of the route(s) used by construction vehicles on public highway, up to 500m from the site entrance or 'ecological receptors' within 50m of the boundary of the site and / or within 50m of the route(s) used by construction vehicles on public highway, up to 500m from the site entrance.
2	Assess the Risk of Dust Effects	The risk of dust arising in sufficient quantities to cause annoyance and / or health or ecological effects should be determined using three risk categories: low, medium and high based on the following factors: • the scale and nature of the works, which determines the risk of dust arising (i.e. the magnitude of potential dust emissions) classed as small, medium or large; and • the sensitivity of the area to dust effects, considered separately for ecological and human receptors (i.e. the potential for effects), defined as low, medium or high.
3	Site Specific Mitigation	Determine the site specific measures to be adopted at the site based on the risk categories determined in Step 2 for the four activities. For the cases where the risk is 'insignificant' no mitigation measures beyond those required by legislation are required. Where a local authority has issued guidance on measures to be adopted these should be taken into account.
4	Determine Significant Effects	Following Steps 2 and 3, the significance of the potential dust effects should be determined, using professional judgement, taking into account the factors that define the sensitivity of the surrounding area and the overall pattern of potential risks.

Demolition and Construction Vehicle Exhaust Emissions

The IAQM guidance on assessing demolition and construction effects states that:

"*Experience of assessing the exhaust emissions from on-site plant and site traffic suggests that they are unlikely to make a significant effect on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed.*"

Given the area of the Site (0.354ha) and the duration of the construction phase (approximately two years), in accordance with the IAQM guidance, a quantitative assessment of the exhaust emissions from construction traffic is not required, and a qualitative assessment is appropriate.

Construction Plant Emissions

All construction plant now need to comply with the London Low Emission Standards set out for NRMM, as such it is considered that no significant effects are predicted for construction plant and no further consideration is required.

3.1.2 Operational Phase Assessment Methodology

As mentioned in **Section 1: Introduction**, only two car parking spaces within the Development would be retained and the operational Development would not generate any significant traffic (predicted to result in an overall additional eight vehicular trips per day relating to additional servicing vehicles). Therefore, the effects on local air quality from traffic movements generated by the completed Development have not been assessed.

The Development would include heating and energy plant. As such, the air quality assessment takes into account additional pollutant emissions from these plant.

The detailed design of the heating and energy plant is not complete at this stage, however the assessment has been undertaken based on the maximum plant required to operate the Development, as recommended by the M&E consultants. Accordingly, the exact details of the proposed plant (i.e. the final manufacturing plant to be used) is indicative and may change post-planning during detailed design. Any changes to the plant would be agreed with LBC prior to installation.

Model

The likely effects on local air quality from the heating and energy plant emissions generated from the completed and operational Development were assessed using the advanced atmospheric dispersion model, ADMS.

ADMS is a Gaussian atmospheric dispersion model widely used for investigating air pollution from controlled or fugitive emissions. The model is used for a wide range of air quality assessments, from small energy centres in urban areas to large industrial facilities. It is also used to model the dispersion of odours to determine the potential for nuisance at sensitive receptors around installations. The model uses advanced algorithms for the height-dependence of wind speed, turbulence and atmospheric stability which improve the calculations of air pollutant concentrations. It can predict long-term and short-term concentrations, as well as concentration percentiles.

ADMS is developed in the UK by CERC (Cambridge Environmental Research Consultants), and has been extensively validated against field data sets in order to assess various configurations of the model such as flat of complex terrain, line / area / volume sources, buildings, dry deposition, fluctuations and visible plumes. Further information in relation to the model validation is available from the CERC web site at www.cerc.co.uk.

Dispersion modelling of stack emissions from the proposed heating and energy plant was carried out for the year 2014 because this is the latest year for which full monitoring data are available from LBC.

Data relating to the indicative heating and energy plant for the Development were provided by Long and Partners. At this stage the proposed heating and energy plant are likely to include three gas-fired boilers and one gas-fired CHP. For the purposes of the assessment it is assumed that all NO_X is converted to NO_2. Full details of the ADMS modelling study are presented within **Appendix B**.

Potentially Sensitive Receptors

The approach adopted by the UK AQS is to focus on areas at locations at, and close to, ground level where members of the public (in a non-workplace area) are likely to be exposed over the averaging time of the objective in question (i.e. over 1-hour, 24-hour or annual periods). Objective exceedances principally relate to annual mean NO_2 and PM_{10}, and 24-hour mean PM_{10} concentrations, so that associated potentially sensitive locations relate mainly to residential properties and other sensitive locations (such as schools) where the public may be exposed for prolonged periods.

The immediate area surrounding the Site is in commercial land use. The nearest residential properties to the Site are located on Phoenix Street approximately 7m to the north (National Grid Reference: 529929, 181170) and Charing Cross Road approximately 19m to the west (National Grid Reference: 529870, 181138). The potential effect of from emissions from the indicative heating and energy plant has therefore been considered at these selected receptors. The Phoenix Street receptor is five stories in height and has therefore been modelled at each floor level up to 15m above ground level (representing the fifth storey) and the Charing Cross receptor is three stories in height and has therefore been modelled from the first floor (the lowest floor of residential use) up to 9m (representing the third floor) so as to understand the potential effect at its closest location to the heating plant flue.

Given that there are few residential properties in the local area, in addition to the modelling at the selected receptors, for conservatism the emissions from the indicative heating plant has been assessed across a 1km grid centred on the Site (National Grid Reference: 529930, 181120), in order to understand the maximum effect of its operation.

3.2 Determining Significance of Effects

3.2.1 Demolition and Construction

Dust Emissions

The potential effects of construction activities on local air quality were based on professional judgement and with reference to the criteria set out in IAQM's Construction Dust Guidance. Appropriate mitigation that would be implemented to minimise any adverse effects on air quality were also considered. Details of the assessors experience and competence to undertake the dust assessment is provided in **Appendix B**.

The assessment of the risk of dust effects arising from the likely construction activities, as identified by the IAQM's Construction Dust Guidance, is based on the magnitude of potential dust emissions and the sensitivity of the area. The risk category matrix for construction activity types, taken from the IAQM guidance, is presented in **Table 3** to **Table 6**. Examples of the magnitude of potential dust emissions for each construction activity and factors defining the sensitivity of an area are provided in **Appendix B**.

Table 3: Risk Category from Demolition Activities

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 4: Risk Category from Earthworks Activities

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 5: Risk Category from Construction Activities

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 6: Risk Category from Trackout Activities

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

The risk category determined for each construction activity type was used to define the appropriate mitigation measures that should be applied. The IAQM's Construction Dust Guidance recommends that significance is only assigned to the effect after considering mitigation, and assumes that all actions to avoid or reduce the effects are inherent within the design of the development. In the case of construction mitigation, this would be secured through planning conditions, legal requirements or required by regulations.

Experience of implementing mitigation measures for construction activities demonstrates that total mitigation is normally possible. Accordingly, the IAQM guidance recommends that the significance of effects should only be considered post-mitigation where the likely residual effects (in accordance with the above evidence-based theory) would not be 'significant'. It therefore follows that, within this assessment, no significance is identified for the pre-mitigation effects of the construction activities.

Demolition and Construction Vehicle Exhaust Emissions

The significance of the effects of construction vehicle exhaust emissions on air quality is based on professional judgement.

Demolition and Construction Plant Emissions

The significance of the effects from construction plant emissions on air quality is also based on professional judgement, because all construction plant are required to meet the NRMM emissions standards for NO_2 and PM_{10} in the London Plan

3.2.2 Operational Phase

The aforementioned EPUK / IAQM Guidance provides an approach to assigning the magnitude of changes as a result of a development as a proportion of a relevant assessment level, followed by examining this change in the context of the new total concentration and its relationship with the assessment criterion to provide a description of the effect at selected receptor locations.

Table 7 presents the IAQM framework for describing the effects (the change in concentration of an air pollutant) at individual receptors. The term Air Quality Assessment Level (AQAL) is used to include air quality objectives or limit values, where these exist.

Table 7: Effect Descriptors for Individual Receptors

Long term average Concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76 - 94% of AQAL	Negligible	Slight	Moderate	Moderate
95 - 102% of AQAL	Slight	Moderate	Moderate	Substantial
103 - 109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Note: AQAL may be an air quality objective, EU limit value, or an Environment Agency 'Environmental Assessment Level (EAL)'
The table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers. Changes of 0%, i.e. less than 0.5% are described as Negligible.
The table is only to be used with annual mean concentrations

The approach set out in the EPUK / IAQM Guidance provides a method for describing the effect magnitude at individual receptors only. The Guidance outlines that this change may have an effect on the receptor depending on the severity of the effect and other factors that may need to be taken into account. The assessment framework for describing effects can be used as a starting point to make a judgement on the significance of the effect. However, whilst there may be 'slight', 'moderate' or 'substantial' effects described at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances.

Following the approach to assessing significance outlined in the EPUK / IAQM Guidance, the significance of likely residual effects of the completed Development on air quality was established through professional judgement and the consideration of the following factors:

- the geographical extent (local, district or regional) of effects;
- their duration (temporary or long term);
- their reversibility (reversible or permanent);
- the magnitude of changes in pollution concentrations;
- the exceedance of standards (e.g. AQS objectives); and
- changes in pollutant exposure.

4. Baseline Conditions

4.1 London Borough of Camden Review and Assessment Process

Between 1998 and 2001 LBC undertook the first Round of Review and Assessment of air quality[25] which concluded that it was necessary to declare the whole Borough as an AQMA for the annual mean objective for NO_2 and the 24-hour mean objective for PM_{10}.

The Updating and Screening Assessments (USAs) completed in August 2003[26], 2006[27] and 2009[28] concluded that the LBC AQMA designation should remain and no further Detailed Assessment for air quality were required.

The fourth Round of Review and Assessment[29] identified that Camden no longer exceeded the 24-hour mean objective for PM_{10} at three of their automatic monitoring sites. However, LBC attributed this to the change in the methodology used to measure PM_{10} concentrations rather than improvements in emissions, and therefore, the AQMA order remained unchanged.

The fourth Round of Review and Assessment additionally indicated that a number of diffusion tube sites and one automatic site at roadside locations exceeded that the 1-hour mean NO_2 AQS objective. LBC undertook further modelling work to understand the spatial distribution of PM_{10} and NO_2 exceedances across the Borough. The modelling revealed that a number of roads in Camden which experience high volumes of traffic and a large proportion of HGV vehicles, exceeded both short and long term NO_2 and PM_{10} AQS objectives.

The latest air quality report published by LBC as part of the Fifth Round of Review and Assessment[30] confirmed that the NO_2 annual mean AQS objective was still being exceeded at all the Council's automatic monitoring sites and the vast majority of the NO_2 diffusion tube sites. Although the report confirmed that PM_{10} concentrations now meet the AQS objectives at all monitoring sites, no amendment to the AQMA order has been suggested.

4.2 Local Monitoring

LBC currently undertakes air quality monitoring at four automatic monitors within the Borough. The nearest monitor is located on Shaftesbury Avenue approximately 160m north of the centre of the Site and is classified at a roadside location. The monitoring results for NO_2 and PM_{10} at the Shaftesbury Avenue automatic monitor are presented in **Table 8** for the latest years available.

25 LBC, June 1998, 'Statutory Review and Assessment of Air Quality in the London Borough of Camden Stages 1 and 2'
26 LBC, August 2003, 'Second Round of Review and Assessment of Air Quality: Updating and Screening Assessment'
27 LBC, August 2006, 'Third Round of Review and Assessment of Air Quality: Updating and Screening Assessment'
28 LBC, August 2009, '2009 Air Quality Updating and Screening Assessment for London Borough of Camden'
29 LBC, June 2010, '2009 Progress Report for London Borough of Camden'
30 LBC, July 2013, '2013 Air Quality Progress Report for the London Borough of Camden'

Table 8: Monitored Annual Mean Concentrations (µg/m^3) at the Shaftesbury Avenue Automatic Monitoring operated by LBC

Pollutant	Averaging Period	AQS Objective	Year		
			2013	2014	2015
NO_2	Annual Mean	40µg/m^3	**69**	**74**	No Data*
	Hourly Mean	200µg/m^3 not to be exceeded more than 18 times per year	6	1	No Data*
PM_{10}	Annual Mean	40µg/m^3	29	25	23
	No. of Days	50µg/m^3 not to be exceeded more than 3! times per year	17	16	4

Notes: Data obtained from London Air (www.londonair.org.uk)
Exceedances of the AQS Objectives shown in **bold** text
*No monitoring data is available on London Air for NO_2 for the year 2015

The monitoring results in **Table 8** indicate that the annual mean NO_2 objective of 40µg/m^3 was exceeded at the Shaftesbury Avenue automatic monitor in 2013 and 2014. All other objectives were met in all years for all other pollutants.

In addition to the above automatic monitors, NO_2 is measured at 14 locations using diffusion tubes within LBC. The nearest diffusion tube is CA21: Bloomsbury Street located approximately 600m north from the Site and classified as a roadside site. The most recent results from this location are presented in **Table 9**.

Table 9: Monitored Annual Mean NO_2 Concentrations (µg/m^3) at the Bloomsbury Street Automatic Monitoring operated by LBC

Site I.D	Approx. Distance from Site (m)	AQS Objective	2013	2014
CA21: Bloomsbury Street	600	40µg/m^3	**76.1**	**80.8**

Notes: Data obtained from LBC 2015 Updating Screening Assessment
Exceedances of the AQS Objectives shown in **bold text**

The monitoring results in Table 9 indicate that the annual mean NO_2 objective of 40µg/m^3 was exceeded at the Bloomsbury Street automatic monitor in 2013 and 2014.

4.3 Background Pollutant Concentrations

ADMS was used to model pollutant concentrations from the heating plant emissions. To estimate the total concentrations due to the contribution of any other nearby sources of pollution, background pollutant concentrations need to be added to the modelled concentrations. In the absence of modelled traffic emissions, it was assumed that the concentrations of roadside receptors in the vicinity of the Site would be similar to the concentrations measured at the Shaftesbury Avenue automatic monitor (the closest monitor to the Site) as presented in **Table 8** for 2014. This approach is considered conservative; however, it allows the total effects (to include traffic emissions, urban background concentrations and the proposed energy centre) to be predicted. The use of 2014 data is considered worst-case as no year on year improvements in air quality have been taken into account.

5. Demolition and Construction Phase Effects

5.1.1 Dust Emissions

Construction activities of the Development have the potential to affect local air quality through Demolition, Earthworks, Construction and Trackout activities, as described in **Section 3: Assessment Methodology and Significance**.

The Site is located in an area dominated by offices and retail units; however, the nearest residential properties are located at Phoenix Street approximately 7m to the north. There are no ecological receptors within 50m of the boundary of the Site or within 50m of the routes used by construction vehicles. Therefore, ecological effects of dust emissions are not considered further.

Because there are existing receptors within 350m of the boundary of the Site and within 50m of the routes that would be used by construction vehicles on the public highway, a detailed assessment is required to determine the likely dust effects, as recommended by the IAQM guidance on construction dust. The results of this assessment are provided for each main activity (Demolition, Earthworks, Construction and Trackout) below.

The sensitivity of the area to each main activity was based on the number and distance of the nearest sensitive receptors to the activity, and the sensitivity of these receptors to dust soiling and human health.

Based on the criteria set out in **Table A2** of **Appendix B** the sensitivity of the receptors to dust soiling is high and there are estimated to be between 1 and 10 receptors within 20m of the Site. On this basis, as set out in **Table A3** of **Appendix B**, the sensitivity of the area to dust soiling is **medium**.

Based on the criteria set out in **Table A2** of **Appendix B**, the sensitivity of the receptor to human health is high. Because of the estimated 1 to 10 receptors within 20m of the Site and because the 2014 PM_{10} concentrations measured at the Shaftesbury Avenue automatic monitor range between 23 and 29µg/m^3, the sensitivity of the area to human health as set out in **Table A4** of **Appendix B** is **medium**.

Demolition

The top four floors of the existing building at 125 Shaftesbury Avenue would be demolished to facilitate the Development. It is estimated that the total volume of buildings to be demolished is between 20,000 and 50,000m^3. Accordingly, and considering the criteria in **Table A1** in **Appendix B**, the potential dust emissions during demolition activities would be of a medium magnitude.

Earthworks

Based on the Site's area of 0.354ha and considering the criteria in **Table A1** in **Appendix B**, the potential dust emissions during earthworks activities would be of medium magnitude.

Construction

The Development would comprise the construction of two buildings connected at the first floor over Caxton Walk. Based on the estimated total volume of buildings to be constructed being in the range 25,000 to 100,000m^3 and considering the criteria in **Table A1** in **Appendix B**, the potential dust emissions during construction activities would be of medium magnitude.

Trackout

Based on the size of the Site, it is estimated that number of HDVs would range between 10 and 50 HDV trips in any one day. Considering the criteria in **Table A1** in **Appendix B**, the potential for dust emissions due to trackout activities would be of medium magnitude.

Assessment of Dust Risk Categories

The dust risk categories, based on the potential magnitude of dust emissions and the sensitivity of the area to dust, are presented in **Table 10**.

Table 10: Summary of Risk for the Construction Phase

Potential Effect	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium Risk	Medium Risk	Medium Risk	Low Risk
Human Health	Medium Risk	Medium Risk	Medium Risk	Low Risk
Ecological	Low Risk	Low Risk	Low Risk	Negligible

The Site is assessed as being of medium risk with regard to dust soiling and human health for demolition, earthworks and construction activities. In line with the methodology described above, no significance is prescribed to pre-mitigation effects. However, such effects would likely be short-term, episodic, local and adverse. Consequently, mitigation measures would be required to ensure that adverse effects are minimised, reduced and, where possible, eliminated.

5.1.2 Demolition and Construction Vehicle Exhaust Emissions

Construction vehicles and plant operating on the Site would have the potential to increase local air pollutant concentrations, particularly in respect of NO_2 and particulate matter (both PM_{10} and $PM_{2.5}$).

Based on the size of the Site, it is estimated that the number of Heavy Goods Vehicles (HDV) would range between 10 and 50 trips in any one day. Therefore, emissions from construction traffic would be relatively small compared to existing road traffic emissions on the local network (15,119 daily vehicles, including 535 HGVs on the A400 in 2015[31]).

Taking into account the existing traffic movements and background pollutant concentrations around the Site, the potential effect of construction vehicles on air quality would, in the worst-case, result in a short term, local, adverse effect of **minor significance** during the construction period.

5.1.3 Demolition and Construction Plant Emissions

In accordance with the London Plan, all NRMM would need to adhere to the emissions standards for NO_2 and PM_{10}. Consequently, the effect of demolition and construction plant would be **not significant**.

[31] www.dft.gov.uk/traffic-counts

6. Operational Phase Effects

As mentioned in **Section 1: Introduction**, the Development would retain two car parking spaces. In addition, the Development would retain office and flexible retail uses which are similar to the existing Site. Based on the Transport Statement the development once operational is only predicted to result in an additional 14 vehicular trips per day associated with servicing vehicles but a reduction of six vehicles for the retail element. Overall there would be a change of eight vehicles per day. This change would be unlikely to increase road traffic exhaust emissions. Consequently, an air quality assessment of the traffic emissions was not undertaken because based on the IAQM Planning Guidance the effect of the Development on air quality would be **not significant**.

Effects on local air quality associated with the completed and operational Development would likely result from emissions from the indicative heating plant associated with the Development. The results of the ADMS air quality modelling at the selected receptors on Phoenix Street and Charing Cross Road, and at the maximum process contribution across the 1km grid, are presented in **Table 11**.

Table 11: Results of the ADMS-Roads Modelling at the selected Sensitive Receptor and at the Maximum Process Contribution

Receptor		Change in Concentration ($\mu g/m^3$)	% Change in concentration relative to Air Quality Assessment Level (AQAL)	Long term average Concentration at receptor in assessment year[(a)]	Effect Descriptor
1	Phoenix Street (selected receptor)[(b)]	0.0000078	0	>110%	Negligible
2	Charing Cross Road (selected receptor)[(c)]	0.0001375	0	>110%	Negligible
3	Dudley Court, Shorts Garden (max process contribution)	0.0124	0	>110%	Negligible

Note: it is assumed all NO_X is converted to NO_2

(a) as a worst case assumption concentrations are assumed to be similar to those presented at the Shaftesbury Avenue automatic monitor as shown in Table 8 i.e. >110% of the annual mean (i.e. >44µg/m^3) in order to calculate the Effect Descriptor as set out in Table 7

(b) Receptor modelled at 15m above ground level to represent the closest location to the heating plant flue

(c) Receptor modelled at 9m above ground level to represent the closest location to the heating plant flue

Using the effect descriptors outlined in **Table 7**, the Development is predicted to result in a 'negligible' effect at all receptor locations. Using professional judgement, based on the severity of the effects; the concentrations predicted at the sensitive receptors; the geographical extent of the effects; and that a worst-case assessment was carried out (which took background roadside concentrations into account) the overall effect of the Development on local air quality would be **not significant**.

7. Mitigation Measures and Likely Residual Effects

7.1 Construction Phase

7.1.1 Dust Emissions

As the Site is considered to be medium-risk in terms of potential dust emissions, a range of environmental management controls would be developed with reference to the IAQM guidance for medium-risk sites. The management controls would prevent the release of dust entering the atmosphere and / or being deposited on nearby receptors.

A range of environmental management controls would be developed and set out in a Dust Management Plan, with reference to the IAQM guidance. This would prescribe a number of standard measures including:

- removing materials that have the potential to produce dust, where possible;
- enclosing material stockpiles at all times and damping down of dusty materials during dry weather;
- providing appropriate hoarding and / or fencing to reduce dust dispersion and restrict public access;
- maintaining Site fencing, barriers and scaffolding clean using wet methods;
- controlling cutting or grinding of materials on the Site and avoiding scabbling;
- dust generating machinery e.g. disk cutters to be fitted with vacuums;
- appropriate handling and storage of materials, especially stockpiled materials;
- restricting drop heights onto lorries and other equipment;
- fitting equipment with dust control measures such as water sprays, wherever possible;
- using a wheel wash, avoiding of unnecessary idling of engines and routing of Site vehicles as far from sensitive properties as possible;
- ensuring bulk cement and other fine powder materials are delivered in enclosed tankers and stored silos with suitable emission control systems to prevent escape of material and overfilling during delivery;
- using gas powered generators rather than diesel if possible and ensuring that all plant and vehicles are well maintained so that exhaust emissions do not breach statutory emission limits;
- switching off all plant when not in use;
- prohibiting fires on the Site; and
- ensuring that a road sweeper is available to clean mud and other debris from hard-standing, roads and footpaths.

Such measures are routinely and successfully applied to construction projects throughout the UK, and are proven to reduce significantly the potential for adverse nuisance dust effects associated with the various stages of demolition and construction work. Taking account of the mitigation measures, the likely residual effect of nuisance dust is **negligible**.

7.1.2 Demolition and Construction Vehicle Exhaust Emissions

All demolition and construction traffic logistics would be agreed with LBC. Consideration would also be given to the avoidance, or limited use of, traffic routes in proximity to sensitive routes (i.e. residential roads, etc.) and the avoidance (or limited) use of roads during peak hours, where practicable.

Taking into account the existing traffic movements and background air pollutant concentrations, the likely residual effect of construction vehicles entering and egressing the Site on air quality would remain as per the likely effect; i.e. of worst-case **minor significance** during the construction period.

7.1.3 Demolition and Construction Plant Emissions

Given that all construction plant now need to comply with the London Low Emission Standards set out for NRMM, even in the absence of mitigation, the likely effect of any emissions from plant operation on the Site is **negligible**. This would therefore remain the likely residual effect.

7.1.4 Completed Development

As identified earlier in this report, even in the absence of mitigation, the Development is predicted to have a likely insignificant effect on local air quality. Accordingly, mitigation measures would not be required and the likely residual effects would remain as being **not significant**.

8. Summary and Conclusions

A qualitative assessment of dust effects during the construction phase has been carried out. With the implementation of a range of appropriate site management practices to control dust emissions, the likely effects associated with construction activities are **negligible**.

It is anticipated that the likely effect of construction vehicles entering and leaving the Site is in the worst-case of **minor significance** in the context of existing local road traffic emissions.

All construction plant now need to comply with the London Low Emission Standards set for non-road mobile machinery. Consequently, the likely effect of any emissions from plant operation on the Site is **negligible**.

All construction effects would be localised, episodic and temporary.

The Development would retain two car parking spaces. In addition, the Development would retain office and flexible retail uses which are similar to the existing Site. The operational Development is only predicted to result in an additional 14 vehicular trips per day associated with servicing vehicles but a reduction of six vehicles for the retail element. Overall there would be a change of eight vehicles per day. This change is unlikely to increase road traffic emissions. Consequently, an air quality assessment of the traffic emissions was not undertaken because the likely effect of the Development on air quality is **not significant**.

The existing heating and energy plant at the Site would be replaced by newer / more efficient plant. Consequently, computer modelling was carried out to predict the likely effect of the heating and energy plant emissions from the operation of the completed Development, and the likely resultant changes that this would bring about to local air quality. The detailed design of the heating and energy plant is not complete at this stage, however the assessment has been undertaken based on the maximum plant required to operate the Development, as recommended by the M&E consultants. The effect of the Development on air quality was predicted for the closest residential receptor to the Development located on Phoenix Street and Charing Cross Road, and across a 1km grid centred on the Site.

The results of the computer modelling demonstrate that the likely overall effect of the operational Development on local air quality is **not significant**.

APPENDICES

A. Air Quality Neutral Assessment

Appendix A: Air Quality Neutral Calculations

Introduction

Calculations were undertaken by Waterman Infrastructure and Environment (WIE) to accompany the detailed planning application for the proposed refurbishment and extension of the existing building (the 'Development') at 125 Shaftesbury Avenue (the 'Site'), located within the London Borough of Camden (LBC). The Site covers an area of approximately 0.345ha. The purpose of the calculations is to demonstrate how the Development performs against relevant 'air quality neutral' benchmarks.

Description of the Development

The land uses proposed would be of a similar nature to those currently existing at the Site (retail and office use), albeit that there would be a net increase of commercial floorspace of 7,160m^2 Gross Internal Area (GIA).

The development is located within the London Central Activity Zone (CAZ).

The total amount of floorspace proposed by the Development is set out below in **Table 1**.

Table 1: Proposed Floorspace

Land Use (Use Class)	Proposed Floorspace Areas (GIA) (m^2)
Commercial (B1)	24,963
Retail (A1-A3)	2,100
Total	27,063*

Note: * the GIA for the plant, servicing, and boiler house have been excluded

Planning Policy

The London Plan - The Spatial Development Strategy for Greater London; consolidated with alterations since 2011, March 2015

Policy 7.14 'Improving air quality' of the London Plan[1] states that development proposals should:

"…be at least 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as areas designated as AQMAs);.."

The Mayor's Air Quality Strategy 'Clearing the Air' 2010

The Mayor's Air Quality Strategy states that:

"New developments in London shall as a minimum be 'air quality neutral' through the adoption of best practice in the management and mitigation of emissions".

Sustainable Design and Construction - Supplementary Planning Guidance, 2014

To enable the implementation of the London Plan the GLA have produced a Sustainable Design and Construction Supplementary Planning Guidance (SPG). Section 4.3 focusses on air pollution and the effects from the operation of new developments to ensure that they are 'air quality neutral'.

Paragraph 4.3.17 and Appendix 5 of the SPG note that Building Emission Benchmarks (BEBs) have been defined for a series of land-use classes for both NO_X and PM_{10}. **Table 2** outlines the relevant emissions benchmarks for the Development. It is considered that where a development

does not exceed these benchmarks it is considered to be 'air quality neutral' and would not increase NO_X and PM_{10} emissions across London as a whole.

Table 2: 'Air Quality Neutral' Emissions Benchmarks for Buildings

Land Use Class	NO_X (g/m^2)	PM_{10} (g/m^2)
Class A1	22.6	1.29
Class A3 - A5	75.2	4.32
Class A2 and Class B1	30.8	1.77
Class B2 – B7	36.6	2.95
Class B8	23.6	1.90
Class C1	70.9	4.07
Class C2	68.5	5.97
Class C3	26.2	2.28
Class D1(a)	43.0	2.47
Class D1(b)	75.0	4.30
Class D1(c-h)	31.0	1.78
Class D2(a-d)	90.3	5.18
Class D2(e)	284	16.3

As well as defining a series of benchmarks for a building's operation, the Appendix 6 of the SPG also defines benchmarks for the transport emissions related to the Development. **Table 3** details the emissions benchmarks for transport relevant to the Development. Section 4.3.18 of the SPG notes that the design of a development should encourage and facilitate walking, cycling and the use of public transport, thereby minimising the generation of air pollutants.

Table 3: 'Air Quality Neutral' Emissions Benchmarks for Transport

Land Use	London Central Activity Zone	Inner	Outer
NO_X (g/m^2/annum)			
Retail (A1)	169	219	249
Office (B1)	1.27	11.4	68.5
NO_X (g/dwelling/annum)			
Residential (C3)	234	558	1553
PM_{10} (g/m^2/annum)			
Retail (A1)	29.3	39.3	42.9
Office (B1)	0.22	2.05	11.8
PM_{10} (g/dwelling/annum)			
Residential (C3, C4)	40.7	100	267

For the both the Building and Transport Emissions Benchmarks where a development does not exceed these benchmarks it is considered to be 'air quality neutral' and would not increase NO_X and PM_{10} emissions across London as a whole.

As well as providing benchmarks the SPG also recommends emission standards for combustion plant to comply with, in addition to meeting the overall 'air quality neutral' benchmark.

Air Quality Neutral Planning Support: GLA 80371, April 2014

In April 2014 the GLA published a report to provide support to the development of the Mayor's policy related to 'air quality neutral' developments. The report provides a method to enable a development to be assessed against the air quality neutral benchmarks set out in the Sustainable Design and Construction SPG.

The report provides a methodology required to apply the air quality neutral policy. It requires the transport and building emissions for the development to be identified and then compared to the benchmark emissions. The report notes that the building and transport emissions should be calculated separately and not combined.

Calculation of the Emissions Benchmarks

Building Emissions

The energy centre for the proposed development comprises one gas-fired CHP unit and three gas boilers. The detailed design of the heating and energy plant is not complete at this stage, however the assessment has been undertaken based on the maximum plant required to operate the Development, as recommended by the M&E consultants.

The details of the energy centre are presented in **Table 4**.

Table 4: Calculation of the Total Building Emission

Unit	Number	Release Rate (m/s)	Total NO_X Emissions (g/s)	Hours of Operation (hrs/annum)	Total NO_X (kg/annum)
CHP	1	15*	0.015646	2,920	168.1
Boiler	3	15*	0.010368	4,000	152.6
Total Building NO_X Emission					**320.7**

Note: For gas-fired plants PM_{10} emission factors are not provided because gas-fired plants do not emit any significant level of particulates

The Building Emission Benchmarks (BEB) for each land use category are presented in **Table 5**. These are calculated by multiplying the floor area for each land use category with the Building Emission Benchmark presented in **Table 2**.

Table 5: Calculation of the Benchmarked NO_X Building Emissions for each Land-Use Category

Land Use	GIA	Building Emissions Benchmark (gNO_X/m^2/annum)	Benchmarked Emissions ($kgNO_X$/annum)
B1	24,963	30.8	768.9
A1-A3	2,100	22.6	47.5
Total Benchmarked Building Emissions			**816.4**

The Total Building NO_X Emission of 320.7kg/annum is below the benchmark of 816.4kg/annum and the Development is therefore considered to be 'Air Quality Neutral' with respect to building emissions. No further abatement would be required.

Transport Emissions

Details of the trip generation per day for each land-use class have been provided by WIE (also the Applicant's transport consultant). The calculation of the Transport Emission for each component of the Development is presented in **Table 6**.

Table 6: Calculation of the Transport Emissions for each Land-Use Category

Land Use	Trips per day	Trips per annum	Average Distance per trip*	Distance travelled km/annum	Emission Factors (g/vehicle-km)	Transport Emission (kg/annum)	
						NO_X	PM_{10}
B1	68	24,820	3.0	74,460	NO_X: 0.4224	31.4	5.5
A1-A3	11	4,015	9.3	3,856	PM_{10}: 0.0733	1.6	0.3
Total Transport Emissions						**33.0**	**5.8**

Note: * Average distance travelled by car per trip for sites within CAZ

The Transport Benchmark for the Development can be calculated by multiplying the benchmark in **Table 3** by the area of each landuse class.

Table 7: Calculation of the Benchmarked Transport Emissions for each Land-Use Category

Land Use	GIA	Transport Emission Benchmark		Benchmarked Emissions	
		$gNO_X/m^2/annum$	$gPM_{10}/m^2/annum$	$kgNO_X$/ annum)	$kgPM_{10}$/ annum
B1	24,963	1.27	0.22	31.7	5.5
A1-A3	2,100	169	29.3	354.9	61.5
Total Transport Emissions				**386.6**	**67.0**

The Total Transport NO_X Emission of 33.0kg/annum is below the benchmark of 386.6kg/annum and the Total Transport PM_{10} Emission of 5.8kg/annum is below the benchmark of 67.0kg/annum. The Development is therefore considered to be 'Air Quality Neutral' with respect to transport emissions. No further mitigation measures are required.

References

1 Greater London Authority (2015): The London Plan –– The Spatial Development Strategy for London consolidated with alterations since 2011, GLA, London.

B. Air Quality Modelling Methodology

Appendix B: Air Quality Modelling Methodology

1.1 This Appendix presents the technical information and data upon which the air quality assessment is based.

Construction and Demolition Dust Assessment

1.2 Table A1 provides examples of the potential dust emissions classes for each of the construction activities, as provided in 'The Control of Dust and Emissions during Construction and Demolition' Supplementary Planning Guidance[1] (based on the evaluation process set out in the IAQM 2014 'Guidance on the Assessment of Dust from Demolition and Construction'[2]). Note that not all the criteria need to be met for a particular class. Once the class has been determined, the risk category can be determined from the matrices presented in Tables 4 to 7 in the Air Quality Assessment.

Table A1: Criteria for the Potential Dust Emissions Class

Activity	Class	Example Criteria
Demolition	Large	Total Building volume >50,000m^3, potentially dusty construction material (e.g. concrete), on site crushing and screening, demolition activities >20m above ground level.
	Medium	Total Building volume 20,000-50,000m^3, potentially dusty construction material, demolition activities 10-20m above ground level.
	Small	Total Building volume <20,000m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months.
Earthworks	Large	Total site area >10,000m^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 stockpile enclosures >8m in height, total material moved >100,000 tonnes.
	Medium	Total site area 2,500m^2 - 10,000m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of stockpile enclosures 4m-8m in height, total material moved 20,000 tonnes – 100,000 tonnes (where known).
	Small	Total site area <2,500m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of stockpile enclosures <4m in height, total material moved <10,000 tonnes, earthworks during wetter months.
Construction	Large	Total Building volume >100,000m^3, piling, on site concrete batching, sand blasting.
	Medium	Total building volume 25,000 m^3 - 100,000m^3, potentially dusty construction material (e.g. concrete), on site concrete batching.
	Small	Total building volume <25,000m^3, construction material with low potential for dust release (e.g. metal cladding or timber).
Trackout	Large	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay / silt content), unpaved road length >100m.
	Medium	10-50 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50-100m (high clay content).
	Small	<10 HDV (>3.5t) trips in any one day, surface material low potential for dust release, unpaved road length <50m.

1 Greater London Authority, 2014, 'The Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance' July 2014.
2 Institute of Air Quality Management, 2014, 'Guidance on the Assessment of Dust from Demolition and Construction.

1.3 Once the risk category has been defined, the significance of the likely dust effects can be determined, taking into account the factors that define the sensitivity of the surrounding area. Examples of the factors defining the sensitivity of the area, as set out in the IAQM guidance, are presented in Table A2.

Table A2: Examples of Factors Defining Sensitivity of the Area

Type of Effect	Sensitivity of Receptor	Examples
Sensitivities of People to Dust Soiling Effects	High	Users can reasonably expect a 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[1] 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[2] and car showrooms.
	Medium	Users would expect[1] to enjoy a reasonable level of amenity, but would not reasonably expect 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[1] 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.
	Low	The enjoyment of amenity would not reasonably be expected[1]; or property would not reasonably be expected[1] 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[2] and roads.
Sensitivities of People to Health Effects of PM_{10}	High	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, relevant location would be one where individuals may be exposed for eight hours or more in a day).[3] 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.
	Medium	Locations where the people exposed are workers[4], 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.
	Low	Locations where human exposure is transient.[5] Indicative examples include public footpaths, playing fields, parks and shopping streets.
Sensitivities of Receptors to	High	Locations with an international or national designation and the designated features may be affected by dust soiling; or

Ecological Effects		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[6]. 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 containing concrete (alkali) buildings.
	Medium	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.
	Low	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.

1 Peoples' expectations will vary depending on the existing dust deposition in the area.

2 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.

3 This follows Defra guidance as set out in LAQM.TG(16).[3]

4 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 PM10. 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.

5 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.

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

1.4 Table A3, Table A4 and Table A5 show how the sensitivity of the area may be determined for effects related to dust soiling (nuisance), human health and ecosystem respectively. Distances are to the dust source and so a different area may be affected by the on-Site works than by trackout (i.e. along the routes used to access the Site). The IAQM guidance advises that the highest level of sensitivity from each table should be recorded.

Table A3: Sensitivity of the Area to Dust Soiling Effects on People and Property

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

3 Defra (2016), 'London Local Air Quality Management (LLAQM) Technical guidance 2016 (LLAQM.TG (16))', DEFRA, London.

Table A4: Sensitivity of the Area to Human Health Impacts

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

Table A5: Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Operational Assessment

Heating Plant

1.5 Three gas-fired boilers and one gas-fired Combined Heat and Power (CHP) plant are proposed within the Development, which would release emissions through flues at the roof level. The stack parameters used within the ADMS model for the boilers and CHP are indicative. Long and Partners provided information based on the current design, which are presented in Table A6 below. It is noted that the detailed design of the heating and energy plant is not complete at this stage, however the assessment has been undertaken based on the maximum plant required to operate the Development, as recommended by Long and Partners.

Table A6: Stack Parameters for the Heating Plant

Unit	Number	Grid Reference	Flue Diameter (m)	Release Rate (m/s)	Release Height (m)	Release Temperature (deg ºC)	Total NO_x Emissions (g/s)
Boiler	3	529946.1, 181125.8	0.35	15	47.69	179	0.003456
CHP	1	529946.9, 181125.4	0.18	15	47.69	120	0.15646

Note: For gas-fired plants emission factors are not provided for PM_{10} because gas-fired plants do not emit any significant level of particulates
The boilers have been modelled based on operating for 8 hours per day and the CHP has been modelled based on 10 hours per day as detailed by Long and Partners.
The ADMS model uses the combined stack characteristic parameters

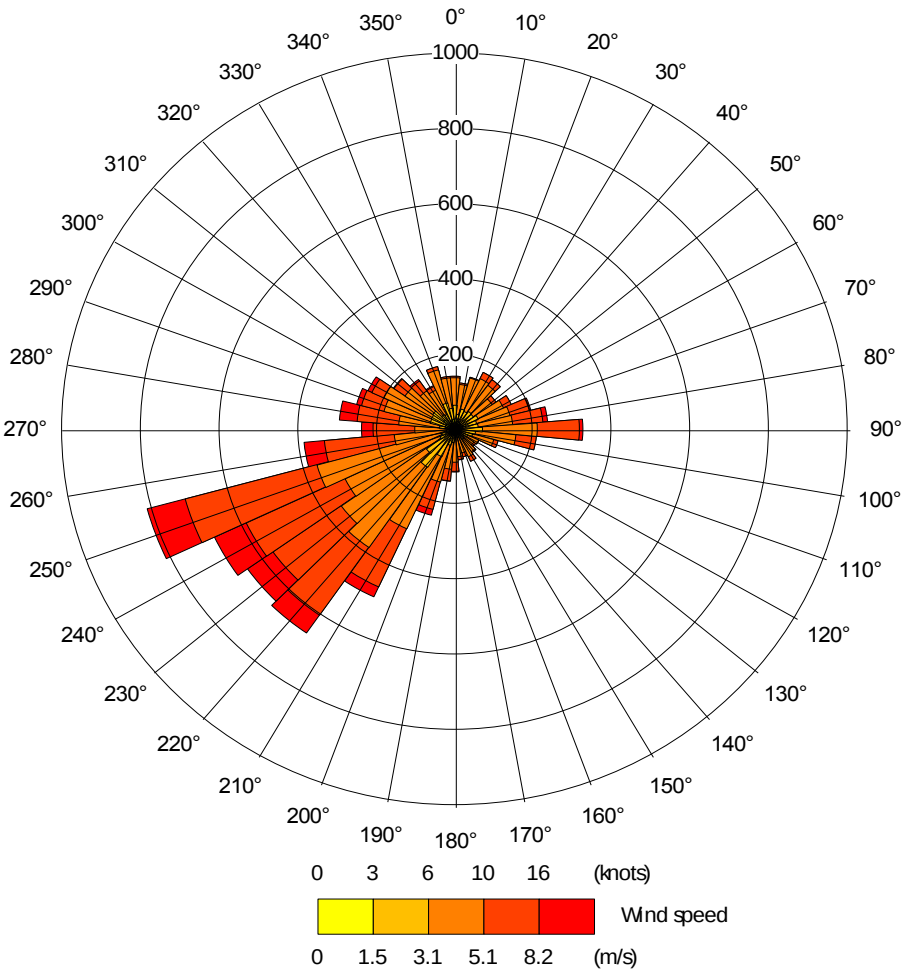
Meteorological Data

1.6 Local meteorological conditions strongly influence the dispersal of pollutants. Key meteorological data for dispersion modelling include hourly sequential data for wind direction, wind speed, temperature, precipitation and the extent of cloud cover for each hour of a given year. As a minimum ADMS requires wind speed, wind direction, and cloud cover.

1.7 Meteorological data to input to the model were obtained from the London City Airport Meteorological Station, which is the closest to the Site and considered to be the most representative. The 2014 data were used. Figure A1.1 presents the wind-rose for the meteorological data.

1.8 Most dispersion models do not use meteorological data if they relate to calm winds conditions, because the dispersion of air pollutants is more difficult to calculate in these circumstances. ADMS treats calm wind conditions by setting the minimum wind speed to 0.75m/s. It is recommended in Technical Guidance LAQM.TG(16) that the meteorological data file be tested within a dispersion model and the relevant output log file checked, to confirm the number of missing hours and calm hours that cannot be used by the dispersion model. This is important when considering predictions of high percentiles and the number of exceedances. Technical Guidance LAQM.TG(16) recommends that meteorological data should only be used if the percentage of usable hours is greater than 75%, and preferably 90%. 2014 meteorological data from London City Airport include 8,709 lines of usable hourly data out of the total 8,760 for the year, i.e. 99.4% of usable data. This is above the 75% threshold, and is therefore adequate for dispersion modelling.

Figure A1.1: 2014 Wind Rose for the London City Airport Meteorological Site



1.9 A value of 1.0 was used for the London City Airport Meteorological Station, which is representative of cities and is considered appropriate following a review of the local area surrounding the Meteorological Station.

Other Model Parameters

1.10 There are a number of other parameters that are used within the ADMS model which are described here for completeness and transparency:

- The model requires a surface roughness value to be inputted. A value of 1.5 was used, which is representative of large urban areas such as London;
- The model requires the Monin-Obukov length (a measure of the stability of the atmosphere) to be inputted. A value of 100m (representative of large conurbations >1,000,000) was used for the modelling; and
- NO_2 is the pollutant of concern in relation to human health, assumptions need to be made on the proportion of NO emissions oxidised to NO_2 by the time the plume reaches sensitive receptors. This is commonly referred to as the NO_X to NO_2 conversion ratio. For this

assessment, it has been assumed that all emitted NO_X would be converted to NO_2 at sensitive receptors.

Assessor Experience

Name: Guido Pellizzaro

Years of Experience: 10

Qualifications:

- BSc (Hons)
- AIEMA (Associate Member of the Institute of Environmental Management and Assessment)
- MIAQM (Member of the Institute of Air Quality Management)

Guido has over ten years of experience in the assessment of air quality and odour for a variety of environmental impact assessment projects. Guido has knowledge and extensive experience of designing and undertaking ambient air quality monitoring programmes using real time equipment and passive diffusion tubes. This includes devising monitoring programs for dust deposition, typically to monitor levels of dust generated during construction activities in populated areas where there is the potential for nuisance to be caused.

Guido has been responsible for the technical delivery of a wide range of air quality projects for a variety of clients in both the public and private sector. These projects include consideration of emissions from both transportation and industrial sources, through both monitoring and modelling, and therefore he has an in depth understanding of the regulatory requirements for these sources and the published technical guidance for their assessment.

UK and Ireland Office Locations