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Centric Close, Camden

Air Quality Assessment

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Project Revision Sheet

Revision No	Date	Status	Changes	Author	Checked
0	13 December 2016	FINAL	-	S. Hashemi	G. Hodgkiss
1	8 March 2017	FINAL	Removal of commercial parking spaces & Sustainability Officer Consultation comments	G. Hodgkiss	P. Chan

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Executive Summary

MLM Consulting Engineers Ltd was commissioned by Fairview Ventures Limited ('the Client') to undertake an Air Quality Assessment for the proposed construction of a new residential led mixed-use development in Centric Close, Camden.

The Local Authority responsible for determining the planning application is London Borough of Camden (LBC). This report is to support the planning application for the proposed demolition of existing buildings and the erection of 76 residential units and 1,219 sqm of commercial floor space (Use Class B1) over 4, 5, 6 and 7 storeys providing a mix of 1, 2 and 3 bed apartments. The development includes a landscaped courtyard and communal amenity areas.

The redevelopment of the site will make a positive enhancement to the visual appearance of the area, providing much needed homes for the local area, including commercial floor space to reflect the Council's aspirations for the area.

The proposed scope of this assessment was forwarded to the Air Quality Team at London Borough of Camden in November 2016 for review and appraisal of the proposed scope and methodology, but no specific comments were received at that stage. However, following the submission of planning documents in December 2016, the scheme was subsequently revised at the request of the Local Authority to reduce the number of commercial parking spaces. Specific consultation comments provided by LBC's Sustainability Officer have been addressed within the report revisions.

The assessment, using the ADMS Roads Extra dispersion model, determined the impact of the emissions from the local traffic on the proposed development, as well as the impact of the operation of the development on local air quality and nearby sensitive receptors. The latter involves the modelling of the emissions from the proposed combined heat and power (CHP) plant and central boilers, plus the impact of worst-case additional traffic flows on local roads.

The modelling results were compared against the objectives set out in the Air Quality (England) Regulations of 2000. The latest guidance from the Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK) document 'Land-Use Planning & Development Control: Planning for Air Quality (May 2015 v1.1)' was also used in the assessment. This document was produced as a guide for both consultants and local planners to assist with the use of air quality assessment in the local development control process.

The performance of the ADMS-Roads Extra model has been verified using the ratified monitoring data from the diffusion tube located on Camden Road and Kentish Town Road. An appropriate adjustment factor was applied to the predicted modelling results.

The results of the assessment are as below:

- The objective for the annual mean NO_2 concentration is 40 µg/m^3. This objective is forecast to be met at all receptors representative of the proposed development.
- The annual mean objective is forecast to be exceeded at six existing receptors in the vicinity of the development in all future scenarios (with and without scheme), due to existing poor air quality. The air quality impacts of the proposed scheme at these locations is negligible, therefore no specific mitigation measures are required to address this issue.
- The short-term hourly objective for NO_2 is expected to be met at all locations. The PM_{10} and $PM_{2.5}$ concentrations are forecast to meet their respective long and short term objectives by a considerable margin.

- In the 2019 'with development' scenario, no new exceedances are created at existing receptors.
- The largest impact descriptors ('Slight Adverse') are seen on various floors of the adjacent building but the overall NO_2 concentrations are still below the annual mean objective at these receptors. Impact descriptors at all other existing receptors are negligible.

Given the above, it is concluded that the setting of the new mixed-use development is suitable for its proposed purpose in terms of air quality.

A qualitative assessment on the construction phase activities has also been carried out. The risk of the different activities towards dust soiling ranges from **'Low to Medium'**, and that for human health impact ranges from **'Negligible to Low'**. Following implementation of the appropriate mitigation measures as outlined in the report, the impact of emissions during construction of the proposed development would be **'not significant'**.

According to the London Councils Air Quality and Planning Guidance, the Air Pollution Exposure Criteria (APEC) for the proposed new development is **APEC-A**. Current Guidance published by the London Councils suggests that there should be "No air quality grounds for refusal; however mitigation of any emissions should be considered".

An Air Quality Neutral Assessment was compiled to support the planning application for the proposed development. The assessment indicates that the emissions for the proposed heating plant meet the Air Quality Neutral benchmark. Following a reduction in the provision of commercial parking spaces within the development requested by LBC, and a proportionate reduction in commercial vehicle trips, the total NO_x and PM_{10} emissions from the road traffic vehicles meet the Air Quality Neutral Benchmark for both the residential and commercial elements of the scheme.

In order to minimise site generated pollutant emissions, low NOx boiler and CHP plant have been included within the design proposals. The emissions from the CHP and boiler are not predicted to have any significant adverse impact on the receptors within the development, as well the existing receptors nearby. It is not necessary to adjust the current proposed stack height (1.0m above roof on Block A), or increase the flue gas exit velocity.

In order to reduce potential operational phase traffic related air quality impacts, a Travel Plan is being be submitted to encourage future residents to use alternative transport modes rather than private vehicles, with an aim to further reduce the number of traffic to be generated by the proposed development. Cycle parking will also be provided on site, comprising dedicated, secure storage areas. The scheme will provide a total of 138 long-stay and 5 short-stay cycle parking spaces, of which 124 long-stay and 2 short-stay spaces will be provided for residential use.

To minimise the need for future households to own a vehicle and reduce demand for on-site parking, the client will provide support towards existing car clubs within the vicinity of the site (final details to be agreed). It is anticipated that the car free nature of the residential aspect of the development would be secured via Section 106 planning obligation preventing future residents form purchasing parking permits within the surrounding Car Parking Zones.

Air quality constitutes a material consideration in the determination of planning applications. However, with the effective implementation of appropriate mitigation measures listed in this report, it is considered that air quality should not present a constraint to the granting of planning permission for the proposed development on this occasion.

Limitations and Exceptions

1 This report and its findings should be considered in relation to the terms and conditions proposed and scope of works agreed between MLM Consulting Engineers Ltd and the client.

2 The Executive Summary, Conclusions and Recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon until considered in the context of the whole report.

3 This report provides available factual data for the site and the surrounding area at the time of the study and as obtained by the means described in the text. The data is related to the site on the basis of the site location information provided by the Client.

4 It should be appreciated that the information that has been made available to date, is not necessarily exhaustive and that further information relevant to the proposed site usage may be provided which could change the overall findings.

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7 This report is prepared and written in the context of the proposals stated in the introduction to this report and should not be used in a differing context. Furthermore, new information, improved practices and legislation may necessitate an alteration to the report in whole or in part after its submission. Therefore, with any change in circumstances or after the expiry of one year from the date of the report, the report should be referred to us for re-assessment and, if necessary, re-appraisal.

1 Introduction

1.1 General

MLM Consulting Engineers Ltd was commissioned by Fairview Ventures Limited ('the Client') to undertake an Air Quality Assessment for the proposed construction of a new residential led mixed-use development in Centric Close, Camden NW1 7EP.

The Local Authority responsible for determining the planning application is London Borough of Camden (LBC). This report is to support the planning application for the proposed demolition of existing buildings and the construction of a residential led mixed-use development.

The redevelopment of the site will make a positive enhancement to the visual appearance of the area, providing much needed homes for the local area, including commercial floor space to reflect the Council's aspirations for the area.

The proposed scope of this assessment was forwarded to the Air Quality Team at LBC Council in November 2016 for review and appraisal of the proposed scope and methodology, however no specific comments were received.

1.2 Report Structure

The structure of the report is summarised below:

- A brief description of the site and proposed development;
- A brief description of the legislation governing air quality in England;
- Details of the method and the input data used for the assessment;
- Results of the assessment;
- Construction Dust Risk assessment;
- Air Quality Neutral assessment;
- Mitigation measures;
- Conclusions

1.3 Objective

The objective of this assessment is to use the Gaussian-based ADMS-Roads Extra software developed by Cambridge Environmental Research Consultants (CERC) to predict the impact of the local air quality on the proposed development, as well as the impact of the operation of the development (including the Energy Centre emissions) on the existing Air Quality Management Area (AQMA) and nearby sensitive receptors. The assessment is based upon Local Authority and historical monitoring data available via the public domain. The scope of the assessment is limited to the pollutants nitrogen dioxide (NO_2) and Particulate Matter (PM_{10} and $PM_{2.5}$, i.e. particles with an aerodynamic diameter less than 10 µm and 2.5 µm in diameter respectively).

2 The Site

2.1 Location and Description

The site is located at Centric Close, Camden, and offers good access to Central London via the Euston Road (A501), west to the A40 (Westway) or east to The City.

The site, which is currently occupied by a number of commercial buildings, is situated to the west of Oval Road, opposite the junction with Gloucester Crescent. The western perimeter of the site is formed by the West Coast Main Line, whilst a mixture of residential and commercial properties borders the site to the north and south.

Figure 1 shows the red line application site boundary and the location of the proposed development.

The redevelopment of the site will make a positive enhancement to the visual appearance of the area, providing much needed homes for the local area, including commercial floor space to reflect the Council's aspirations for the area.

2.2 Proposed Development

The proposed development comprises the demolition of existing buildings and the erection of 76 residential units and 1,219 sqm of commercial floor space (Use Class B1) over 4, 5, 6 and 7 storeys providing a mix of 1, 2 and 3 bed apartments. The development includes a landscaped courtyard and communal amenity areas.

The latest parking provision is for a total of 14 spaces, with the following breakdown:

- 8 disabled residential parking bays;
- 1 servicing/delivery bay;

It is anticipated that the car free nature of the residential aspect of the development would be secured via Section 106 planning obligation, preventing future residents form purchasing parking permits within the surrounding Car Parking Zones.

The proposed scheme includes provision for an on-site CHP and boiler plant. These will be located within the plant room within Block A, with the flue stack exiting 1m above the roof level, which is the highest point of the development.

Figure 2 shows the proposed ground floor layout.

3 Legislation and Policy

3.1 International Legislation and Policy

The European Directive (2008/50/EC)[1] sets legally binding limits for concentrations of outdoor air of major air pollutants that impact public health such as particulate matter (PM_{10} and $PM_{2.5}$) and nitrogen dioxide (NO_2). The European Directive is implemented in the UK under the Air Quality Standards Regulations 2010[2]. The obligations under the Air Quality Standards Regulations 2010 are separate from those of the 2000 and 2002 UK Regulations[3, 4] because local authorities in the UK will only have powers to manage some of the pollutants in the Air Quality Standards Regulations 2010; most of the source pollutants will be managed by the Environment Agency under the IPPC Regime. Therefore the obligation to meet the Air Quality Standards Regulations 2010 rests with the Secretary of State for Environment.

3.2 National Legislation and Policy

3.2.1 Local Air Quality Management

Part IV of the Environment Act 1995[5], requires the UK Government to publish an Air Quality Strategy and local authorities to review, assess and manage air quality within their areas. This is known as Local Air Quality Management (LAQM). The 2007 Air Quality Strategy[6] establishes the policy for ambient air quality in the UK. It includes the National Air Quality Objectives (NAQOs) for the protection of human health and vegetation for 11 pollutants. Those NAQOs included as part of LAQM are prescribed in the Air Quality (England) Regulations 2000 and the Air Quality (Amendment) (England) Regulations 2002.

Table 3.1 presents the NAQOs for the key pollutants of concern in relation to vehicle emissions: NO_2, PM_{10} and $PM_{2.5}$.

Table 3.1 Relevant Objectives Set Out in the Air Quality Strategy

Pollutant	Concentrations	Measured As	Date to be Achieved by
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times per year	1 hour mean	31 December 2005
	40 µg/m^3	Annual mean	31 December 2005
Particulate Matter (PM_{10})	50 µg/m^3 not to be exceeded more than 35 times per year	24 hour mean	31 December 2004
	40 µg/m^3	Annual mean	31 December 2004
Particulate Matter ($PM_{2.5}$)	25 µg/m^3	Annual Mean	2020

The Air Quality Strategy also introduced a new policy framework for tackling fine particles ($PM_{2.5}$) including an exposure reduction target. However, although EU Directive 2008/50/EC includes a new regulatory framework for $PM_{2.5}$ this pollutant is not included within LAQM, therefore there is no requirement to assess this pollutant unless as part of an Environmental Impact Assessment (EIA).

The NAQOs apply to external air where there is relevant exposure to the public over the associated averaging periods within each objective. Guidance is provided within the recently published London Local Air Quality Management Technical Guidance 2016 (LLAQM.TG (16)) [7] issued by the Greater London Authority (GLA) to support London boroughs in carrying out their duties under the Environment Act 1995 and connected regulations. Information on where the NAQOs apply is provided in Table 3.2. The objectives do not apply in workplace locations, to internal air or where people are unlikely to be regularly exposed (i.e. centre of roadways).

Table 3.2 Locations Where Air Quality Objectives Apply

Averaging Period	Objectives Should Apply at:	Objectives Should Generally Not Apply at:
Annual mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
24-hour mean and 8-hour mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties. [a]	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
1-hour mean	All locations where the annual mean and: 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15-min mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes.	

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

3.2.2 National Planning Policy Framework

Published on 27 March 2012, the National Planning Policy Framework (NPPF)[8] sets out the Government's planning policies for England and how these are expected to be applied. It replaces Planning Policy Statement 23: Planning and Pollution Control[9] which provided planning guidance for local authorities with regards to air quality.

At the heart of the NPPF is a presumption in favour of sustainable development. It requires Local Plans to be consistent with the principles and policies set out in the Framework with the objective of contributing to the achievement of sustainable development.

Current planning law requires that application for planning permissions must be determined in accordance with the relevant development plan (i.e. Local Plan or Neighbourhood Plan). The NPPF should be taken into account in the preparation of development plans and therefore the policies set out within the Framework are a material consideration in planning decisions.

The NPPF identifies 12 core planning principles that should underpin both plan-making and decision-taking, including a requirement for planning to *'contribute to conserving and enhancing the natural environment and reducing pollution'*.

Under Policy 11: Conserving and Enhancing the Natural Environment the Framework requires the planning system to *'prevent both new and existing developments from contributing to or being put at unacceptable risk or being adversely affected by unacceptable levels of air pollution'*.

In dealing specifically with air quality the Framework states that *'planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan'*.

3.2.3 Control of Dust and Particulates Associated with Construction

Section 79 of the Environmental Protection Act (1990)[10] states that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Statutory nuisance is defined as:

- *'Any dust or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance'*
- *'Any accumulation or deposit which is prejudicial to health or a nuisance'*

Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

In the context of the proposed development, the main potential for nuisance of this nature will arise during the construction phase: potential sources being the clearance, earthworks, construction and landscaping processes.

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

However, research has been undertaken by a number of parties to determine community responses to such impacts and correlate these to dust deposition rates. However, impacts remain subjective and statutory limits have yet to be derived.

3.3 Regional and Local Planning Policy

3.3.1 Cleaning the Air – The Mayor's Air Quality Strategy, 2010

The Mayor of London's Air Quality Strategy[11] sets out a series of policies and proposals for implementation of the UK AQS and for the achievement of the air quality standards and objectives within Greater London. With regards new developments the following policies are of relevance:

- Policy 1 – Encouraging smarter choices and sustainable travel: The mayor will support a shift to public transport, by only supporting developments that generate high levels of trips in locations with good public transport accessibility, by supporting car free developments and encouraging the inclusion of infrastructure to support sustainable travel, such as cycling, electric vehicle charging points and car clubs

- Policy '6 - Reducing emissions from construction and demolition sites': The London Council's Best Practice guidance will be reviewed and updated, and more vigorously implemented

- Policy '7 - Using the planning process to improve air quality - new developments in London as a minimum shall be 'air quality neutral': The Mayor will encourage boroughs to require emissions assessments to be carried out alongside conventional air quality assessments. Where air quality impacts are predicted to arise from developments these will have to be offset by developer contributions and mitigation measures secured through planning conditions, section 106 agreements or the Community Infrastructure Levy

- Policy '8 - Maximising the air quality benefits of low to zero carbon energy supply': The Mayor will apply emission limits for both PM and NO_x for new biomass boilers and NO_x emission limits for Combined Heat and Power Plant (CHPP). Air quality assessments will be required for all developments proposing biomass boilers or CHPPs and operators will be required to provide evidence yearly to demonstrate compliance with the emission limits

- Policy '9 - Energy efficient buildings': The Mayor will set CO_2 reduction targets for new developments which will be achieved using the Mayor's Energy Hierarchy. These measures will result in reductions of NO_x emissions

- Policy '10 - Improved air quality in the public realm': The Mayor will encourage the improvement of air quality in the public realm by planting vegetation to trap particulate matter. Through the planning system the Mayor will increase the number of green roofs and living walls across London. Additionally, he will encourage the planting of trees in areas of poor air quality

3.3.2 The London Plan 2016

The London Plan 2016[12] was published in March and consolidated the London Plan 2011 with the Revised Early Minor Alterations to the London Plan[13] and the Further Alterations to the London Plan also published in March 2015[14] along with minor alterations in March 2016. The Plan is the overall strategic plan for London setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years. It specifically addresses how development can help support the implementation of the Mayor's Air Quality Strategy and achieve a reduction in pollutant emissions and public exposure to pollution.

Policy 5.7 deals with renewable energy and states that 'all renewable energy systems should be located and designed to avoid any adverse impacts on air quality'.

'Policy 7.14 - Improving Air Quality' requires all development proposals to:

- Minimise increased exposure to existing poor air quality, make provision to address local problems of air quality (particularly within AQMAs) and promote greater use of sustainable transport modes through travel plans
- Promote sustainable design and construction to reduce emissions from demolition and construction of buildings including following current best practice guidance
- Be at least 'air quality neutral' and therefore not leading to further deterioration of existing poor air quality
- Look, in the first instance, to implement measures on-site to reduce emissions from a development. If inappropriate or impractical, other measures should be considered and where found to provide equivalent air quality benefits, planning obligations or planning conditions should be used to ensure their implementation

The policy also states that 'permission will only be granted where a detailed assessment of biomass boilers shows no adverse impact from emissions'.

3.3.3 Air Quality Neutral

All major developments in London, defined in The London Plan as residential use with over ten dwellings and other use with floor space ≥1,000 m^2, need to be assessed against emissions benchmarks for buildings and transport. Developments with emissions of NO_x and PM_{10} below these benchmarks are considered to avoid increasing concentrations across London as a whole, and hence referred to as 'air quality neutral'.

Developments that are not 'air quality neutral' and cannot reduce emissions further through on-site mitigation will be required to work with local planning authorities to off-set emissions through off-site measures, either provided directly by the developer, or as part of an existing scheme to improve air quality. The local planning authority will secure these measures through conditions or Section 106 agreements.

3.3.4 Local Planning Policy

LBC Council's Draft Local Plan[15] includes an air quality chapter. Within this, Policy CC4 states that:

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

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

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

Until the new Local Plan is adopted the Council's Local Development Framework from 2010 remains the relevant set of planning policy documents. A number of policies relating to improving air quality are contained within LBC Council's Core Strategy[16]. In particular policy CS16 (Improving Camden's health and wellbeing) recognises the impact of poor air quality on public health, which states that:

"The Council will seek to improve health and well-being in Camden. We will… recognise the impact of poor air quality on health and implement Camden's Air Quality Action Plan which aims to reduce air pollution levels".

The Core Strategy is supported by the Camden Development Policies document[17]. Policy DP32 sets out how LBC Council will expect developments to reduce their impact on air quality:

"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".

LBC Council has also prepared a Supplementary Planning Document - Camden Planning Guidance (CPG) 6 Amenity[18], which provides further guidance on air quality. It includes information on when an air quality assessment will be required, what an air quality assessment should cover and what measures can reduce air quality emissions and protect public exposure. LBC Council's overarching aim is for new development to be 'air quality neutral' and not lead to further deterioration of existing poor air quality. Mitigation and offsetting measures to deal with any negative air quality impacts associated with the development proposals may be required. The development should be designed to minimise exposure of occupants to existing poor air quality. It states that the Council requires assessments for development that could have a significant negative impact in air quality. This impact can arise during both the construction and operational stages of a development as a result of increased NO_x and PM_{10} emissions.

3.3.5 Air Quality Action Plan

Camden Council has declared an AQMA for NO_2 and PM_{10} that covers the whole Borough, and has developed an Air Quality Action Plan. Camden's Clean Air Action Plan[19] outlines the Councils commitment to improving air quality in the Borough.

The key objectives of the plan are to reduce PM_{10} and NO_2 concentrations by:

- Encouraging reductions in fossil fuel use, the adoption of clean fuels and low emission technology and promote energy efficiency;

- Raising awareness about air quality in Camden and promote lifestyle changes which can help reduce levels of air pollution and minimise exposure to air pollution;

- Improving the health and well-being of the local population, including those that work and visit Camden;

- Working in partnership with national and regional bodies, and with local public and private organisations, to foster and drive improvements in air quality;

- Leading by example and reduce NO_2 and PM_{10} emissions associated with the Council's own buildings and transport services;

- Ensuring actions which serve to reduce NO_2 and PM_{10} emissions complement actions to mitigate CO_2 emissions.

4 Local Baseline Air Quality

The Council declared the whole borough as an Air Quality Management Area (AQMA) in 2002, for both nitrogen dioxide (NO_2) and fine particles (as PM_{10}), as modelled predictions confirmed that the annual mean NO_2 and 24-hour PM_{10} objectives were exceeded.

LBC Council's most recent Annual Progress Report within the public domain was published in 2015 and contains monitoring data from the 2014 calendar year.

LBC Council currently operates five automatic monitoring stations within its area but none of these are close to the proposed development site, all being over 2 km away.

Fourteen diffusion tubes were deployed by LBC Council to monitor air quality at mainly roadside, kerbside and urban background locations in 2014.

The closest diffusion tube monitor which measures roadside NO_2 concentrations is CA23 located on Camden Road, approximately 700m to the east of the site and CA16 on Kentish Town Road, approximately 1.2Km to the north east of the site (Figure 3).

The captured monitoring data from 2010 to 2014 for these diffusion tubes is summarised in Table 4.1 below.

Table 4.1 Selected NO_2 Diffusion Tubes data for 2012-2015 in RBK

Site	Eastings	Northings	Type	Measured NO_2 Concentration $\mu g/m^3$				
				2010	2011	2012	2013	2014
CA 16	529013	185102	Roadside	74.0	57.2	59.0	65.3	57.8
CA 23	529173	184129	Roadside	84.0	72.2	67.4	77.9	72.2

These locations show a consistent exceedance of the annual objective over the years, with some fluctuation of the measured values between 2010 and 2014.

5 Input for ADMS-Roads Dispersion Modelling

5.1 General

Atmospheric dispersion modelling has been undertaken using the ADMS-Roads Extra software suite (version 4.0.1.0) developed by Cambridge Environmental Research Consultants (CERC). The model uses a number of input parameters to simulate the dispersion of emissions and predictions of pollutant concentration at specified receptors are made across the area of interest. The details of the input parameters are described in the next section.

The following parameters are required to determine the air pollution concentration using the ADMS-Roads model:

- The assessment years;
- Receptor(s) location(s) details;
- Background concentration;
- The road network details (including traffic volume and associated emissions);
- Meteorological data;
- Traffic data

The details of the parameters used in the analysis for the site are presented below.

5.2 The Assessment Years

The selected assessment years are 2014 and 2019. 2014 was chosen as the base year to verify the modelling, 2019 was selected as the future year when the new development will be operating. The impact of local air quality on the operational development, as well as the operation of the site heating plant on nearby sensitive receptors, were assessed.

5.3 Receptors Locations

Various points along the façades of the new building have been chosen to assess the impact of local air quality on the proposed development. Also, sensitive receptors along the access roads near the site and the main junction to the south east of the site were chosen to evaluate the impact of emissions from operational traffic increases and the proposed heating plant.

Receptors at the proposed development have been selected to represent each floor of the building, assuming the following heights above ground:

- Ground floor (GF) – 1.5 m
- 1st Floor (1) – 5.1 m
- 2nd Floor (2) – 8.5 m
- 3rd Floor (3) – 10.3 m
- 4th Floor (4) – 14.3 m
- 5th Floor (5) – 17.5 m
- 6th Floor (6) – 20.8 m

The diffusion tubes CA16 and CA23 were included as receptors within the model for performance verification purposes. Interrogation of Google Street view images from November 2015 indicated that the diffusion tubes were mounted on a lamp post near the road, and the receptor coordinates were modified to reflect the current status. Table 5.1 and Figure 4 summarise and show the locations of the selected receptors points respectively.

Table 5.1 Receptor Locations

Rec. No	Receptor Name/Description	Easting	Northing	Height (m)
R1	Oval Rd	528553.2	183892.2	1.5
R2	Oval Rd	528589.8	183798.7	1.5
R3	Jamestown Rd	528588.4	183965.4	1.5
R4	Jamestown Rd-FLAT	528785.6	184046.3	4.5
R5	Camden-N-flat	528833.5	183977.6	4.5
R6	Parkway	528780.3	183769.1	1.5
R7	Parkway-flat	528780.3	183769.1	4.5
R8	Camden -S-flat	528954.4	183814.9	4.5
R9	Camden -S -flat	528974.2	183728.8	4.5
R10	Camden Rd- E	528989.3	183934.7	1.5
R11	Camden Rd -E	529037.6	183979.9	1.5
R12	Adjacent Building -8F	528485.6	183924.7	28.0
R13	Adjacent Building -5F	528485.6	183924.7	18.1
R14	Adjacent Building -1F	528485.6	183924.7	5.2
R15	Adjacent Building -GF	528485.6	183924.7	1.5
PR1	North Building-FRONT-GF	528508.1	183912.0	1.5
PR2	North Building-FRONT-6F	528508.1	183912.0	20.8
PR3	North Building-BACK-6F	528489.9	183898.9	20.8
PR4	North Building-Middle-Front	528519.0	183895.3	1.5
PR5	North Building-Middle-Front	528519.0	183895.3	17.6
PR6	North Building-Middle-Back	528500.0	183890.0	17.6
PR7	South Building- Middle-Front	528530.4	183875.5	1.5
PR8	South Building- Middle-Front	528530.4	183875.5	14.3
PR9	South Building- Middle-Back	528512.6	183873.2	14.3
PR10	South Building- Middle-Front	528539.6	183859.8	1.5
PR11	South Building- Middle-Front	528539.6	183859.8	11.1
PR12	South Building- Middle-Back	528525.3	183857.4	11.1

5.4 The Road Network

The following roads were selected for the assessment, for the reasons provided:

- Camden High Street-north junction (one of the main sources of air pollution in the area);
- Camden High Street-south junction (one of the main sources of air pollution in the area);
- Camden Road - east junction(one of the main sources of air pollution in the area);
- Parkway- west junction(one of the main sources of air pollution in the area);
- Oval Road (Main Access Road to development site);
- Jamestown Road (Neighbouring Road);
- A503- Camden Road - for verification of diffusion tube CA21;
- A400- Kentish Town Road - for verification of diffusion tube CA16;

5.5 Traffic Data

Traffic data for roads around the proposed development in terms of Annual Average Daily Traffic (AADT) were obtained from two sources:

- London Atmospheric Emissions Inventory (LAEI) (2013);
- Via the Transport Consultant (TC) for this project

Traffic flows from 2013 were factored to 2014 and 2019 by applying correction factors of 1.0141 and 1.0927 respectively, generated using the Department for Transport's TEMPRO software (NTEM 7.0).

2014 traffic flows were used in the verification of the dispersion model.

For the 2019 'without development' scenario, the 2013 baseline traffic data were used and projected to 2019 by applying the TEMPRO factor.

The TC provided an estimation of vehicle trips associated with the development; this equated to 42 daily trips from the residential component and 13 associated with the commercial element, following revision of the scheme to remove all commercial parking spaces, apart from one for servicing/delivery. This makes a total of 55 trips in total. These flows were conservatively applied to all road links incorporated into the model for the 2019 'with development' scenario.

Traffic data used in the ADMS model for the 2014 verification, and for all future scenarios in 2019, are presented in Table 5.2.

Table 5.2 AADT Data for Baseline and Future Scenarios for Proposed Development at Centric Close

Road	Baseline (2014)		Future without Development (2019)		Future with Development (2019)	
	AADT	HGV%	AADT	HGV%	AADT	HGV%
A503	27933	9.9	-	-	-	-
A400	20914	18.6	-	-	-	-
Camden High Street-north junction	-	-	10568	19.6	10662	19.4
Camden High Street-south junction	-	-	13335	20.2	13429	20.1
Camden Road - east junction	-	-	16013	13.1	16107	13.1
Parkway- west junction	-	-	15404	6.2	15498	6.2
Oval Road	-	-	56	0.0	150	0.0
Jamestown Road	-	-	56	0.0	150	0.0

Road dimensions were determined from the interrogation of ordnance survey (OS) mapping sets and digital satellite images. A typical national diurnal profile provided by DfT has been incorporated into the models. The diurnal profile used is presented in Appendix A.

5.7 Emissions from Road Traffic

Roads are the main source of pollution in this area. The road source emissions are calculated from traffic flow data using the latest Defra Emission Factor Toolkit (EFT v 7.0, July 2016). The toolkit calculates emission rate for selected pollutants for each modelled road for input in to the atmospheric dispersion modelling.

The most detailed input option along with a vehicle fleet composition year of 2019 was used to derive emission rates for all future scenarios.

5.8 Background Air Pollution

Defra provides estimated background air quality data in the form of background maps. Background concentrations of NO_2, NO_x, PM_{10} and $PM_{2.5}$ are provided for each 1x1 km grid for each local authority area. The latest data, which is based on 2013 monitoring results across the UK, is summarised in Table 5.3 below.

Table 5.3 Background Concentrations for Site and Diffusion Tube Locations from Defra Background Map for 2014

Pollutant	Estimated NO_2 Annual Mean Value ($\mu g/m^3$)		
	Site (528500, 183500)	Tube CA23 (529500, 184500)	Tube CA16 (529500, 184500)
NO_2	35.8	37.4	37.4
PM_{10}	20.8	21.4	21.4
$PM_{2.5}$	14.9	15.3	15.3

As recommended by guidance provided in the publication 'Local Air Quality Management Technical Guidance LAQM. TG (16)[20] published by Department for Environment, Food and Rural affairs (Defra), since there is no local measurement of PM_{10} and $PM_{2.5}$ background concentrations, the predicted values provided by Defra were used instead.

For model verification, the background data for 2014 were used. For the future year 2019, when the development will become operational, background data for 2014 were used again. The reason for this is that in theory the background concentrations should decrease over the years. This is due to the advancement of technologies for emissions control, leading to lower emissions especially from road vehicles. However, latest air quality monitoring in the borough shows that the downward trend is not as obvious as previously predicted. Therefore as a worst case scenario, it is assumed that the background concentration will not decrease, but remain the same as the base year used for model verification.

5.9 Emissions from Gas Fired Heaters (Point Sources)

For the proposed development, it is understood that there will be one CHP unit and one central boiler provided for heating and power generation purposes. The stacks for the flue gas will run up from the plant room to 1m above the roof of Block A, which is the highest point of the development. Since all the units will be gas-fired, nitrogen oxides (NOx) will be the main pollutant within its flue gas emission. The client's M&E consultant has provided the following details (Table 5.4) which were included in the ADMS model to consider the impact of the NOx emissions from the plant. It is understood that the CHP and boilers will run throughout the year, with the CHP averaging a daily run-time of 15 hours, while the boilers will be available 24 hours a day. All operating parameters are included in the dispersion model as appropriate.

Table 5.4 CHP Details and Emissions Data

Parameter	Boilers	CHP	Units
Stack diameter	350	150	mm
Emission rate of NOx	0.015	0.004	g/s
Exhaust NOx emissions @ 0% O2	40	16.8	mg/m3
Stack height above building (assumed)	1.0	1.0	m
Stack gas temperature	70	120	^oC
Stack velocity	4	15	m/s

Parameter	Boilers	CHP	Units
Flue Stack Location	528496.8, 183901.0	528498.7, 183901.8	m
Annual Natural Gas Consumption	69,771	267,692	kWh
Operating regime (i.e. days of the week and operating hours	24 availability	15	hours

It is understood that the exact units to be installed may differ from those currently proposed, as it will be up to the contractor to choose the exact make and model at subsequent stage of the development.

In accordance to guidance provided by the Environment Agency Air Quality Modelling and Assessment Unit, it is assumed that 70% of the total NO_x emissions will be converted into NO_2.

5.10 The Effect of Buildings on Dispersion

Buildings have an effect on the dispersion of pollutants and can alter the predicted ground level pollutant concentration. This is by entraining pollutants in the cavity region on the leeward side of the buildings containing the sources and bringing the pollution levels down to ground level. Consequently, concentrations near the buildings could be increased but further away they are decreased (CERC 2013). ADMS Roads Extra has algorithms that model the effect of the buildings on the dispersion of pollutants specifically from point sources.

The details entered into the ADMS Roads Extra are shown in Table 5.5 below. They represent the massing of the buildings which may affect the dispersion of the pollutants from the point sources as realistically as possible.

Table 5.5 Details for the Buildings Entered into ADMS Roads Extra

No	Building	Centre Point Coordinates	Height (m)	Length (m)	Width (m)	Angle (°)
1	North Tower	528497.7, 183909.2	22.5	23.6	21.5	340
2	North-Middle	528510.7, 183889.4	19.3	23.2	19.5	340
3	South-Middle	528522.6, 183871.3	16.1	19.6	17.4	340
4	South Building	528533.2, 183856.4	12.8	16.0	14.3	340
5	Adjacent Building	528494.0, 183961.8	29.2	64.0	64.0	340

The building layout is illustrated in Figure 5.

5.11 Meteorological Data

ADMS Roads utilises sequential meteorological data to calculate atmospheric dispersion. The minimum metrological data that must be entered are: wind speed and direction, and cloud cover. The wind, cloud, temperature, rainfall and humidity data were taken from the London City Airport weather station.

London City Airport is the closest meteorological station with suitable data capture for the assessment years. The London City Airport meteorological station is approximately 14km east of the proposed site and the dominant prevailing wind direction is from the south west.

2014 met data has been used for the road source dispersion modelling. According to the EPUK CHP and Air Quality Guidance 2012 [21], at least three years of met data should be used for dispersion modelling for CHP. As a result, London City Airport met data from 2010 to 2014 were used for the point-source dispersion modelling. Maximum concentration at each receptor points from the five years of modelling scenario was chosen to represent the worst-case scenario.

The wind rose illustrating the data is presented in Appendix B.

5.12 Street Canyon

No street canyons have been identified along the modelled roads and therefore no street canyons have been included in the model.

5.13 Other Model Parameters

The dispersion site surface roughness was set to 1.5m (Large, urban areas) and the Minimum Monin-Obukhov Length (MMOL) was set to 100m (Large conurbations > one million).

The meteorological measurement site surface roughness was set to 0.5m (Parkland, open suburbia) and the MMOL was set to 75m (CERC Guidance).

6 Model Output and Results Discussions

6.1 General

The modelling predicted total oxides of nitrogen (NO_X) at the chosen locations. The base year of 2014 was chosen to predict the NO_X levels at the selected diffusion tube and automatic monitoring station and these values were compared with monitored NO_X and NO_2 result to verify the model predictions. An adjustment factor was determined for the modelling and the factor was applied to predicted values for the opening year in Year 2019. The details of the process are presented below.

6.2 Baseline Conditions

6.2.1 Method

The model adjustment was undertaken using the methodology given in LAQM. TG (16), which requires the determination of the ratio between the measured and modelled road contributed NO_x at each comparison site. The ratio between them, referred to as the adjustment factor, is applied to the modelled road contributed NO_x. The modelled NO_2 is then determined using the Defra NO_x/NO_2 calculator.

6.2.2 Model Verification

The modelled and monitored road contributed NO_x values at the diffusion tube with the ratio between them are given in Table 6.1. The monitored road contributed NO_x was calculated using the Defra NO_x/NO_2 calculator.

Table 6.1 Adjustment Factor, Monitored and Modelled Road Contributed NO_x, 2014

Diffusion Tube	Modelled Road Contributed NOx (excluding background) (µg/m³)	Monitored Road Contributed NOx (excluding background) (µg/m³)	Adjustment Factor
CA23	48.0	104.7	1.970
CA16	39.5	65.6	

The modelled road contributed NO_x is adjusted by the factor 1.970 and then converted to total NO_2 using the NO_x-NO_2 calculator as provided by Defra.

The results, in comparison with the measured total NO_2, together with the ratio between them, are shown in Table 6.2.

Table 6.2 Ratio of the Measured and Modelled total NO_2 for Year 2014

Diffusion Tube	Modelled total NO_2 (µg/m³)	Measured total NO_2 (µg/m³)	Adjustment Factor
CA23	69.7	72.7	0.9996
CA16	61.8	57.8	

The final adjusted total NO_2 concentration predicted at the two diffusion tubes is within ±25% of the measured values, and is therefore considered satisfactory.

Based on the above verification process, the road source NO_x contribution determined by the model was adjusted using the factor of 1.970, then the modelled total NO_2 results were further adjusted by a factor of 0.9996.

In accordance with Defra guidance, the road contributed NO_x adjustment factor was also applied to the road contributed PM concentration. The total PM_{10} and $PM_{2.5}$ concentrations are derived by adding the adjusted road contribution value to the Defra background concentrations as described in Section 5.

6.3 Modelled Results

The predicted NO_2, PM_{10}, and $PM_{2.5}$ values for all future scenarios in 2019 are presented in Table 6.3.

Table 6.3 Modelled NO_2, PM_{10} and $PM_{2.5}$ Concentrations in 2019 (without development, with development)

ID	Receptor	Year 2019 (without development)				Year 2019 (with development)			
		Annual Mean ($\mu g/m^3$)			No. of exceedances of 24-hour mean PM_{10}	Annual Mean ($\mu g/m^3$)			No. of exceedances of 24-hour mean PM_{10}
		NO_2	PM_{10}	$PM_{2.5}$		NO_2	PM_{10}	$PM_{2.5}$	
R1	Oval Rd	36.1	20.8	14.9	4	36.5	20.8	14.9	4
R2	Oval Rd	36.2	20.8	14.9	4	36.3	20.8	14.9	4
R3	Jamestown Rd	36.1	20.8	14.9	4	36.4	20.8	14.9	4
R4	Jamestown Rd-FLAT	38.2	21.2	15.1	5	38.3	21.2	15.1	5
R5	Camden-N-flat	39.5	21.4	15.3	5	39.6	21.4	15.3	5
R6	Parkway	**42.0**	22.1	15.7	7	**42.1**	22.1	15.7	7
R7	Parkway-flat	**40.2**	21.7	15.4	6	**40.3**	21.7	15.4	6
R8	Camden -S-flat	**45.3**	21.9	15.6	6	**45.3**	21.9	15.6	6
R9	Camden -S -flat	**40.3**	21.5	15.3	6	**40.3**	21.5	15.3	6
R10	Camden Rd- E	**44.5**	22.2	15.7	7	**44.6**	22.2	15.7	7
R11	Camden Rd -E	**42.4**	22.0	15.6	6	**42.5**	22.0	15.6	6
R12	Adjacent Building -8F	36.0	20.8	14.9	4	36.8	20.8	14.9	4
R13	Adjacent Building -5F	36.0	20.8	14.9	4	36.7	20.8	14.9	4
R14	Adjacent Building -1F	36.0	20.8	14.9	4	36.7	20.8	14.9	4
R15	Adjacent Building -GF	36.0	20.8	14.9	4	36.7	20.8	14.9	4
PR1	North Building-FRONT-GF	36.0	20.8	14.9	4	36.1	20.8	14.9	4
PR2	North Building-FRONT-6F	36.0	20.8	14.9	4	36.0	20.8	14.9	4
PR3	North Building-BACK-6F	36.0	20.8	14.9	4	37.1	20.8	14.9	4
PR4	North Building-Middle-Front	36.1	20.8	14.9	4	36.9	20.8	14.9	4

Table 6.3 Modelled NO_2, PM_{10} and $PM_{2.5}$ Concentrations in 2019 (without development, with development)

ID	Receptor	Year 2019 (without development)				Year 2019 (with development)			
		Annual Mean ($\mu g/m^3$)			No. of exceedances of 24-hour mean PM_{10}	Annual Mean ($\mu g/m^3$)			No. of exceedances of 24-hour mean PM_{10}
		NO_2	PM_{10}	$PM_{2.5}$		NO_2	PM_{10}	$PM_{2.5}$	
PR5	North Building-Middle-Front	36.0	20.8	14.9	4	36.9	20.8	14.9	4
PR6	North Building-Middle-Back	36.0	20.8	14.9	4	37.0	20.8	14.9	4
PR7	South Building- Middle-Front	36.1	20.8	14.9	4	36.5	20.8	14.9	4
PR8	South Building- Middle-Front	36.1	20.8	14.9	4	36.5	20.8	14.9	4
PR9	South Building- Middle-Back	36.0	20.8	14.9	4	36.5	20.8	14.9	4
PR10	South Building- Middle-Front	36.1	20.8	14.9	4	36.3	20.8	14.9	4
PR11	South Building- Middle-Front	36.1	20.8	14.9	4	36.3	20.8	14.9	4
PR12	South Building- Middle-Back	36.1	20.8	14.9	4	36.3	20.8	14.9	4

Exceedances of annual mean objective highlighted in Bold.

7 Discussion of Results

Comparison with the National Air Quality Objectives and with the Operation of the Proposed Development in 2019:

- The objective for the annual mean NO_2 concentration is 40 µg/m³. This objective is forecast to be met at receptors PR1 to PR12, which are representative of the proposed development.
- The annual mean objective is forecast to be exceeded at six existing receptors in all future scenarios (with and without scheme), due to existing poor air quality.
- According to LLAQM.TG (16) guidance, exceedance of the 1-hour NO_2 mean objective is generally unlikely to occur where annual mean concentrations do not exceed 60 µg/m³. Since the annual mean NO_2 concentration at all the receptors are lower than 60 µg/m³, it is unlikely the 1-hour mean will be exceeded at any of the above locations.
- The objective for the annual mean PM_{10} concentration is 40 µg/m³. The forecast suggested that this objective will be met at all of the selected sensitive receptors.
- LAQM.TG (16) guidance provides guidance on calculating the number of exceedances, as a 24-hour mean PM_{10} concentration, of 50 µg/m³. In all scenarios, the number of exceedance is considerably below the limit of 35.
- The objective for the annual mean $PM_{2.5}$ concentration is 25 µg/m³. The forecast suggested that this objective will be met at all of the selected sensitive receptors.
- In the 2019 'with development' scenario, no new exceedances are created at existing receptors.

7.1 Significance of Impact

In 2015, EPUK and IAQM published guidance (updated January, 2017) to ensure that air quality is adequately considered in the land-use planning and development control processes[22]. This guidance is for assessing the significance of air quality impacts at selected 'receptors' by using the changes in concentrations relative to the AQAL and the long term average concentration at each receptor. AQAL could be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level' (EAL).

The impact descriptors used in this assessment are summarised in Table 7.1.

Table 7.1 Impact 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

*Changes are rounded up to the nearest whole percentage. Changes of less than 0.5% of the AQAL are considered imperceptible.

Table 7.2 shows that there is a slight increase in NO_2 concentrations at all of the modelled existing receptors in the 2019 with development future scenario, with 2-5% the largest percentage change in NO_2 concentrations relative to the AQAL.

The largest impact descriptors ('Slight Adverse') are seen on various floors of the adjacent building but the overall NO_2 concentrations are still below the annual mean objective at these receptors. Impact descriptors at all other existing receptors are negligible.

Tables 7.2 to 7.4 show that although there is a very slight increase in NO_2, PM_{10} and $PM_{2.5}$ concentrations at all of the modelled existing receptors in the 2019 with development future scenario, the percentage change in concentrations relative to the AQAL is below 1% and therefore considered to be '**Negligible**'.

Table 7.2 NO_2 Annual Mean Concentration Changes and Associated Impact at Existing Sensitive Receptors in 2019 (without development, with development)

	Receptor Name	Predicted Annual Mean NO_2 Concentration 2019 ($\mu g/m^3$)	Long Term Average Concentration at Receptor in Assessment Year 2019	Pollutant Concentration Change 2019 ($\mu g/m^3$)	% Change Relative to AQAL in 2019	2019 Impact Descriptor
R1	Oval Rd	36.5	76-94% of AQAL	0.4	1%	Negligible
R2	Oval Rd	36.3	76-94% of AQAL	0.1	0%	Negligible
R3	Jamestown Rd	36.4	76-94% of AQAL	0.2	1%	Negligible
R4	Jamestown Rd-FLAT	38.3	95-102% of AQAL	0.1	0%	Negligible
R5	Camden-N-flat	39.6	95-102% of AQAL	0.0	0%	Negligible
R6	Parkway	**42.1**	103-109% of AQAL	0.1	0%	Negligible
R7	Parkway-flat	**40.3**	95-102% of AQAL	0.1	0%	Negligible
R8	Camden -S-flat	**45.3**	110% or more of AQAL	0.0	0%	Negligible
R9	Camden -S -flat	**40.3**	95-102% of AQAL	0.0	0%	Negligible
R10	Camden Rd- E	**44.6**	110% or more of AQAL	0.0	0%	Negligible
R11	Camden Rd -E	**42.5**	103-109% of AQAL	0.0	0%	Negligible
R12	Adjacent Building -8F	36.8	76-94% of AQAL	0.9	2-5%	Slight Adverse
R13	Adjacent Building -5F	36.7	76-94% of AQAL	0.7	2-5%	Slight Adverse
R14	Adjacent Building -1F	36.7	76-94% of AQAL	0.7	2-5%	Slight Adverse
R15	Adjacent Building -GF	36.7	76-94% of AQAL	0.7	2-5%	Slight Adverse

Table 7.3 PM_{10} Annual Mean Concentration Changes and Associated Impact at Existing Sensitive Receptors in 2019

	Receptor Name	Predicted Annual Mean PM_{10} Concentration 2019 ($\mu g/m^3$)	Long Term Average Concentration at Receptor in Assessment Year 2019	Pollutant Concentration Change 2019 ($\mu g/m^3$)	% Change Relative to AQAL in 2019	2019 Impact Descriptor
R1	Oval Rd	20.8	75% or less of AQAL	0.0	0%	Negligible
R2	Oval Rd	20.8	75% or less of AQAL	0.0	0%	Negligible
R3	Jamestown Rd	20.8	75% or less of AQAL	0.0	0%	Negligible
R4	Jamestown Rd-FLAT	21.2	75% or less of AQAL	0.0	0%	Negligible
R5	Camden-N-flat	21.4	75% or less of AQAL	0.0	0%	Negligible
R6	Parkway	22.1	75% or less of AQAL	0.0	0%	Negligible
R7	Parkway-flat	21.7	75% or less of AQAL	0.0	0%	Negligible
R8	Camden -S-flat	21.9	75% or less of AQAL	0.0	0%	Negligible
R9	Camden -S -flat	21.5	75% or less of AQAL	0.0	0%	Negligible
R10	Camden Rd- E	22.2	75% or less of AQAL	0.0	0%	Negligible
R11	Camden Rd -E	22.0	75% or less of AQAL	0.0	0%	Negligible
R12	Adjacent Building -8F	20.8	75% or less of AQAL	0.0	0%	Negligible
R13	Adjacent Building -5F	20.8	75% or less of AQAL	0.0	0%	Negligible
R14	Adjacent Building -1F	20.8	75% or less of AQAL	0.0	0%	Negligible
R15	Adjacent Building -GF	20.8	75% or less of AQAL	0.0	0%	Negligible

Table 7.4 $PM_{2.5}$ Annual Mean Concentration Changes and Associated Impact at Existing Sensitive Receptors in 2019

	Receptor Name	Predicted Annual Mean $PM_{2.5}$ Concentration 2019 ($\mu g/m^3$)	Long Term Average Concentration at Receptor in Assessment Year 2019	Pollutant Concentration Change 2019 ($\mu g/m^3$)	% Change Relative to AQAL in 2019	2019 Impact Descriptor
R1	Oval Rd	14.9	75% or less of AQAL	0.0	0%	Negligible
R2	Oval Rd	14.9	75% or less of AQAL	0.0	0%	Negligible
R3	Jamestown Rd	14.9	75% or less of AQAL	0.0	0%	Negligible
R4	Jamestown Rd-FLAT	15.1	75% or less of AQAL	0.0	0%	Negligible
R5	Camden-N-flat	15.3	75% or less of AQAL	0.0	0%	Negligible
R6	Parkway	15.7	75% or less of AQAL	0.0	0%	Negligible
R7	Parkway-flat	15.4	75% or less of AQAL	0.0	0%	Negligible
R8	Camden -S-flat	15.6	75% or less of AQAL	0.0	0%	Negligible
R9	Camden -S -flat	15.3	75% or less of AQAL	0.0	0%	Negligible
R10	Camden Rd- E	15.7	75% or less of AQAL	0.0	0%	Negligible
R11	Camden Rd -E	15.6	75% or less of AQAL	0.0	0%	Negligible
R12	Adjacent Building -8F	14.9	75% or less of AQAL	0.0	0%	Negligible
R13	Adjacent Building -5F	14.9	75% or less of AQAL	0.0	0%	Negligible
R14	Adjacent Building -1F	14.9	75% or less of AQAL	0.0	0%	Negligible
R15	Adjacent Building -GF	14.9	75% or less of AQAL	0.0	0%	Negligible

8 Construction Impacts

8.1 Site and Surrounding Area

As stated in Section 2.2, the proposed development comprises the demolition of existing buildings as well as the erection of 76 residential units and 1,219 sqm of commercial floor space (Use Class B1) over 4, 5, 6 and 7 storeys, providing a mix of 1, 2 and 3 bed apartments. The development includes a landscaped courtyard and communal amenity areas.

The surrounding area mainly consists of residential areas with some local shops and Camden Market approximately 250 meters to the north of the site. Primrose School is located 200 m to the northwest of the site and North Bridge House Preparatory School is 200m to the south of the site.

Impacts associated with the demolition and construction activities have been considered within this assessment, which is based on the recommended approach by the Institute of Air Quality Management (2016)[23].

The precise behaviour of the dust, its residence time in the atmosphere, and the distance it may travel before being deposited would depend upon a number of factors. These include wind direction and strength, local topography and the presence of intervening structures (buildings, etc.) that may intercept dust before it reaches sensitive locations. Furthermore, dust would be naturally suppressed by rainfall.

8.2 Risk Assessment of Dust Impacts

8.2.1 Potential Dust Emission Magnitude

The dust emission magnitude is based on the scale of anticipated works at the site and has been classified as small, medium or large for each of the four activities; demolition, earthworks, construction and trackout. A summary of the dust emission magnitude for each activity is set out in Table 8.1.

Demolition

It is understood that demolition activities are anticipated to take place between June and September 2017. The approximated total volume of buildings to be demolished has been estimated as approximately 16,000 m^3 and demolition activities will be carried out less than 10 m above ground level.

As the total building volume to be demolished is less than 20,000m^3, it is considered that the dust emission magnitude for demolition activities would be ‘Small’.

Earthworks

Earthworks are those activities involved in preparing the site for construction such as excavation of material, haulage, tipping, stockpiling and levelling.

It is understood that earthworks activities are planned to take place between October and November 2017.

The total ground floor area of the site is approximately ~3600m^2. It is estimated that there is a made ground thickness of up to 3.0m. The made ground is underlain by alluvium in the centre of the site, with London Clay below. The approximate tonnage of material to be removed is 7.2 tonnes per square metre of basement area.

Based on the information above, it is considered that the potential dust emission magnitude for earthwork activities would be 'Medium'.

Construction

It is understood that construction activities will last for about 2 years, taking place between December 2017 and November 2019.

There are a number of factors that can have an impact on the magnitude of dust emission during construction activities, which include the size of the building, materials used for construction, the method of construction and the duration of the build.

The proposed development volume is estimated to be > 100, 000m^3. Construction activities will involve substructure, superstructure and fit out. Based on these factors, it is considered that the dust emission magnitude for construction activities would be 'large'.

Trackout

The risk of impacts occurring during trackout is predominantly dependent on the number of vehicles accessing the site on a daily basis. However, vehicle size and speed, the duration of activities and local geology are also factors which are used to determine the emission class of the site as a result of trackout.

It is expected that there will be about 3-4 movements per day during demolition activities, and between 1 or 2 movements per day during earthworks activities.

However, during construction, it is understood that there will be over 10 movements per day, therefore, movement of vehicles will be over surfaces with moderate potential for dust release. Given these factors, it is considered that the dust emission magnitude for trackout activities would be 'medium'.

Table 8.1 Summary of Dust Emission magnitude for Each Activity

Source	Magnitude
Demolition	Small
Earthworks	Medium
Construction	Large
Trackout	Medium

8.2.2 Sensitivity of the area

The sensitivity of the surrounding area takes into account the following factors:

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

The IAQM distance screening bands for the identification of sensitive receptors are shown in Figure 6.

Based on the IAQM guidance, residential dwellings are considered as 'High' sensitivity receptors in relation to both dust soiling and health effects of PM_{10}. There are more than 10 residential units within 20 m of the site, on Oval Road as well as to the north of the proposed development.

IAQM guidance also states that 'in the case of high sensitive receptors with high occupancy (such as schools or hospitals), approximate the number of people likely to be present. Schools are considered to be 'high' sensitivity receptors with regard to dust soiling and human health impacts. There is likely to be >100 students located in Primrose School within a 200 m radius, which makes the sensitivity be 'low'. It should be noted that in cases such as these, only the highest level of area sensitivity needs to be considered further.

According to the Defra mapped PM_{10} background data presented in Table 5.2, the PM_{10} concentration is predicted to be less than 24 $\mu g/m^3$ at the site.

Given the above, the sensitivity of the area is considered to be 'high' with regards to dust soiling for demolition, earthworks and construction. Trackout may occur from roads up to 200 m, and there are between 1 and 10 receptors within 20 m of the road used by construction traffic, therefore the sensitivity has been estimate to be 'medium'. Regarding human health impacts, the sensitivity would be 'low' with respect to demolition, construction, earthworks and trackout activities.

Assessment of relevant ecological sites in accordance with the IAQM guidance revealed that there are no sensitive ecological habitats within 20 m of the site.

Therefore, the sensitivity of the area is considered to be 'negligible' with respect to ecological impacts for demolition, construction, earthworks and trackout activities.

Table 8.2 Summary of Sensitivity of Surrounding Area

Potential Impact	Sensitivity of Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	Medium
Human Health	Low	Low	Low	Low
Ecological	N/A	N/A	N/A	N/A

8.2.3 Defining the Risk of Impacts

The dust emission magnitude as set out in Table 8.1 is combined with the sensitivity of the area (Table 8.2) to determine the risk of both dust soiling and human health impacts, assuming no mitigation measures applied at site. The risk of impacts associated with each activity is provided in Table 8.3 below and has been used to identify site-specific mitigation measures, which are set out in Section 10.

Table 8.3 Summary of Risk Effects to Define Site Specific Mitigation

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium Risk	Medium Risk	High Risk	Low Risk
Human Health	Negligible	Low Risk	Low Risk	Low Risk
Ecological	N/A	N/A	N/A	N/A

9 Air Quality Neutral Assessment

9.1 General

Policy within the London Plan requires development to be 'air quality neutral', the aim of which is to bring forward development that are air quality neutral or better and that do not degrade air quality in areas where air quality objectives are not currently being achieved. The proposed development is located in London Borough of Camden, which is categorised as an 'Inner' London Borough, and as such the appropriate figures for Inner London were used.

Guidance for undertaking AQNA are given in the following two documents:

- The Air Quality Neutral Planning Support Update 2014 [24] ;
- Mayor of London Sustainable Design and Construction Supplementary Planning Guidance 2014 [25].

9.2 Method of Assessment

GLA 80371 guidance recommends that the Air Quality Neutral Assessment should focus on the NO_x and PM_{10} emissions and to consider the emissions from the energy sources used within the building and emissions from transport vehicles associated with buildings use.

9.3 Transport Emissions

9.3.1 General

The air quality neutral assessment for the road traffic emissions compares the road traffic emissions from the proposed development with benchmark values based on land usage.

9.3.2 Assessment

The project's TC has provided estimated trip rates for the proposed development; these equate to 42 residential trips and 13 commercial trips per day.

GLA 80371, provides emission factors in terms of g/vehicle-km. Based on these rates, the worst-case annual vehicle emissions associated with the additional vehicle trips are presented in Table 9.1.

Table 9.1 Calculated Emissions for Proposed Traffic

Land use	Annual Traffic Flow (veh/ annum)	Emission rate (g/veh/km)		Average distance travelled by vehicle per trip (km)	All Vehicle (Annual Emissions (kg/yr)	
		NO_x	PM_{10}	(C3) / (B1)	NO_x	PM_{10}
Residential (C3)	15330	0.37	0.0665	3.7	21.0	3.8
Commercial (B1)	4780	0.37	0.0665	7.7	13.6	2.4

The benchmark emissions were calculated using the GLA 80371 guidance for the each development type. The emissions are calculated based on the number of dwellings for residential units and the site area for commercial units as presented in Table 9.2 and Table 9.3 respectively.

Table 9.2 Benchmark Emissions for Proposed Development (Residential)

Land use	Number of dwellings	Benchmark Emission rate (g/dwelling/annum)		All Vehicle (Annual Emissions (kg/yr)	
		NO_x	PM_{10}	NO_x	PM_{10}
Residential (C3)	76	558	100	42.4	7.6

Table 9.3 Benchmark Emissions for Proposed Development (Commercial)

Land use	Site Area m^2	Benchmark Emission rate (g/ m^2/annum)		All Vehicle (Annual Emissions (kg/yr)	
		NO_x	PM_{10}	NO_x	PM_{10}
Commercial (B1)	1219	11.4	2.05	13.9	2.5

The transport emissions easily meet the benchmark emissions for the residential and commercial elements of the development. Therefore, no further mitigation measures are required to address the air quality neutral aspects of the scheme.

9.4 Operational Energy Plant Emissions

9.4.1 General

The residential units of the proposed development will have gas powered CHP and boilers providing heat, electricity and hot water. The details of the energy requirements and hence the design of the CHP and boilers have not been finalised. The following assessments are based on typical worst-case parameters provided by the mechanical & electrical (M&E) consultant for the scheme.

9.4.2 Assessment

The worst case emission factors and the total amounts of natural gas to be used by each plant were calculated using information provided by the Clients M&E Consultant. However, the final consumption will dependent on good controls commissioning and how the operator uses the building and related services. The emission from the proposed development are presented in Table 9.4.

Table 9.4 Emissions from Proposed Plant

	Annual Gas Consumption (kwh)*1	Emission Factor (mg/kwh)		Annual Emissions (kg/yr)	
		NO_x	PM_{10}	NO_x	PM_{10}*1
CHP	267,692	14.4	-	3.9	-
Gas Boiler	69,771	34.3	-	2.4	-

***1-** The PM_{10} emissions from modern plant are negligible and the manufacturers do not supply factors for it.

The benchmark emissions were calculated using the residential development area and factors contained within GLA 80371 and are presented in Table 9.5.

Table 9.5 Benchmark Emissions for Proposed Development

Land use	Residential Area (m^2)	Emission Factor (g/m^2)		Annual Emissions (kg/yr)	
		NO_x	PM_{10} *1	NO_x	PM_{10}*1
Residential-(C3)	504	26.2	-	13.2	-

***1-** The PM_{10} emissions from modern plant are negligible and the manufacturers do not supply factors for it.

The emissions for the proposed heating plant meet the Air Quality Neutral benchmark and therefore no further action is required.

10 Mitigation Measures

10.1 Construction Phase

Particle generation from construction and demolition activities can be substantially reduced through carefully selected mitigation techniques and effective management. The most effective technique is to control at source, as once particles are airborne, it is difficult to prevent them from dispersing into the surrounding area. However, once airborne, water sprays are probably the most effective method for suppression.

Pre-project planning, implementation and on-site management issues are an essential requirement for effective dust control. This includes, for example environmental risk assessments, method statements, training and satisfying planning requirements. Before the start of a project, it is also important to identify which construction activities are likely to generate dust and to draw up action plans to minimise emissions to the atmosphere. Dust emissions from construction sites will mainly be the sum of a large number of small activities. Therefore, attention to detail is a critical feature of effective management of the total site emissions.

The Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance (SPG)[26] provides extensive coverage on the possible dust and emissions control measures. Stakeholder engagement is important, such that local sensitive receptors are notified and consulted properly before any work commence. Site layout should be carefully planned, ensuring dust generating activities and the associated machineries are located away from receptors as far as possible. Green infrastructure is also recommended to control the dispersion of dust, and at the same time improve the local environment.

In terms of mobile vehicles associated with the demolition and construction activities, initial pre-application discussions were held to investigate the possibility of reducing vehicle emissions during the construction phase by considering water-borne delivery of construction materials. However, the tidal nature of Deptford Creek meant that this option could not be integrated into the development proposals. Therefore, any vehicle accessing the site during the construction phase should comply with the Low Emission Zone standards as a minimum requirement. Engine idling should be avoided through careful site vehicles management. Construction Logistics Plans (CLPs) / Construction Traffic Management Plans should be considered, especially for larger development.

As part of the planning application, the Client will prepare a Construction Management Plan (CMP) and agree this with Highways Officers at LBC Council. This will ensure that the construction phase will cause minimal disruption to the surrounding area and neighbours.

Site specific mitigation measures should be set up based on the risk effects as outlined in Table 8.3. Examples of these measures are provided in the IAQM guidance document. In addition to the ‘desirable’ measures, the IAQM guidance also sets out a number of ‘highly recommended’ measures which should also be considered for inclusion within the CMP. Specific attention should be paid to the demolition, construction and earthworks activities, as the risk for dust soiling is considered to be ‘medium’. These are set out in Appendix C.

Following implementation of the measures recommended for inclusion within the CMP the impact of emissions during construction of the proposed development would be ‘not significant’.

10.2 Operational Phase

According to the London Councils Air Quality and Planning Guidance, the Air Pollution Exposure Criteria (APEC) for the proposed development on Centric Close is APEC-A. This guidance suggests that there should be "No air quality grounds for refusal; however mitigation of any emissions should be considered."

Mitigation measures are presented below.

10.2.1 CHP and boilers

Low NOx boiler and CHP plant have been included within the design proposals to minimise site generated emissions. The emissions from the CHP and boiler are not predicted to have any significant adverse impact on the receptors within the development, as well the existing receptors nearby. It is not necessary to adjust the current proposed stack height (1.0m above roof on Block A), or increase the flue gas exit velocity.

It is important that the CHP units will be regularly maintained according to the manufacturer's specification, such that the emission levels will remain at an acceptable level throughout their operational lifetime.

10.2.2 Reducing Vehicle Emissions

A supporting Travel Plan (TP) Statement is being submitted to encourage future residents to use alternative transport modes rather than private vehicles, with an aim to further reduce traffic levels generated by the proposed development. The TP provides a long-term strategy aimed at encouraging future end-users (i.e. residents, employees and visitors) to reduce their dependency on travelling by single occupancy vehicles (SOVs) in favour of the more sustainable modes such as car sharing, public transport, walking and cycling. To accomplish this aim, the TP sets out measures and initiatives, appropriate to future occupiers, thereby ensuring a targeted approach is applied.

The general aims of the plan are as follows:

- Raise awareness of sustainable travel modes available to residents;
- Promote healthy lifestyles and sustainable, vibrant local communities;
- Encourage good urban design principles that maximise the permeability of the development for walking and cycling;
- Improve existing infrastructure and ensure connectivity and assimilation both within the development and between the existing wider community; and
- Avoid reliance on car usage, especially single occupancy vehicles.

Promoting cycling as a mode of sustainable travel is key to encouraging a modal shift away from the use of private cars. The scheme will provide a total of 138 long-stay and 5 short-stay cycle parking spaces, of which 124 long-stay and 2 short-stay spaces will be provided for residential use. This is in accordance with relevant London Plan cycle parking standards contained within the London Plan (2016). 4.7 Local cycling routes and information on safe cycling will be provided to all residents as part of their welcome pack.

To minimise the need for future households to own a vehicle and reduce demand for on-site parking, the client is expecting to provide support towards existing car clubs within the vicinity of the site (final details to be agreed).

In addition, all residents and employees will be made aware of the benefits of membership to the car club through various marketing and promotional material including Travel Information Packs. These will contain up-to-date details of public transport services, the location of bus stops and underground stations, and will also contain details of available sustainable modes of transport including car sharing and car club schemes. The Pack will also provide promotional material highlighting the health benefits of walking and cycling. In addition, it will include details of essential contact addresses, telephone numbers and websites administered by the local authority, transport providers and any other organisations related to sustainable modes of transport.

11 Conclusions

Fairview New Homes (the Client) are proposing a new mixed use residential led development in Centric Close, Camden. This air quality assessment is to support the planning application for the proposed redevelopment. The performance of the ADMS-Roads Extra model has been verified using the ratified monitoring data from diffusion tubes located on Camden Road and Kentish Town Road. An appropriate adjustment factor was applied to the predicted modelling results.

The results of the assessment are as below:

- The objective for the annual mean NO_2 concentration is 40 µg/m³. This objective is forecast to be met at all receptors representative of the proposed development.
- The annual mean objective is forecast to be exceeded at six existing receptors in the vicinity of the development in all future scenarios (with and without scheme), due to existing poor air quality. The air quality impacts of the proposed scheme at these locations is negligible, therefore no specific mitigation measures are required to address this issue.
- The short-term hourly objective for NO_2 is expected to be met at all locations. The PM_{10} and $PM_{2.5}$ concentrations are forecast to meet their respective long and short term objectives by a considerable margin.
- In the 2019 'with development' scenario, no new exceedances are created at existing receptors.
- The largest impact descriptors ('Slight Adverse') are seen on various floors of the adjacent building but the overall NO_2 concentrations are still below the annual mean objective at these receptors. Impact descriptors at all other existing receptors are negligible.

A qualitative assessment on the construction phase activities has also been carried out. The risk of the different activities towards dust soiling ranges from **'Low to Medium'**, and that for human health impact ranges from **'Negligible to Low'**. Following implementation of the appropriate mitigation measures as outlined in the report, the impact of emissions during construction of the proposed development would be **'not significant'**.

According to the London Councils Air Quality and Planning Guidance, the Air Pollution Exposure Criteria (APEC) for the proposed new development is **APEC-A**. Current Guidance published by the London Councils suggests that there should be "No air quality grounds for refusal; however mitigation of any emissions should be considered".

An Air Quality Neutral Assessment was compiled to support the planning application for the proposed development. The assessment indicates that the emissions for the proposed heating plant meet the Air Quality Neutral benchmark. Following a reduction in the provision of commercial parking spaces within the development requested by LBC, and a proportionate reduction in commercial vehicle trips, the total NO_x and PM_{10} emissions from the road traffic vehicles meet the Air Quality Neutral Benchmark for both the residential and commercial elements of the scheme.

In order to minimise site generated pollutant emissions, low NOx boiler and CHP plant have been included within the design proposals. The emissions from the CHP and boiler are not predicted to have any significant adverse impact on the receptors within the development, as well the existing receptors nearby. It is not necessary to adjust the current proposed stack height (1.0m above roof on Block A), or increase the flue gas exit velocity.

In order to mitigate reduce potential operational phase traffic related air quality impacts, a Travel Plan is being be submitted to encourage future residents to use alternative transport modes rather than private vehicles, with an aim to further reduce the number of traffic to be generated by the proposed development. Cycle parking will also be provided on site, comprising dedicated, secure storage areas. The scheme will provide a total of 138 long-stay and 5 short-stay cycle parking spaces, of which 124 long-stay and 2 short-stay spaces will be provided for residential use.

To minimise the need for future households to own a vehicle and reduce demand for on-site parking, the client will provide support towards existing car clubs within the vicinity of the site (final details to be agreed). It is anticipated that the car free nature of the residential aspect of the development would be secured via Section 106 planning obligation preventing future residents form purchasing parking permits within the surrounding Car Parking Zones.

Air quality constitutes a material consideration in the determination of planning applications. However, with the effective implementation of appropriate mitigation measures outlined above, it is considered that air quality should not present a constraint to the granting of planning permission for the proposed development on this occasion.

12 References

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9 Planning Policy Statement 23 (PPS 23): Planning and Pollution Control (ODPM).

10 Environmental Protection Act (1990)

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12 Greater London Authority (March 2015) The London Plan: Spatial Development Strategy for Greater London

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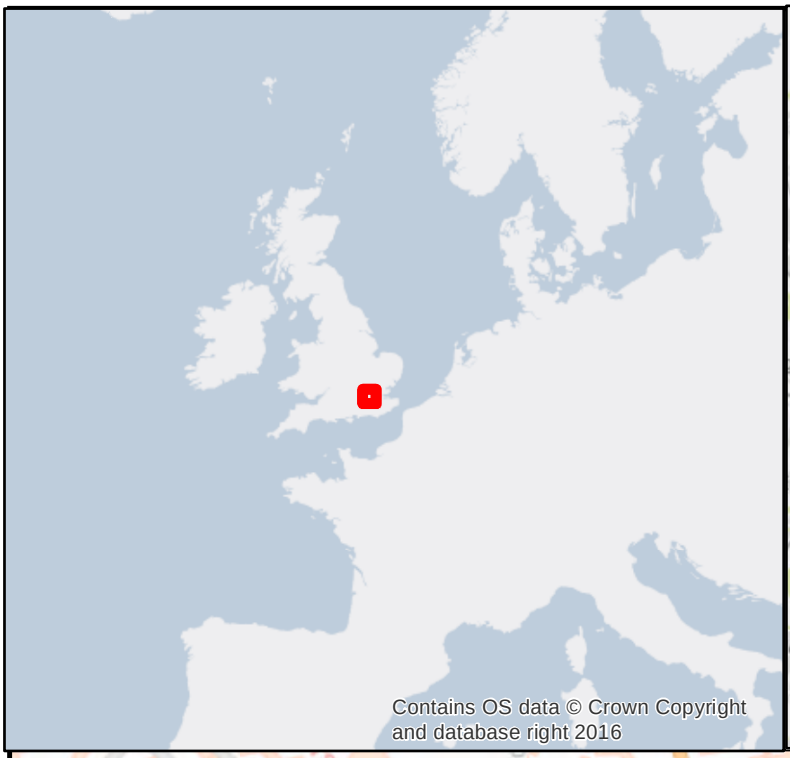
25 Mayor of London Sustainable Design and Construction Supplementary Planning Guidance, published April 2014

26 The Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance. July 2014. Greater London Authority

Figures



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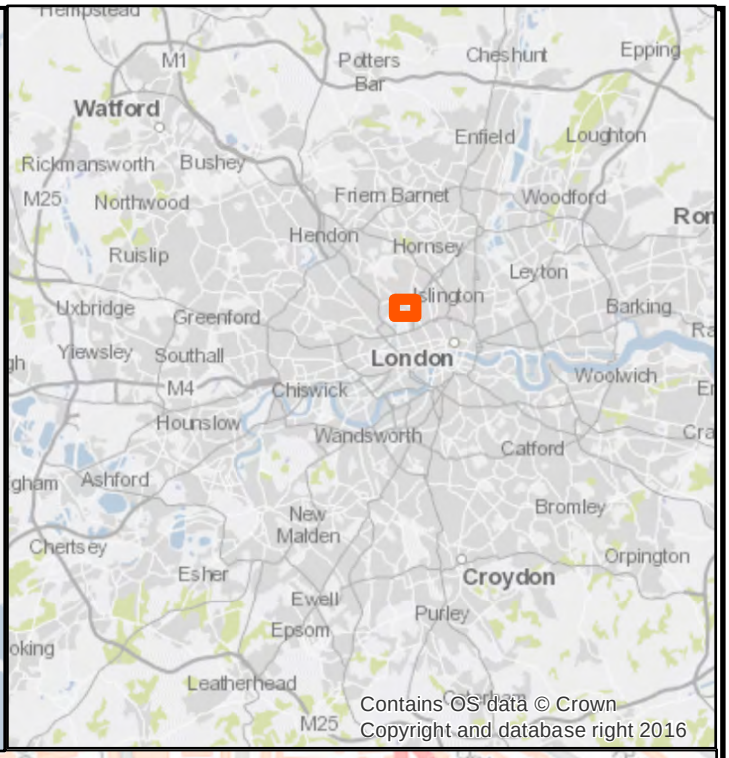

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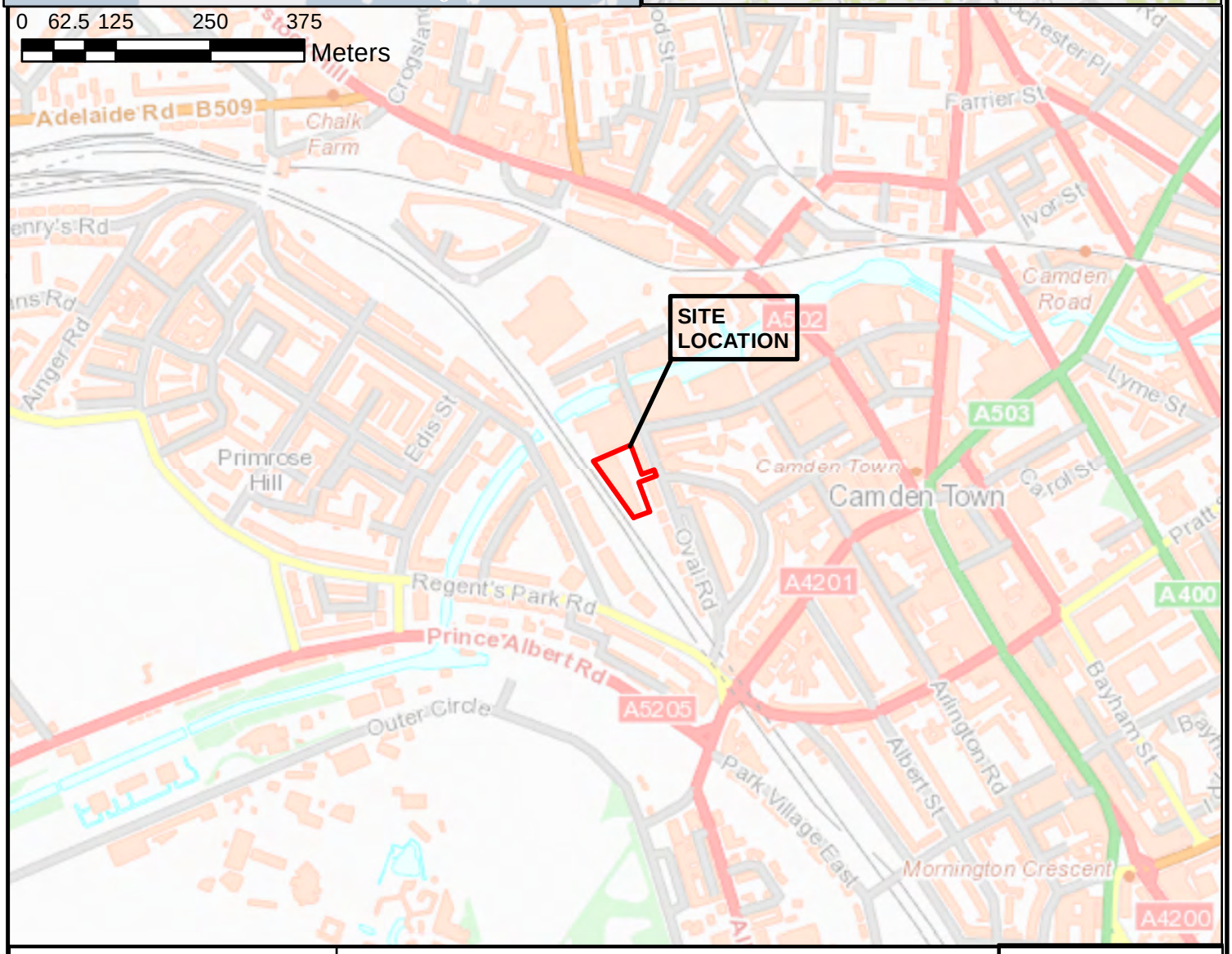

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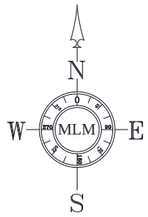
PROJECT

FAIRVIEW VENTURES LTD
CENTRIC CLOSE

SITE LOCATION

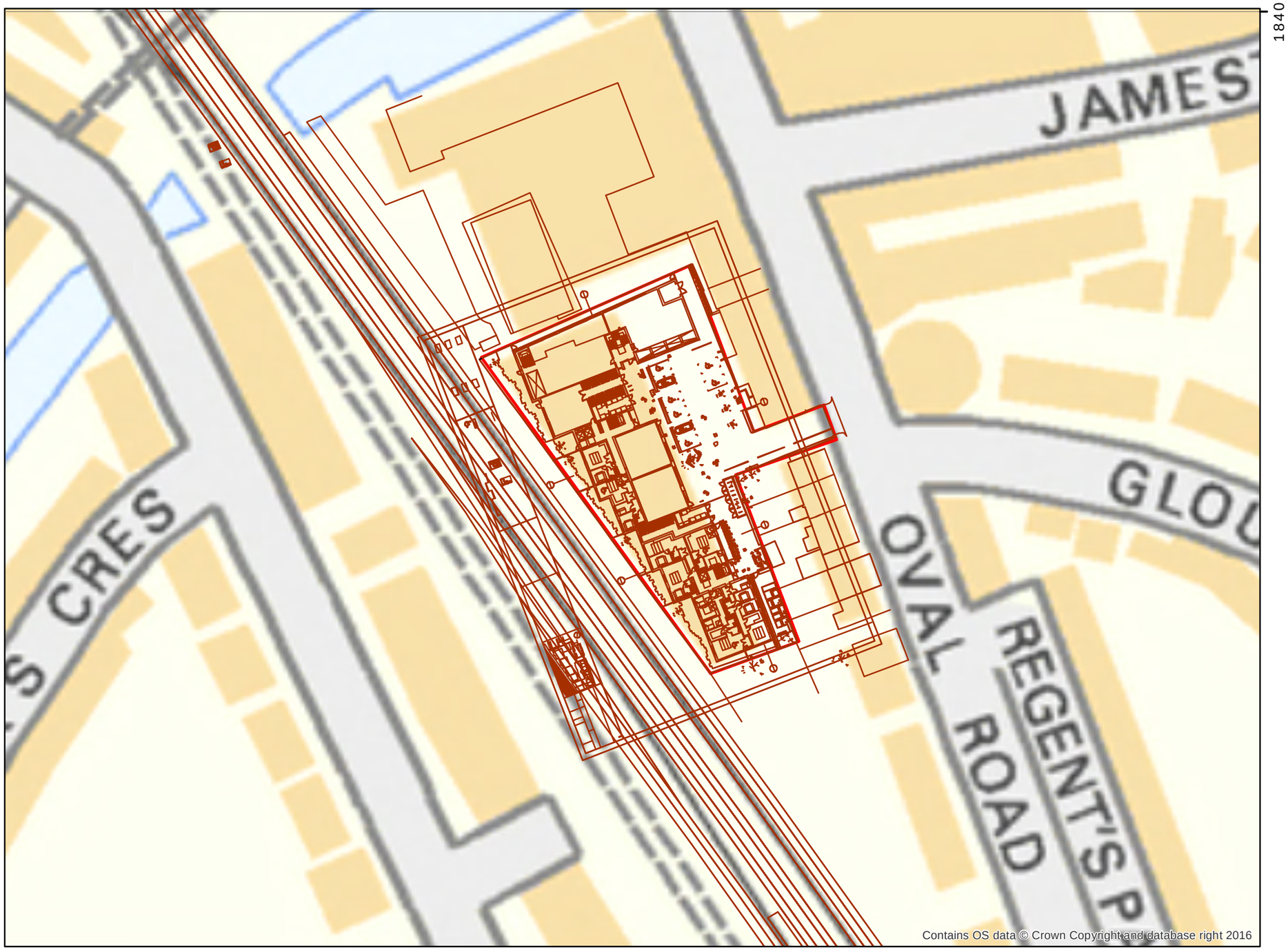
Job No.
774547

Figure No.
1



LEGEND

GROUND FLOOR LAYOUT



0 20 40 80 Meters

COORDINATE SYSTEM: BRITISH NATIONAL GRID
UNITS: METER

SCALE: 1:1,000

Rev	Date	Description	Made	Ckd

MLM

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Drawing Status: FINAL ISSUE

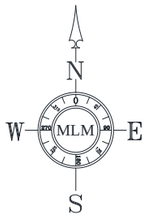
Client: FAIRVIEW VENTURES LTD

Project: CENTRIC CLOSE, CAMDEN

Drawing Title: SITE LAYOUT PLAN

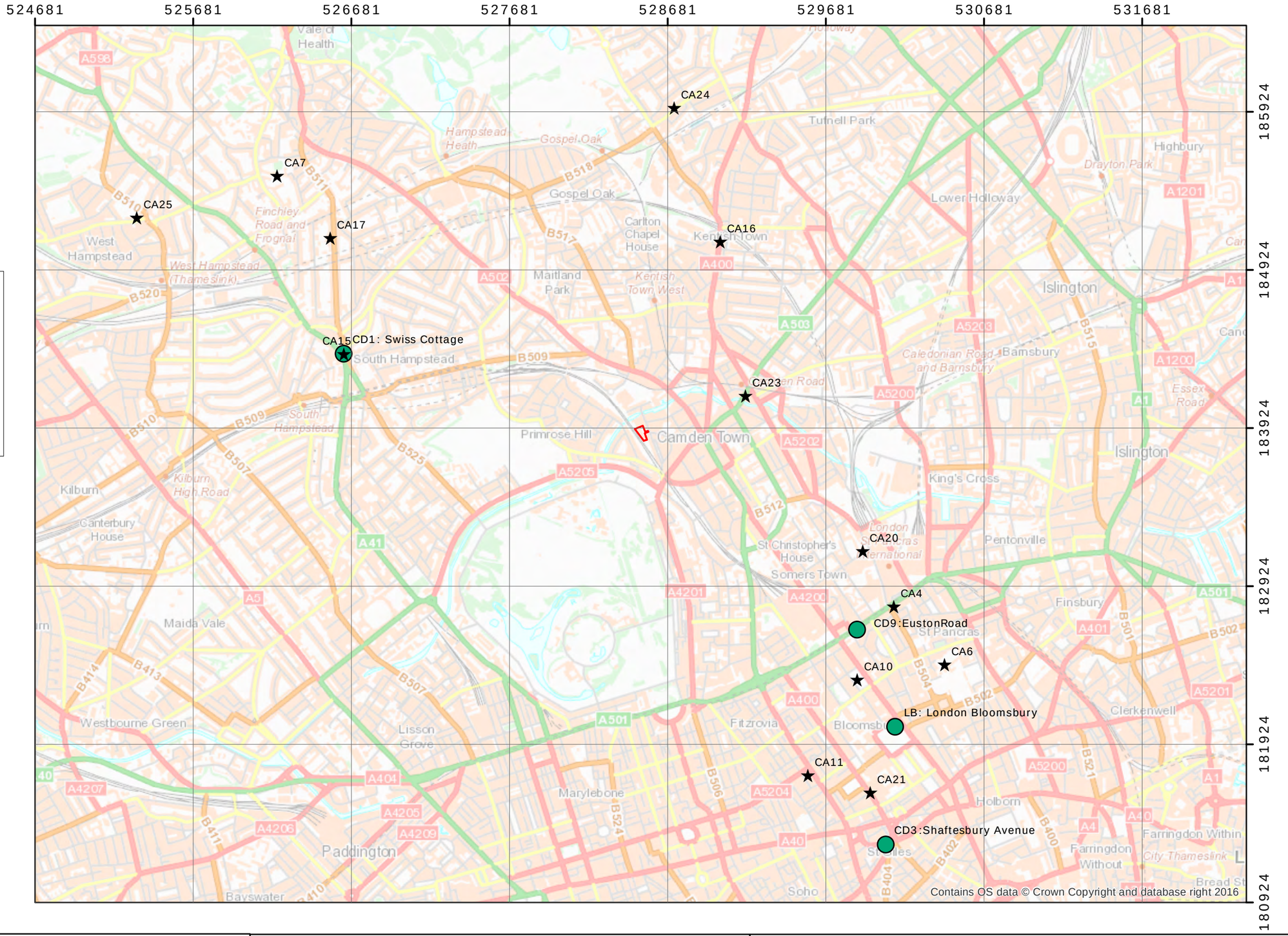
Drawn/Design	GH	Date	MAR 2017	Scales	NTS @A1
Checked	PC	Approved	PC		1:1000 @A3

Drawing No. 774547-DWG-ENV-002



LEGEND

- SITE BOUNDARY
- ★ DIFUSSION TUBES
- AIR QUALITY MONITORING STATION



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Coordinate System: British National Grid
Units: Meter
Scale: 1:25,000

Rev	Date	Description	Made	Ckd

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Drawing Status: FINAL ISSUE

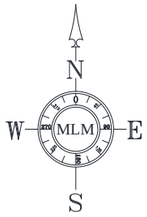
Client: FAIRVIEW VENTURES LTD

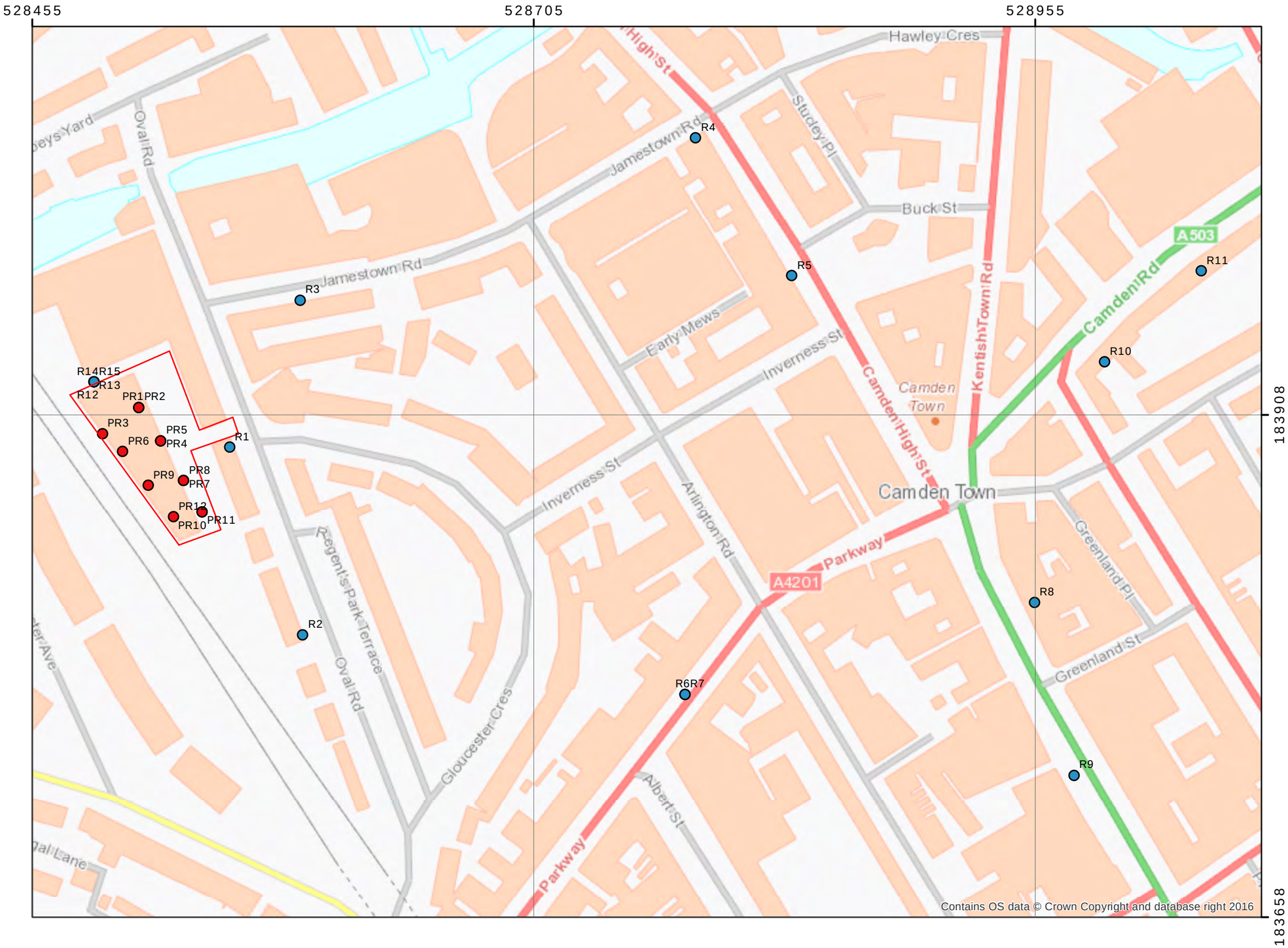
Project: CENTRIC CLOSE CAMDEN

Drawing Title: SITE IN RELATION TO MONITORING LOCATIONS

Drawn/Design	ER	Date	DEC 2016	Scales	NTS @A1
Checked	GH	Approved	GH		1;25,000 @A3

Drawing No. 774547-DWG-ENV-FIG 3





LEGEND

- PROPOSED RECEPTORS
- EXISTING RECEPTORS
- SITE BOUNDARY

0 30 60 120 Meters

Coordinate System: British National Grid
Units: Meter
Scale: 1:2,000

Rev	Date	Description	Made	Ckd

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Drawing Status: FINAL ISSUE

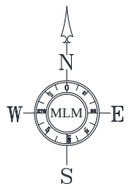
Client: FAIRVIEW VENTURES LTD

Project: CENTRIC CLOSE CAMDEN

Drawing Title: RECEPTORS LOCATION PLAN

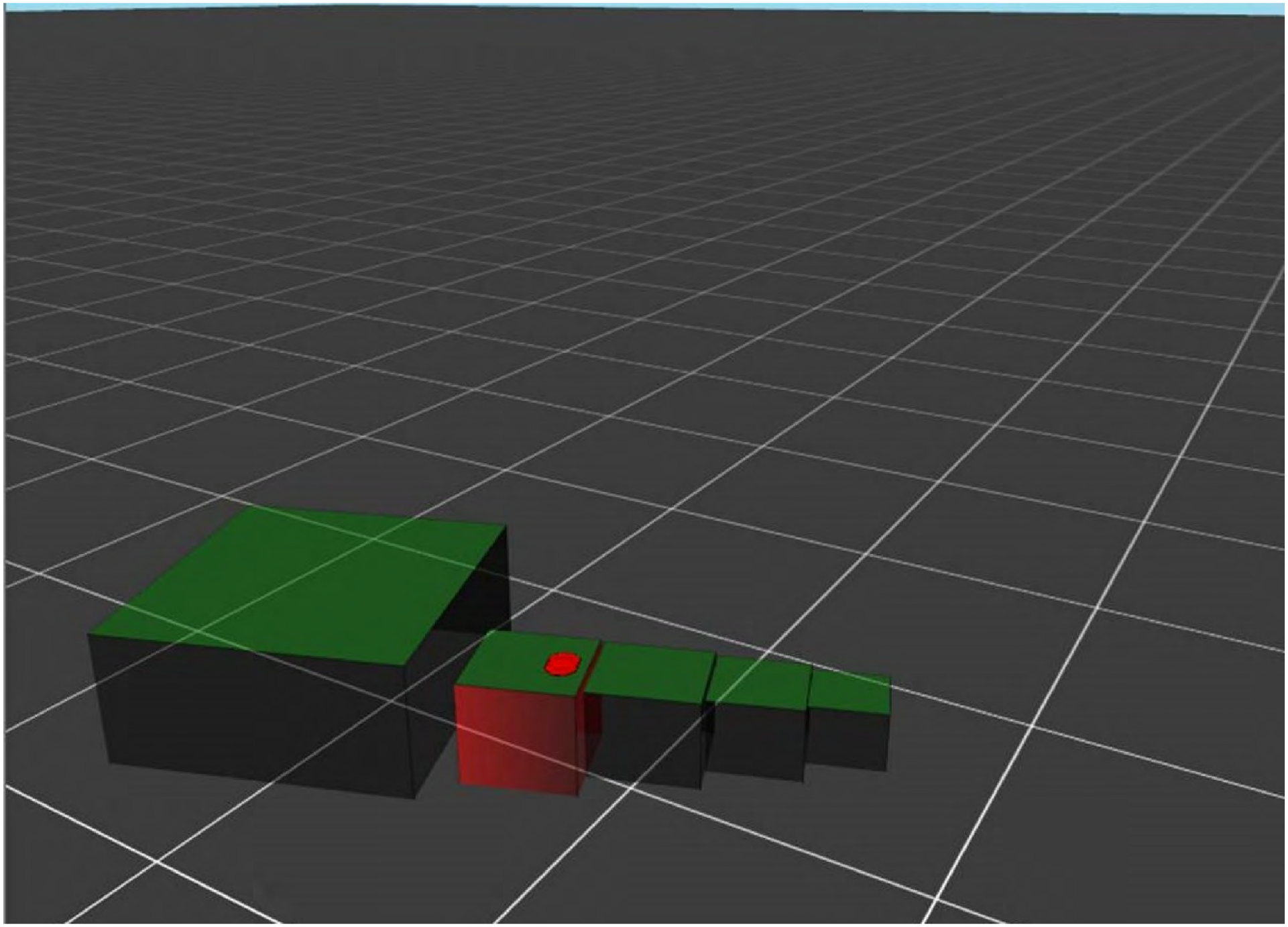
Drawn/Design	ER	Date	DEC 2016	Scales	NTS @A1
Checked	GH	Approved	GH		1;2,500 @A3

Drawing No. 774547-DWG-ENV-FIG 4



LEGEND

- MAIN BUILDING
- BUILDINGS MODELLED
- STACKS



Rev	Date	Description	Made	Ckd

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Drawing Status: FINAL ISSUE

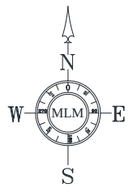
Client: FAIRVIEW VENTURES LTD

Project: CENTRIC CLOSE, OVAL ROAD, CAMDEN

Drawing Title: BUILDING LAYOUT USED IN MODEL

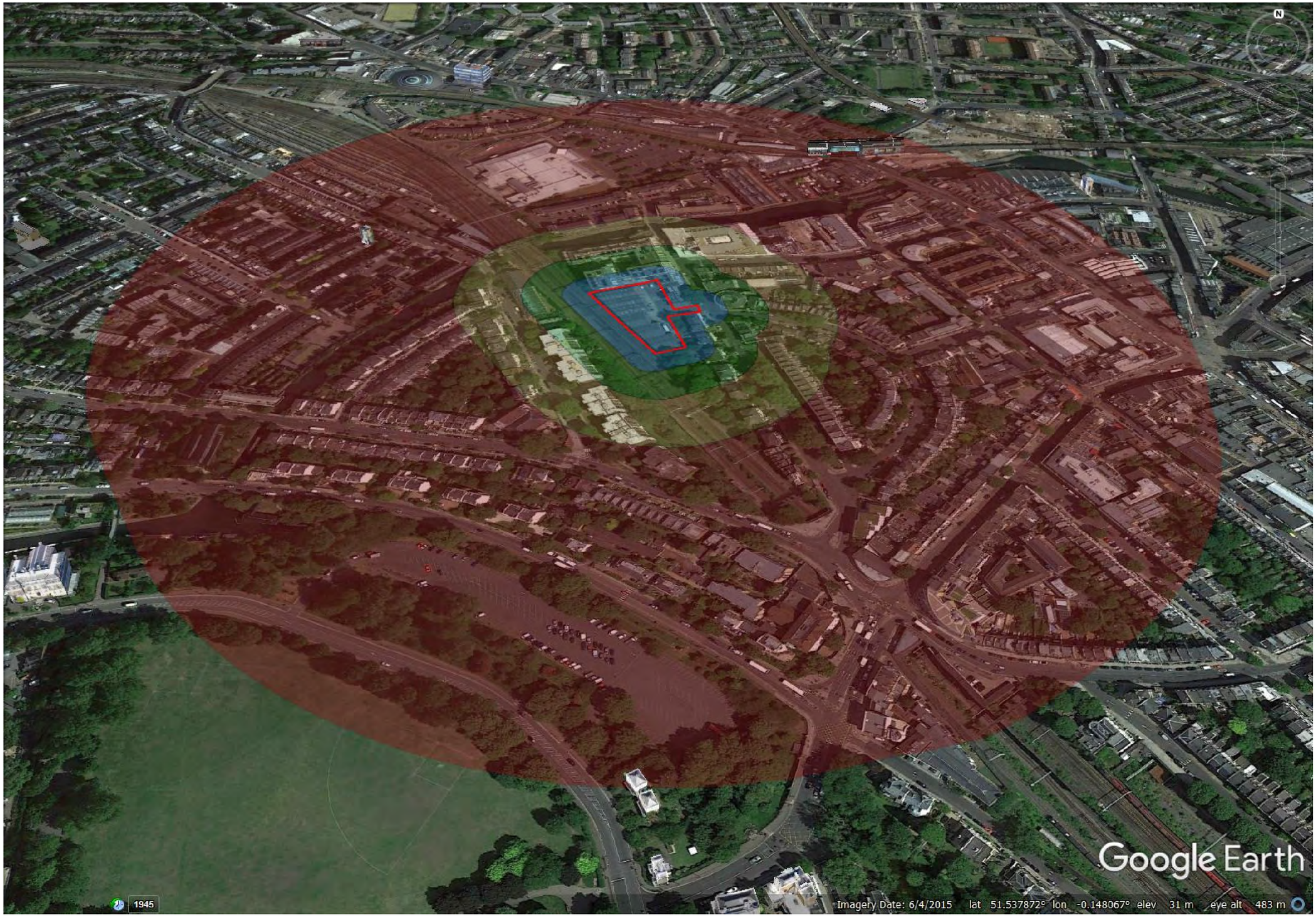
Drawn/Design	ER	Date	DEC 2016	Scales	NTS @A1
Checked	GH	Approved	JM		NTS @A3

Drawing No. 774547-DWG-ENV-FIG 5



LEGEND

- SITE BOUNDARY
- 20 m BUFFER
- 50 m BUFFER
- 100 m BUFFER
- 350 m BUFFER



Rev	Date	Description	Made	Ckd

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Drawing Status: FINAL ISSUE

Client: FAIRVIEW VENTURES LTD

Project: CENTRIC CLOSE, OVAL ROAD, CAMDEN

Drawing Title: CONSTRUCTION DUST RISK ASSESMENT BUFFER ZONES

Drawn/Design	ER	Date	NOV 2016	Scales	NTS @A1
Checked	GH	Approved	JM		NTS @A3

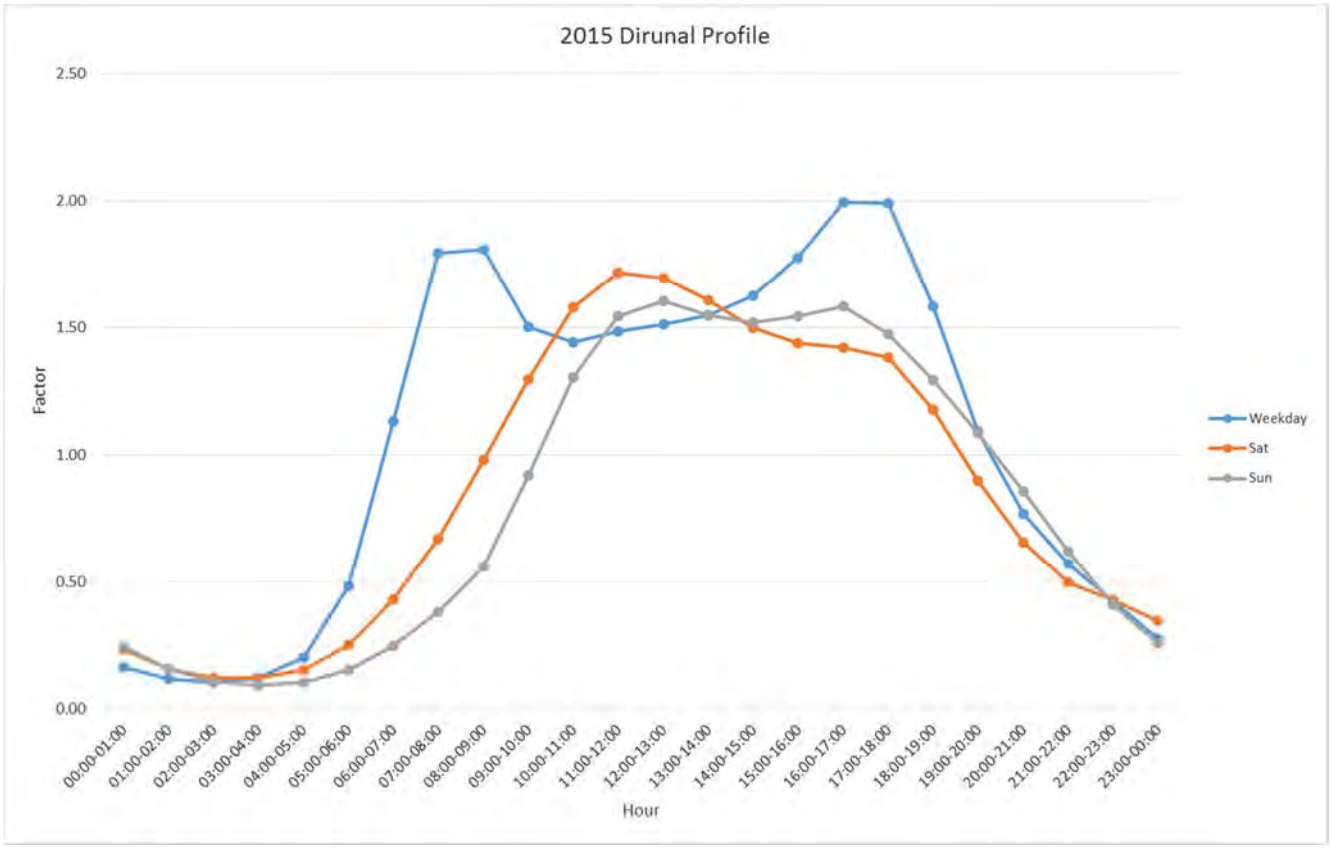
Drawing No. 774547-DWG-ENV-FIG 6

Appendices

Appendix A: Diurnal Profile
Appendix B: Wind Rose from London City Airport 2010-2014
Appendix C: Examples of 'highly recommended' mitigation measures for demolition and construction activities, and specific to demolition, earthworks and construction

Appendix A

Diurnal Profile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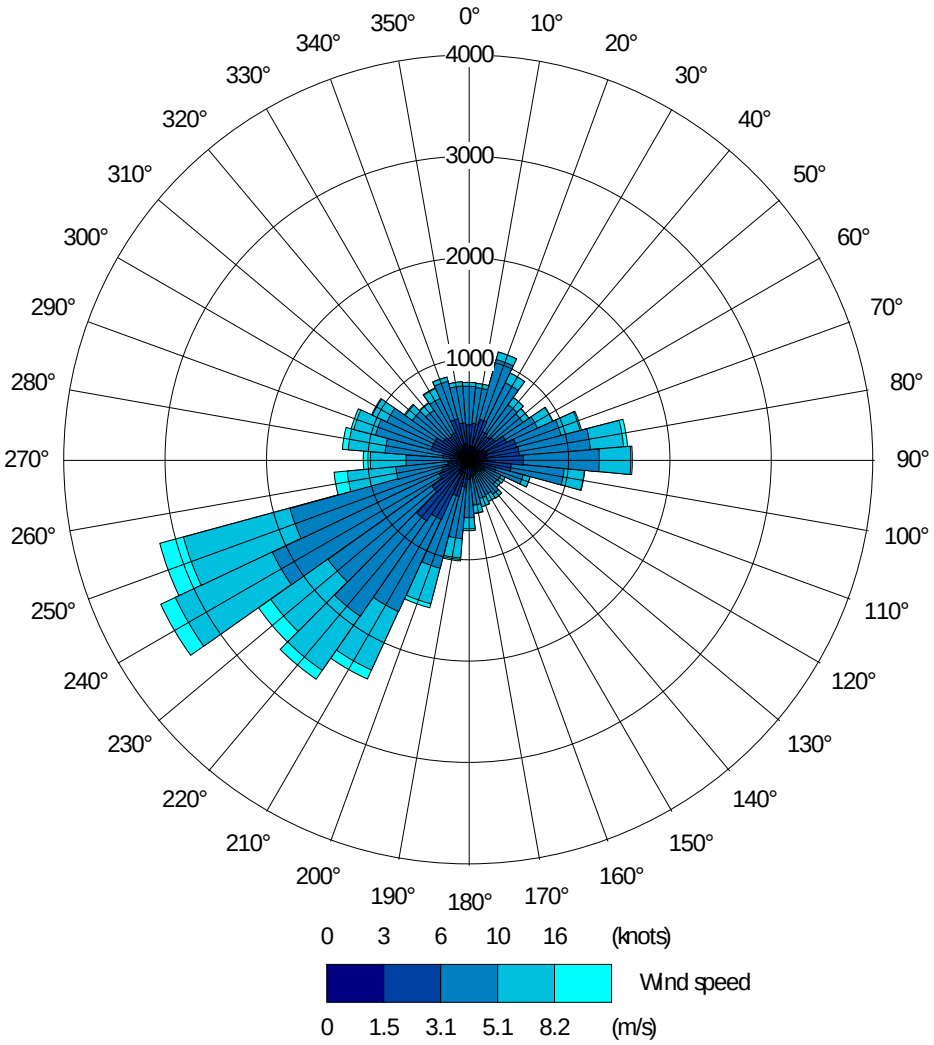
Appendix B

Wind Rose from London City Airport Met Station 2010 to 2014

Wind Rose for London City Met Station 2010 to 2014



Appendix C

Examples of ‘highly recommended’ mitigation measures for demolition and construction activities, and specific to demolition, earthworks and construction

It is suggested that the 'highly recommended' measures as set out in the IAQM 'Guidance on the assessment of dust from demolition and construction 1.1', are incorporated into the CMP by the appointed contractor and are approved by LBL prior to commencement of any work on site. Examples of the measures are shown below:

General mitigation measures

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- Display the name and contact details of the person accountable for air quality and dust issues on the site boundary (i.e. the environment manager/engineer or site manager);
- Display the head or regional office contact information on the site boundary;
- Record all dust and air quality complaints, identify cause, take appropriate measures to reduce emissions in a timely manner and record the measures taken;
- Make the complaints log available to the local authority when asked;
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site and the action taken to resolve the situation in the log book;
- Carry out regular site inspections to monitor compliance with the CMP, record inspection results and make inspection log available to LBC Council when asked;
- Increase frequency of site inspection by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged periods of dry or windy conditions;
- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles;
- Fully enclose site or specific operations where there is a high potential for dust production and the activities are being undertaken for an extensive period;
- Avoid site runoff of water or mud;
- Keep site fencing, barriers and scaffolding clean using wet methods;
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If being re-used on site, cover as detailed below;
- Cover, seed or fence stockpiles to prevent wind whipping;
- Ensure all on-road vehicles comply with the requirements of the London Low Emissions Zone and the London NRMM standards, where applicable;
- Ensure all vehicles switch off engines when stationary - no idling vehicles;
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable;
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and

materials;

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction e.g. suitable local exhaust ventilation systems;
- Ensure an adequate water supply on site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- Use enclosed chutes and conveyors and covered skips;
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate;
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods;
- Avoid bonfires and burning of waste materials;
- Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring dust particles to the ground;
- Avoid explosive blasting, using appropriate manual and mechanical alternatives; and,
- Bag and remove any biological debris or damp down such material before demolition.

Measures specific to demolition

- Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives
- Bag and remove any biological debris or damp down such material before demolition

Measures specific to earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable
- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable
- Only remove the cover in small areas during work and not all at once

Measures specific to construction

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.