Air Quality Assessment

Stephenson House, Camden

June 2017

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Lazari Properties 2 Ltd

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1. Introduction

1.1 Phlorum Ltd has been commissioned by Lazari Properties 2 Ltd to undertake an air quality assessment for a proposed development at Stephenson House in the London Borough of Camden (LBC), the location of which is shown in Figure 1. The National Grid Reference for the centre of the site is 529170, 182510.

1.2 The proposals consist of the remodelling of the existing office building, including part demolition and new extensions. The building will be predominantly the same office and commercial uses as previously; however, there will also be some residential uses.

1.3 The residential component of the proposed development will comprise accommodation in the north east of the building from the second floor to the top, seventh floor.

1.4 The application site is located in the south west end of the Borough, with the City of Westminster approximately 600m to the west. The proposed development is surrounded by commercial uses, with some residential properties interspersed.

1.5 The main pollution sources in the vicinity of the application site are vehicles travelling on the local road network, particularly the A400 Hampstead Road, the A501 Euston Road and Drummond Street.

1.6 LBC declared a borough wide Air Quality Management Area (AQMA) in 2002, including the application site, due to elevated concentrations of both nitrogen dioxide (NO_2) and particulate matter (PM_{10}).

2. Policy Context

The UK Air Quality Strategy (UKAQS)

2.1 The UKAQS[1] sets a number of "standard" (AQS) concentrations for a number of key pollutants that are to be achieved at sensitive receptor locations across the UK by various "objective" dates. The sensitive locations at which the standards and objectives apply are places where the population is expected to be exposed to the various pollutants over the particular averaging period. Thus for those objectives to which an annual mean standard applies, the most common sensitive receptor locations used to measure concentrations against the set standards are areas of residential housing, since it is reasonable to expect that people living in their homes could be exposed to pollutants over such a period of time. Schools and children's playgrounds are also often used as sensitive locations for comparison with annual mean objectives due to the increased sensitivity of young people to the effects of pollution (regardless of whether or not their exposure to the pollution could be over an annual period). For shorter averaging periods of between 15 minutes, 1 hour or 1 day, the sensitive receptor location can be anywhere where the public could be exposed to the pollutant over these shorter periods of time.

2.2 The objectives adopted in the UK are based on the Air Quality (England) Regulations 2000[2], as amended, for the purpose of Local Air Quality Management. These Air Quality Regulations have been adopted into UK law from the limit values required by European Union Daughter Directives on air quality.

2.3 Obligations under the Environment Act 1995 require local authorities to declare an AQMA at sensitive receptor locations where an objective concentration has been predicted to be exceeded. In setting an AQMA, the local authority must then formulate an Air Quality Action Plan (AQAP) to seek to reduce pollution concentrations to values below the objective levels.

2.4 LBC continues to produce annual Review and Assessment reports under the Local Air Quality Management (LAQM) regime, informed by the requirements of the Environment Act 1995. LBC declared a borough wide AQMA in 2002 due to exceedances of the annual mean AQS for NO_2 and the 24 hour mean AQS for PM_{10}.

[1] Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2) July 2007.
[2] The Air Quality (England) (Amendment) Regulations 2002 - Statutory Instrument 2002 No.3043.

National Planning Policy Framework (NPPF)

2.5 The NPPF, which was published in March 2012, sets out the Government's planning policy for England. At its heart is an intention to promote more sustainable development. A core principle in the NPPF that relates to air quality effects from development is that planning should "contribute to conserving and enhancing the natural environment and reduce pollution". In achieving this, it states in paragraph 109 that:

"The planning system should contribute to and enhance the natural and local environment by: [...]

preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability [...]".

2.6 With regard to assessing cumulative effects the NPPF states the following at paragraph 120:

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

2.7 The NPPF offers a broad framework, but does not afford a detailed methodology for assessments. Specific guidance for air quality continues to be provided by organisations such as the Department for Environment, Food and Rural Affairs (Defra), Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM).

National Planning Practice Guidance (PPG)

2.8 Reference ID 32 (Air Quality) of the National Planning Practice Guidance (PPG)[3], which was updated in March 2014, provides guiding principles on how planning can take account of the impact of new development on air quality. The PPG summarises the importance of air quality in planning and the key legislation relating to it.

2.9 As well as describing the importance of International, National and Local Policies (detailed elsewhere in this report), it summarises the key sources of air quality information. It also explains when air quality is likely to be relevant to a planning decision:

"Whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife) [...]

When deciding whether air quality is relevant to a planning application, considerations could include whether the development would:

- *Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; adds to turnover in a large car park; or result in construction sites that would generate Heavy Goods Vehicle flows over a period of a year or more.*

- *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; or extraction systems (including chimneys) which require approval*

[3] Planning Practice Guidance (PPG) 32. (2014). Air Quality. http://planningguidance.planningportal.gov.uk/blog/guidance/air-quality/.

under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area.

- *Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.*

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

- *Affect biodiversity. In particular, this is likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site, and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites."*

2.10 Details are also provided of what should be included within an air quality assessment. Key considerations include:

- Baseline local air quality;
- Whether the proposed development could significantly affect local air quality during construction/operation; and
- Whether the development is likely to expose more people to poor air quality.

2.11 Examples of potential air quality mitigation measures are also provided in the PPG.

Local Planning Policy

2.12 The Mayor's Air Quality Strategy to tackle air quality across London as a whole was published in 2010. This is supported by the London Plan[4], which was published in 2015 and includes all alterations made to the London Plan since it was first adopted in July 2011. Of particular importance is *'Policy 7.14: Improving Air Quality'*, which states:

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

"[...]B Development proposals should:

a) minimise increased exposure to existing poor air quality and make provision to address local problems of air quality (particularly within Air Quality Management Areas (AQMAs) and where development is likely to be used by large numbers of those particularly vulnerable to air quality, such as children or older people) such as by design solutions, buffer zones or steps to promote greater use of sustainable transport modes through travel plans

b) promote sustainable design and construction to reduce emissions from the demolition and construction of buildings following the best practice guidance in the GLA and London Councils' 'The control of dust and emissions from construction and demolition'

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

d) ensure that where provision needs to be made to reduce emissions from a development, this is usually made on-site. Where it can be demonstrated that on-site provision is impractical or inappropriate, and that it is possible to put in place measures having clearly demonstrated equivalent air quality benefits, planning obligations or planning conditions should be used as appropriate to ensure this, whether on a scheme by scheme basis or through joint area-based approaches

e) where the development requires a detailed air quality assessment and biomass boilers are included, the assessment should forecast pollutant concentrations. Permission should only be granted if no adverse air quality impacts from the biomass boilers are identified. [...]"

2.13 On a local level, LBC has adopted a number of planning documents that, alongside the Mayor's London Plan, form the Local Development Framework (LDF). The key documents within the LDF are Camden Development Policies[5] and the Camden Core Strategy[6].

[5] London Borough of Camden. (2010). Camden Development Policies.
[6] London Borough of Camden. (2010). Camden Core Strategy.

2.14 The key policy of particular importance to the proposed development in the Camden Development Policies is '*Policy DP32 – Air Quality and Camden's Clear Zone*', which states:

"The Council will require air quality assessments where development could potentially cause significant harm to air quality. Mitigation measures will be expected in developments that are located in areas of poor air quality. The Council will also only grant planning permission for development in the Clear Zone region that significantly increases travel demand where it considers that appropriate measures to minimise the transport impact of development are incorporated. We will use planning conditions and legal agreements to secure Clear Zone measures to avoid, remedy or mitigate the impacts of development schemes in the Central London Area."

2.15 Further to this, the Core Strategy, details strategic policies to achieve the overall vision for development in the Borough. '*Core Strategy (CS) 9 – Achieving a successful Central London*' states:

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

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

2.16 Also within the Core Strategy relevant to this development is '*CS16 – Improving Camden's Health and Well-being*', which states:

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

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

2.17 Also significant is the emerging Local Plan[7], which is due to be adopted later in June 2017. *'Policy CC4 – Air Quality'* states:

> *"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 a development on air quality. Consideration must be taken to the actions identified in the Council's Air Quality Action Plan.*
>
> *Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution. Where the AQA shows that a development would cause harm to air quality, the Council will not grant planning permission unless mitigation measures are adopted to reduce the impact to acceptable levels. Similarly, developments in locations of poor air quality will not be acceptable unless designed to mitigate the impact to within acceptable limits.*
>
> *Development which involves significant demolition, construction or earthworks will also be required to assess the risk of impacts in an AQA and include appropriate mitigation measures to be secured in a Construction Management Plan.*
>
> *The Council will only grant planning permission for development in Camden's Clear Zone region that significantly increases travel demand where it considers that appropriate measures to minimise the transport impact of development are incorporated."*

[7] London Borough of Camden. (2015). Draft Camden Local Plan.

3. Baseline

3.1 This chapter is intended to establish prevailing air quality conditions in the vicinity of the application site.

UK-AIR Background Pollution

3.2 Defra provides estimated background concentrations of the UKAQS pollutants at the UK Air Information Resource (UK-AIR) website[8]. These estimates are produced using detailed modelling tools and are presented as concentrations at central 1km^2 National Grid square locations across the UK. At the time of writing, the most recent background maps were from July 2016 and based on monitoring data from 2013.

3.3 Being background concentrations, the UK-AIR data are intended to represent a homogenous mixture of all emissions sources in the general area of a particular grid square location. Concentrations of pollutants at various sensitive receptor locations can, therefore, be calculated by modelling the emissions from a nearby pollution source, such as a busy road, and then adding this to the appropriate UK-AIR background datum.

3.4 The predicted background pollution concentrations for NO_2 and PM_{10} for 2015 to 2017 are presented in Table 3.1. These data were taken from the central grid square location close to the application site (i.e. grid reference: 529500, 182500).

Table 3.1: 2015 to 2017 background concentrations of pollutants at the application site

Pollutant	Predicted background concentration ($\mu g.m^{-3}$)			Averaging period	Air quality standard concentration ($\mu g.m^{-3}$)	Objective: to achieve the standard by
	2015	2016	2017			
NO_2	**45.3**	**43.6**	**42.0**	annual mean	40	31 December 2005
PM_{10}*	22.5	22.2	22.0	(gravimetric) annual mean	40	31 December 2004

*Proposed PM_{10} objectives for 2010 were dropped in the 2007 Air Quality Strategy (there is no AQS for $PM_{2.5}$ in England, however local authorities are required to work towards reducing concentrations).
Bold denotes exceedance of AQS ($40\mu g.m^{-3}$).

[8] Defra: UK-AIR. www.uk-air.defra.gov.uk (accessed 27/04/2017).

3.5 The data in Table 3.1 show that annual mean background concentrations of NO_2 at the application site from 2015 to 2017 are predicted to be above the 40µg.m^{-3} AQS. In 2017, NO_2 concentrations are predicted to be above the AQS by 5%.

3.6 For PM_{10}, the predicted concentrations are well below the AQS. In 2017, background concentrations of PM_{10} are expected to be 45% below the AQS.

3.7 It should be noted that concentrations of both pollutants are predicted to decline each year, which is due to the predicted gradual renewal of the UK fleet with newer, cleaner vehicles.

Local Sources of Monitoring Data

3.8 Monitoring at background locations is considered an appropriate source of data for the purposes of describing baseline air quality.

Automatic Monitoring

3.9 LBC has a widespread monitoring network, including four automatic monitors that measure both NO_2 and PM_{10}. The most recent available results for these monitors, as well as some located in the City of Westminster, are included in Table 3.2 and 3.3 below.

Table 3.2: NO_2 monitoring data from London Borough of Camden and City of Westminster automatic monitoring stations

Monitor	Type	Distance from the application site (km)	NO_2 annual mean concentration (µg.m^{-3})		
			2012	2013	2014
London Borough of Camden					
CD9 – Euston Road	R	0.7	**106**	**106**	**98**
LB – London Bloomsbury	UB	1.1	**55**	**44**	**45**
CD3 – Shaftesbury Avenue	R	1.5	**71**	**74**	**69**
CD1 – Swiss Cottage	K	3.1	**70**	**63**	**66**
City of Westminster					

Monitor	Type	Distance from the application site (km)	NO_2 annual mean concentration (µg.m^{-3})		
			2012	2013	2014
Marylebone Road	K	1.1	**94**	**80**	-
Oxford Street	K	1.7	-	**126**	-

Note: "UB" = urban background; "K" = kerbside; "R" = roadside. **Bold** denotes exceedance of AQS.

3.10 The data in Table 3.2 show that annual mean concentrations of NO_2 were consistently above the 40µg.m^{-3} AQS at all locations. The closest monitor to the application site, CD9 – Euston Road, exceeded the AQS by up to 165% between 2012 and 2014. Whilst this is the closest automatic monitor to the application site, it is located within 0.5m of the kerb, which is considerably closer to the road than the proposed development. Also, it is located on Euston Road, which is far busier than Hampstead road, on which the application site is located. Therefore, the annual mean concentrations monitored at this location are not thought to be representative of the conditions ate the application site.

3.11 Annual mean NO_2 concentrations at the nearest background site, LB – London Bloomsbury, were between 12% and 38% above the AQS, which is comparable to the UK-AIR background data shown in Table 3.1.

Table 3.3: PM_{10} monitoring data from London Borough of Camden and City of Westminster Automatic Monitors

Monitor	Type	Distance from the application site (km)	PM_{10} annual mean concentration (µg.m^{-3})		
			2012	2013	2014
London Borough of Camden					
LB – London Bloomsbury	UB	1.1	19	18	20
CD1 – Swiss Cottage	K	3.1	23	21	22
CD3 – Shaftesbury Avenue	R	1.5	29	29	25
CD9 – Euston Road	R	0.7	-	-	29

Monitor	Type	Distance from the application site (km)	PM_{10} annual mean concentration ($\mu g.m^{-3}$)		
			2012	2013	2014
City of Westminster					
Marylebone Road	K	1.1	31	-	-
Oxford Street	K	1.7	38	34	-

Note: "UB" = background; "K" = kerbside; "R" = roadside.

3.12 The data in Table 3.3 show that annual mean PM_{10} concentrations were below the $40\mu g.m^{-3}$ AQS between 2012 and 2014, even at roadside and kerbside locations. The highest recorded PM_{10} concentration was $38\mu g.m^{-3}$ at Oxford Street, which is 5% below the AQS.

3.13 At the closest background location, LB – London Bloomsbury, PM_{10} concentrations were 50% to 53% below the AQS, which is slightly lower, but still comparable to, the UK-Air data shown in Table 3.1. It is noted that at the application site, PM_{10} is likely to be less of a concern than concentrations of NO_2.

Non-Automatic Monitoring

3.14 LBC operates an extensive non-automatic, NO_2 diffusion tube monitoring network across the Borough. Recent records for diffusion tubes closest to the application site are shown in Table 3.4.

Table 3.4: NO_2 monitoring data from London Borough of Camden Diffusion Tubes

Monitor	Type	Distance from the application site (km)	NO_2 annual mean concentration ($\mu g.m^{-3}$)		
			2012	2013	2014
CA10 – Tavistock Gardens	UB	0.7	**40.1**	**49.4**	**46.5**
CA11 – Tottenham Court Road	K	0.9	**83.3**	**88.1**	**86.8**
CA4 – Euston Road	R	1.0	**82.1**	**107.8**	**89.7**
CA20 – Brill Place	R	1.0	**50.0**	**49.4**	**52.3**
CA21 – Bloomsbury	R	1.2	**71.7**	**76.1**	**80.8**

Monitor	Type	Distance from the application site (km)	NO_2 annual mean concentration (μg.m^{-3})		
			2012	2013	2014
Street					
CA6 – Wakefield Gardens	UB	1.3	39.3	**40.3**	36.4
CA23 – Camden Road	R	1.6	**67.4**	**77.9**	**72.2**

Note: "R" = roadside; "UB" = urban background; "K" = kerbside. **Bold** denotes exceedance of the AQS.

3.15 The data in Table 3.4 show that annual mean concentrations of NO_2 were frequently above the 40μg.m^{-3} AQS between 2012 and 2014. The highest recorded concentration was CA4 – Euston Road. It measured 107.8μg.m^{-3}, which is 170% above the AQS. This is in line with the NO_2 concentrations on Euston Road recorded by CD9 automatic monitor, which are not thought to be representative of the conditions at the application site.

3.16 The closest background site is located at CA10 – Tavistock Gardens, which recorded concentrations up to 24% above the AQS. These concentrations are slightly higher, but still comparable to, the UK-Air data shown in Table 3.1

Summary of Data used in Assessment

3.17 To ensure conservative predictions of pollutant concentrations, no reduction has been applied to the annual mean background NO_2 and PM_{10} concentrations used in this assessment for future years. Concentrations from local background monitors were used, as they were considered most representative of the application site. The background concentrations used in the assessment are included in Table 3.5.

Table 3.5: Background annual mean concentrations used in this assessment

Pollutant	Concentration (μg.m^{-3})	Data Source
NO_2	39.3	CA6 (2012)
PM_{10}	19	LB (2012)

4. Assessment Methodology

Guidance

4.1 Local Air Quality Management Technical Guidance (LAQM.TG(16))[9] was followed in carrying out this assessment. As well as the London Local Air Quality Management Technical Guidance (LLAQM.TG(16))[10], which is specific air quality guidance produced for London by the Greater London Authority (GLA). Guidance published by the IAQM[11] on the *'Assessment of Dust from Demolition and Construction'* was used when assessing the construction phase of the proposed development. The Greater London Authority (GLA) Supplementary Planning Guidance[12] on the control of dust from construction has also been referred to. It details a number of mitigation measures that should be adopted to minimise impacts of dusts and fine particles.

4.2 The latest Environmental Protection UK (EPUK) & IAQM guidance on *'Planning for Air Quality'*[13] was also referred to for the operational phase assessment. The criteria used to determine the significance of impact were derived from this guidance, and have been included in Appendix A.

Construction Phase

4.3 The construction phase of the proposed development will involve a number of activities that could potentially produce polluting emissions to air. Predominantly, these will be emissions of dust. However, they could also include releases of odours and/or more harmful gases and particles.

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9 Defra. 2016. Part IV of the Environment Act 1995, Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management, Technical Guidance LAQM. TG(16). London: Defra.
10 Greater London Authority (GLA). 2016. London Local Air Quality Management, Technical Guidance LLAQM.TG(16). London: Greater London Authority.
11 IAQM. (2014). Guidance on the assessment of dust from demolition and construction.
12 Greater London Authority. (2014). The Control of Dust and Emissions During Construction and Demolition.
13 EPUK & IAQM. (2015). Land-Use Planning & Development Control: Planning For Air Quality.

4.4 The IAQM's guidance to assess the impacts of construction on human and ecological receptors has been followed in carrying out this air quality assessment. The guidance suggests that where a receptor is located within 350m of a site boundary and/or 100m of a route used by construction vehicles, up to 500m from the site entrance, a dust assessment should be undertaken. High sensitivity receptors are considered particularly sensitive when located within 20m of a works area. Figure 2 shows receptors that could be sensitive to dust that are located within 350m of the boundaries of the site.

4.5 Demolition is due to commence in October 2018 and end April 2019. Construction is due to commence March 2019 and end in November 2020.

4.6 Review of the Multi Agency Geographic Information for the Countryside (MAGIC) website[14], which incorporates Natural England's interactive maps, has not identified any ecological sensitive receptors within close proximity of the application site. As there are no statutorily designated ecological receptors within 1km of the site or the potential construction route, the proposed development will have a negligible impact on ecological receptors and this has not been considered further within this assessment.

4.7 The annual mean concentration of PM_{10} is well below the AQS, according to local monitoring and the UK-AIR background maps. This provides a good indication that PM_{10} concentrations for both annual mean and daily mean concentrations are likely to be below the respective AQSs at the application site and adjacent uses.

4.8 The IAQM guidance suggests that Demolition, Earthworks, Construction and Trackout should all be assessed individually to determine the overall significance of the construction phase.

Construction Significance

4.9 In the IAQM dust guidance, the first step in assessing the risk of impacts is to define the potential dust emission magnitude. This can be considered 'Negligible', 'Small', 'Medium' or 'Large' for each of the construction stages. Whilst the IAQM provides examples of criteria that may be used to assess these magnitudes, the vast number of potential variables means that every site is different and therefore professional judgement must be applied by what the IAQM refer to as a "technically competent assessor". The construction phase assessment therefore relies on the experience of the appraiser.

4.10 As such, attempts to define precisely what constitutes a negligible, small, medium or large dust emission magnitude should be treated with caution. Factors such as the scale of the work, both in terms of size and time, the construction materials and the plant to be used must be considered.

14 Natural England and MAGIC partnership organisations. Multi Agency Geographic Information for the Countryside. http://www.magic.gov.uk/ (accessed 27/04/2017).

4.11 The second step is to define the sensitivity of the area around the construction site. As stated in the IAQM guidance:

"the sensitivity of the area takes into account a number of factors:

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

4.12 Based on these factors, the area is categorised as being of 'Low', 'Medium' or 'High' sensitivity.

4.13 When dust emission magnitudes for each stage and the sensitivity of the area have been defined, the risk of dust impacts can be determined. The IAQM provides a risk of impacts matrix for each construction stage. The overall significance for the construction phase can then be judged from the stages assessed. Again, this is subject to professional judgement.

4.14 Combustion exhaust gases from diesel-powered plant and construction vehicles accessing the application site will also be released. However, the volumes and periods over which these releases will occur are unlikely to result in any significant peaks in local air pollution concentrations and therefore this has been scoped out of the assessment.

Operational Phase

Vehicle Emissions

4.15 Vehicle emissions will arise from the combustion of fossil fuels in vehicle engines and their subsequent release to atmosphere via tailpipe exhausts. The most significant pollutants released by cars and other vehicles are oxides of nitrogen (NO_2/NO_x) and fine particulate matter (PM_{10} and $PM_{2.5}$). Releases of carbon monoxide (CO) and some volatile hydrocarbons (e.g. benzene and 1,3-butadiene) are of less significance and are not assessed further in this report.

4.16 As it is elevated annual mean concentrations of NO_2 and PM_{10} that have resulted in the declaration of most AQMAs across the UK, these are the pollutants of most concern and they have therefore been the focus of this air quality assessment.

ADMS-Roads Assessment

4.17 In order to determine the potential exposure of both existing and proposed receptors in the opening year of 2020, emissions from local roads have been assessed using a detailed air dispersion model. The model used was ADMS-Roads (version 4.0), which is produced by CERC and has been validated and approved by Defra for use as an assessment tool for calculating the dispersion of pollutants from traffic on UK roads.

4.18 The latest Defra Emissions Factor Toolkit (EFT)[15] was used within the model to estimate vehicle emissions. However an IAQM Position Statement[16] released in October 2016 recognises that emissions from diesel vehicles have not declined as expected. Therefore, in line with the precautionary approach and to present a conservative assessment, emissions factors from 2017 have been used for all modelled scenarios, including the opening year.

4.19 Detailed, hourly sequential, meteorological data are used by the model to determine pollutant transportation and levels of dilution by the wind and vertical air movements. Meteorological data used in the model were obtained from London City Airport meteorological station, as it was considered to provide the most representative data of similar conditions to the application site. The meteorological data used for this assessment were from 2014, for which monitoring and traffic data were also available for model verification purposes. The surface roughness applied to the model for the meteorological station and site was 1.5m, as is typically used for large, urban areas.

4.20 Discrete model receptors were positioned at the façades of the proposed development. Modelled receptor locations are shown on Figure 3 and detailed in Table 4.1, below.

Table 4.1: Modelled Receptors

ID	Receptor	UK Grid Reference	
		X	Y
R1	Façade of proposed development	529205.1	182551.8
R2	Façade of proposed development*	529205.2	182538.1
R3	Façade of proposed development	529205.6	182510.7

15 Defra. (2016). Emissions Factor Toolkit. http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html (accessed 27/04/17).

16 IAQM. (2016). Interim Position Statement: Dealing with Uncertainty in Vehicle NO_x Emissions within the Air Quality Assessments.

ID	Receptor	UK Grid Reference	
		X	Y
R4	Façade of proposed development*	529205.7	182486.5
R5	Façade of proposed development	529189.6	182481.9
R6	Façade of proposed development	529152.5	182472.0

*At these receptor points, there are no receptors until the 1st floor.

4.1 The receptors listed in Table 4.1 were modelled at "breathing height", which is, by convention, 1.5m above floor level. Receptor points were modelled from ground floor to sixth floor. It should be noted that only Receptors 1 to 3 represent the facades of the building where residential uses are currently proposed, and only from second floor up for Receptors 1 and 2, and from fourth floor up for Receptor 3. The lower floors and other receptors are in areas of the building that are currently proposed for office use or storage, where the annual mean AQSs do not strictly apply (due to shorted exposure periods for office workers compared to long term residents) .

4.2 The grid references included in the model and shown above are indicative as the Ordnance Survey base maps used for the model setup exaggerate the width of roads making the precise location of their centrelines difficult to plot. However, the modelled distances from the façades of the receptors to the kerbs are correct. This separation distance is the primary factor affecting the level of dilution and dispersion of pollutants.

4.3 As there will be no change in traffic flow as a result of the proposed development, it was not necessary to model existing receptors as there is not expected to be a change in the pollutant concentrations they are exposed to.

4.4 Traffic data were provided by the Transport Consultant, RPG, and derived from traffic counts carried out on May 3rd 2017. Flows were provided for the baseline year 2017, and 2020. Future flows were extrapolated using the Automated Traffic Growth Calculator[17].

[17] Defra. (2010). RTF Automated Traffic Growth Calculator.

Model Verification

4.5 It is recommended, following guidance set out in LAQM.TG(16)[9], that the model results be compared with measured data to determine whether they need adjusting to more accurately reflect local air quality. This process is known as verification and reduces the uncertainty associated with local effects on pollution dispersion and allows the model results to be more site-specific.

4.6 A verification study has been undertaken using local authority monitoring data from around Camden. Full details of this study are included in Appendix C. The model was found to be under-predicting concentrations, which is not unusual, and therefore an adjustment factor of 3.05 was applied to the model results.

Air Quality Neutral

4.7 For some time, the standard approach to air quality assessment was to predict the change in pollution concentrations through the use of a screening or detailed dispersion model and, where the potential for a significant impact was identified, recommend mitigation measures so that the significance of effect can be kept to an acceptable level. However, this type of assessment does little to consider the overall emissions from a development and its contribution to broader background concentrations, which can gradually increase due to incremental changes from successive developments, particularly in a large city such as London.

4.8 As a result of these effects, an air quality neutral policy was included in the London Plan. It aims to ensure that developments are air quality neutral, or better, particularly in areas where any AQSs are being breached.

4.9 Since the publication of the London Plan, there has been considerable debate as to how the concept should be assessed and implemented. The GLA guidance[18] was produced in order to further develop the policy and discuss assessment options. The two principal options for the application of the policy were to compare the emissions of a proposed development with the site's previous use, or to establish benchmarks for acceptable emissions for particular planning uses. A combination of these two approaches would also be possible.

4.10 It was decided that a purely benchmarking route should be taken, rather than working on a site-by-site basis, as it would provide a means of ensuring that developments across London as a whole remain air quality neutral. It also allows for the development of long-derelict sites and does not permit large pollution-headroom for former industrial sites, which would be a key problem with the alternative method. The guidance provides building emissions benchmarks for NO_X and also states that PM_{10} benchmarking need not be considered where natural gas is the only fuel used on site.

18 Air Quality Consultants & Environ for the GLA. (2014). Air Quality Neutral Planning Support: GLA 80371.

4.11 It was also concluded that emissions from buildings and transport should be treated separately, with the intent that each should attain air quality neutrality.

Consultation

4.12 Details of the proposed development were sent to LBC's Sustainability Officer for the proposed development and it was established that an Air Quality Neutral assessment and a detailed air quality assessment would be required due to the introduction of permanent residents to the site.

5. Construction Phase Impacts

5.1 The construction phase of the proposed development will involve a number of activities that could produce polluting emissions to air. Predominantly, these will be emissions of dust.

5.2 The estimates for the dust emission magnitude for demolition, earthworks, construction and trackout below are, where appropriate, based on the construction information provided by the client and professional experience by Phlorum staff.

Dust Emission Magnitude

Demolition

5.3 Proposals comprise partial demolition of the existing building. The volume of the building to be demolished is approximately 500m^3, which falls well below the IAQM's 'Small' category of <20,000m^3.

5.4 The height at which demolition will occur is between 10m and 20m above ground, which is classified as 'Medium'. However, due to the relatively small demolition works, it is not thought that this is likely to significantly increase the dust magnitude. It is not yet known whether mobile crushing equipment will be on site.

5.5 Overall, the dust emission magnitude of the demolition stage is considered to be *Small*.

Earthworks

5.6 There are no earthworks proposed for the site, therefore impacts from such works have been scoped out of the assessment and are not considered further.

Construction

5.7 During construction, activities that have the potential to cause emissions of dust may include concrete batching, sandblasting and piling; although it has not been stated whether any of these are anticipated for the proposed development. Localised use of cement powder and general handling of construction materials will also have the potential to generate dust. Furthermore, windblow from stockpiles of friable materials also has the potential to cause dust emissions.

5.8 The prospective building materials for construction are steel frame, stone and brick cladding and concrete slabs, which have a low to medium potential for dust release.

5.9 Additionally, the building will be built under the Considerate Constructors Scheme, which aims to reduce dust emissions off-site.

5.10 The volume of the proposed building is expected to be within the IAQM's 25,000m^3 – 100,000m^3 'Medium' category. Therefore, the overall dust emission magnitude for the construction stage is considered to be *Medium*.

Trackout

5.11 There are likely to be less than 10 Heavy Duty Vehicles (HDVs) accessing the site daily, which is considered 'Small' with reference to the IAQM criteria.

5.12 Trackout is unlikely to be a significant issue as there are not expected to be any unpaved road surfaces or earthworks and the site is relatively small in size. As such, dust emission magnitude from trackout is considered to be *Small*.

Emission Magnitude Summary

5.13 A summary of the dust emission magnitude as a result of the activities of Demolition, Earthworks, Construction and Trackout as specified in the IAQM guidance, and discussed above, is presented in Table 5.1 below. Overall, the dust emission magnitude is considered to be *Small*.

Table 5.1: Dust Emission Magnitude for the construction activities, based on the IAQM's guidance

Activity	Dust Emission Magnitude
Demolition	Small
Earthworks	-
Construction	Medium
Trackout	Small

Sensitivity of the Area

5.14 Having established the emission magnitude for dust above, the sensitivity of the area must be considered to establish the significance of effects. The effect of dust emissions depends on the sensitivity of each receptor. High sensitivity human receptors include residential dwellings, schools and hospitals.

5.15 The impacts of dust emissions from the sources discussed above have the potential to cause an annoyance to human receptors living in the local area. Within distances of 20m of the site boundary there is a high risk of dust impacts, regardless of the prevailing wind direction. Up to 100m from the construction site, there may still be a high risk, particularly if the receptor is downwind of the dust source.

5.16 With the exponential decline in dust with distance from dust generating activities, it is considered that for receptors more than 350m from the site boundary, the risk is negligible. Furthermore, the risks at over 100m only have the potential to be significant in certain weather conditions, e.g. downwind of the source during dry periods.

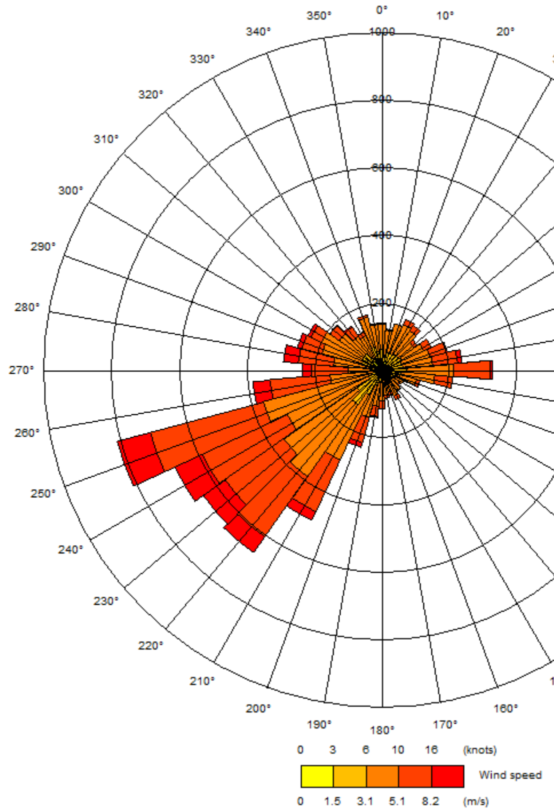
5.17 The approximate number of high sensitivity human receptors in the vicinity of the application site is detailed in Table 5.2 below and shown in Figure 2.

Table 5.2: Approximate number of High Sensitivity Human Receptors close to the application site

Distance to site (m)	Approximate number of receptors	Details
<20	150	South Camden Centre for Health Residential dwellings on Drummond Street, Hampstead Road and William Road.
20-100	1050*	Maria Fidelis Convent School Lower School. Residential dwellings on Drummond Street, Hampstead Road, William Road and adjacent streets.
100-350	2500+*	Netley Primary School and Centre for Autism Westminster Kingsway College BMI Healthcare, University College London Hospital Residential dwellings in the wider area.

Note: * includes the pupils from local schools.

Plate 5.1: Wind Rose for London City Airport, 2015



5.1 Plate 5.1 shows that the prevailing wind is south-westerly. The main sensitive receptors downwind of the proposed development, which are therefore likely to be most affected by any windblown dusts, are the residential dwellings to the north-east and east of the site. The only highly sensitive receptor downwind of the site is Maria Fidelis Lower School.

5.2 Given the relatively high number of sensitive receptors in the surrounding area of the application site, the overall sensitivity of the area is considered to be *High.*

Risk of Impacts

5.3 Having established the likely dust emission magnitudes and sensitivity of the area, the risk of impacts can be determined in accordance with the IAQM guidance. These are summarised in Table 5.3.

Table 5.3: Summary of Impact Risk by Construction Stage based on the IAQM's dust guidance

Stage	Impact Risk		
	Nuisance Dust	Ecology	PM_{10}
Demolition	Medium Risk	Negligible	Low Risk
Earthworks	Negligible	Negligible	Negligible
Construction	Medium Risk	Negligible	Low Risk
Trackout	Low Risk	Negligible	Negligible

5.4 Overall, the development is considered to be *Medium Risk* for nuisance dust soiling effects and *Low Risk* for PM_{10} health effects, in the absence of mitigation.

Site Specific Mitigation

5.5 The GLA guidance, which is used as a benchmark for developments across the UK, suggests a number of mitigation measures that should be adopted in order to minimise impacts from dusts and fine particles. Appropriate measures that could be included in the construction of the proposed development include:

- ideally cutting, grinding and sawing should not be conducted on-site and pre-fabricated material and modules should be brought in where possible;
- where such work must take place, water suppression should be used to reduce the amount of dust generated;
- skips, chutes and conveyors should be completely covered and, if necessary enclosed to ensure that dust does not escape;
- no burning of any materials should be permitted on site;
- any excess material should be reused or recycled on-site in accordance with appropriate legislation;
- developers should produce a waste or recycling plan;
- following earthworks, exposed areas and soil stockpiles should be re-vegetated to stabilise surfaces, or otherwise covered with hessian or mulches;
- stockpiles should be stored in enclosed or bunded containers or silos and kept damp where necessary;

- hard surfaces should be used for haul routes where possible;
- haul routes should be swept/washed regularly;
- vehicle wheels should be washed on leaving the site;
- all vehicles carrying dusty materials should be securely covered; and
- delivery areas, stockpiles and particularly dusty items of construction plant should be kept as far away from neighbouring properties as possible.

5.6 In addition, the IAQM lists recommended mitigation measures for low, medium and high Dust Impact Risks. The highly recommended mitigation measures for Medium Risk sites are included in Appendix E of this report.

5.7 Where dust generation cannot be avoided in areas close to neighbouring properties, additional mitigation measures should be put in place, such as: windbreaks, sprinklers, and/or time/weather condition limits on the operation of some items of plant or the carrying out of activities that are likely to generate a particularly significant amount of dust.

Residual Effects

5.8 After the implementation of the mitigation measures listed above and in Appendix E, the impact risk for each stage of the construction programme will be reduced and the residual significance of impact for the construction phase is expected to be *Negligible*.

6. Operational Phase Impacts

6.1 A comparison of modelled and monitored data, as recommended in LAQM.TG(16), has been undertaken. Full details of this are provided in Appendix C. This verification process ensures that the assessment provides a more conservative estimate of pollution concentrations than using unadjusted modelling results. As the model was found to be under-predicting concentrations, road contributions of both NO_x and PM_{10} were adjusted by a factor of 3.05

6.2 Results from the ADMS-Roads assessment of the proposed development are presented below. Modelled road links and receptor points are shown in Appendix B and Figure 3.

6.3 Contour plots of annual mean NO_2 concentrations at the ground and first floors are included as Figures 4 and 5.

Proposed Receptors

6.4 Tables 6.1 and 6.2 show the predicted annual mean concentrations of NO_2 and PM_{10}, respectively, at the receptor points shown in Figure 3.

Table 6.1 Predicted annual mean concentrations of NO_2 at proposed receptors in 2017 and 2020

Receptor Point	Annual Mean NO_2 concentration ($\mu g.m^{-3}$)						
	Ground Floor	First Floor	Second Floor	Third Floor	Fourth Floor	Fifth Floor	Sixth Floor
2017							
R1	**51.4**	**48.3**	**44.6**	**42.2**	**41.0**	**40.3**	40.0
R2	**51.6**	**48.5**	**44.7**	**42.3**	**41.1**	**40.4**	40.0
R3	**52.8**	**49.4**	**45.3**	**42.5**	**41.1**	**40.4**	40.0
R4	**56.4**	**51.7**	**46.0**	**42.7**	**41.1**	**40.3**	39.9

Receptor Point	Annual Mean NO_2 concentration (µg.m^{-3})						
	Ground Floor	First Floor	Second Floor	Third Floor	Fourth Floor	Fifth Floor	Sixth Floor
R5	**48.9**	**47.0**	**44.6**	**42.6**	**41.3**	**40.5**	40.0
R6	**44.3**	**43.5**	**42.5**	**41.6**	**41.0**	**40.5**	**40.2**
2020							
R1	**51.9**	**48.7**	**44.8**	**42.3**	**41.1**	**40.4**	40.0
R2	**52.1**	**48.9**	**45.0**	**42.5**	**41.1**	**40.4**	40.0
R3	**53.4**	**49.9**	**45.5**	**42.7**	**41.2**	**40.4**	40.0
R4	**57.2**	**52.3**	**46.3**	**42.8**	**41.2**	**40.4**	40.0
R5	**49.4**	**47.4**	**44.8**	**42.8**	**41.4**	**40.6**	**40.1**
R6	**44.6**	**43.7**	**42.6**	**41.8**	**41.1**	**40.6**	**40.2**

Note: **Bold** denotes exceedance of the AQS.

6.5 The data in Table 6.1 indicate that, as expected, NO_2 concentrations at the façades of the proposed buildings will decrease with height as a result of increased dispersion and dilution with separation distance from road traffic sources. However, the model results show predicted exceedances of the AQS at all but the sixth floor (the seventh floor was not modelled but would be expected to experience slightly lower concentrations than the sixth floor).

6.6 The highest concentration was predicted at Receptor 4 at ground level in 2020, which is 43% above the AQS. Being on the corner of Drummond Street and Hampstead Road, this location is exposed to elevated concentrations from traffic on both links.

6.7 However, as residential uses are currently only proposed in the north east of the building from the second to seventh floors, not all results are strictly comparable with the annual mean AQS. The highest concentration where residential uses are proposed is at Receptor 3 on the second floor in 2020, which is 14% above the AQS.

6.8 The contour plots of annual mean NO_2 concentrations at ground and first floors in Figures 4 and 5 show the pattern of dispersion, where concentrations reduce with distance from the adjacent roads and with height. Combined with the results in Table 6.1, the plots indicate that much of the residential component of the proposed development up to the seventh floor would experience concentrations greater than the AQS.

6.9 With respect to the short term AQS, LLAQM.TG(16) states that where the annual mean concentration is below 60µg.m^{-3}, there are not likely to be exceedances of the 1-hour mean objective (i.e. 200µg.m^{-3} not to be exceeded more than 18 times per year). There are no exceedances of this indicative threshold at any of the proposed receptors at any floor and therefore it is not anticipated that any proposed receptors would be exposed to unacceptable short term concentrations of NO_2.

Table 6.2 Predicted annual mean concentrations of PM_{10} at proposed receptors

Receptor Point	Annual Mean NO_2 concentration (µg.m^{-3})						
	Ground Floor	First Floor	Second Floor	Third Floor	Fourth Floor	Fifth Floor	Sixth Floor
2017							
R1	21.0	20.4	19.8	19.4	19.3	19.2	19.1
R2	21.0	20.4	19.8	19.5	19.3	19.2	19.1
R3	21.1	20.5	19.9	19.5	19.3	19.2	19.1
R4	21.5	20.7	19.9	19.5	19.3	19.2	19.1
R5	20.4	20.1	19.8	19.5	19.3	19.2	19.1
R6	19.8	19.7	19.5	19.3	19.3	19.2	19.1
2020							
R1	21.0	20.5	19.8	19.5	19.3	19.2	19.1
R2	21.1	20.5	19.9	19.5	19.3	19.2	19.1
R3	21.2	20.6	19.9	19.5	19.3	19.2	19.1
R4	21.6	20.8	20.0	19.5	19.3	19.2	19.1
R5	20.5	20.2	19.8	19.5	19.3	19.2	19.1

Receptor Point	Annual Mean NO_2 concentration (µg.m^{-3})						
	Ground Floor	First Floor	Second Floor	Third Floor	Fourth Floor	Fifth Floor	Sixth Floor
R6	19.8	19.7	19.5	19.4	19.3	19.2	19.1

6.10 The data in Table 6.2 indicate that annual mean concentrations of PM_{10} are predicted to be below the 40µg.m^{-3} AQS at all receptor points and at each floor level. The highest predicted concentration at a residential location is at Receptors 2 and 3 on the second floor, which is 50% below the AQS.

6.11 For PM_{10} the following equation can be used to derive the number of days that the daily mean AQS limit of 50µg.m^{-3} is likely to be exceeded:

$$\text{No. 24 hour exceedances} = -18.5 + 0.00145 \times \text{annual mean}^3 + \left(\frac{206}{\text{annual mean}}\right)$$

6.12 The highest annual mean PM_{10} concentration in Table 6.2 is 21.6µg.m^{-3} at Receptor 4. Based on the above formula, this equates to 5.5 exceedance days, which is 84% below the 35-day allowance. It is therefore not thought that any proposed receptors would be exposed to unacceptable short term concentrations of PM_{10}.

Air Quality Neutral Assessment

Transport Emissions

6.13 The Air Quality Neutral Assessment for transport emissions compares the expected emissions from traffic generation with benchmarked emissions derived from the Air Quality Neutral Planning Support Update.

6.14 As detailed in Appendix D, Transport Emission Benchmarks (TEB) of 6.86kgNO_x.annum^{-1} and 0.12kgPM_{10}.annum^{-1} were calculated.

6.15 The proposed development is not expected to generate any traffic; therefore, transport emissions have not been calculated and has been scoped out of this assessment.

Building Emissions

6.16 To determine the energy centre impact for an Air Quality Neutral Assessment onsite emissions of NO_x associated with building use must be compared to building emissions benchmarks (BEB) outlined in the Air Quality Neutral Planning Support Update.

6.17 To establish whether a proposed development is expected to be air quality neutral, the total emissions due to the energy centre is compared with benchmark values provided in the guidance for each planning use type (by floor space). Derivation of the BEB has been carried out to provide a benchmark of $598.67kgNO_x.annum^{-1}$ (calculations are shown in Appendix D). It is not necessary to calculate a BEB for PM_{10} as only gas-fired boilers are intended for use in the proposed development, making NO_x the pollutant of concern.

6.18 Using information provided by the project's Building Services Engineers, the total onsite emissions of NO_x associated with the proposed development will be $46.8kgNO_x.annum^{-1}$. This is 92% below the BEB, therefore the development is considered to be better than air quality neutral and no further mitigation will be required.

7. Discussion

7.1 LBC has declared an AQMA covering the whole Borough due to exceedances of the AQSs for both NO_2 and PM_{10}.

7.2 Local monitoring data indicate that PM_{10} concentrations at the application site are unlikely to approach or exceed either the short or long term AQSs for this pollutant. However, background monitoring data from LBC and the UK-AIR for annul mean concentrations of NO_2 indicate that the AQS for this pollutant is exceeded widely across this part of the borough.

7.3 This being the case, the air quality assessment has shown that the contribution from road traffic emissions on the local highway is likely to expose residents of the proposed development to concentrations of NO_2 up to 14% above the AQS. However, proposed units on the sixth and seventh floors might not be exposed to NO_2 concentrations above the AQS.

7.4 The exposure of future residents of the proposed development to elevated NO_2 concentrations could be reduced by installing a suitable mechanical ventilation system that would take in cleaner air from the top of the building, away from the road, and use this to ventilate the living spaces beneath. Alternatively, if mechanical ventilation inlets need to be positioned lower down the building and/or on the street-facing facades, an activated carbon filtration system could be employed to reduce occupants' exposure to elevated NO_2 concentrations.

7.5 As the proposed development will essentially be car-free (four spaces are to be provided for disabled parking only), it will not generate any significant traffic that might contribute to pollution emission on the local road network.

7.6 A Travel Plan has been prepared for the proposed development, which should encourage cleaner modes of travel and help to further mitigate the operational impacts of the development. Public transport is easily accessible from the application site and is likely to be the primary mode of transport to and from it. Cycle parking will also be provided for residents.

7.7 It should be noted that the dispersion modelling assessment has adopted a number of worst case assumptions. Chief amongst these is the use of 2017 pollution data for the future scenario in 2020 when the development is due to be occupied. Using these data the assessment has shown a slight increase in concentrations with time, which is due to the effect of predicted traffic growth. It is likely that future pollution concentrations will actually decrease due to the roll out of cleaner vehicles across London.

8. Conclusions

8.1 This report has assessed the current air quality at the application site in terms of its suitability for its proposed use. The most sensitive component of the proposed development, in terms of air quality, is residential uses in the north-eastern part of the building. The proposed development will essentially be car-free and will not, therefore, add to traffic pollution emissions on the local road network.

8.2 In order to reduce exposure of future residents to annual mean NO_2 concentrations, it is recommended that mechanical ventilation should be provided to rooms along street-facing facades, with the air intakes situated on the top of the building away from the adjacent roads. If such an arrangement is untenable, then it is recommended that an activated carbon filtration system is used to provide filtered air to the affected units – i.e. all those residential units on the second to seventh floors. Furthermore, the Travel Plan prepared for the proposed development will help to further mitigate operational phase impacts.

8.3 During construction, with the adoption of appropriate mitigation measures, dust emissions should not cause any significant off-site effects.

8.4 Considering the above, the proposed development should be acceptable in terms of its impact on, and sensitivity to, local air quality. It should not, therefore, pose any significant obstacles to the planning process.

Figures and Appendices

Figure 1: Site Location Plan

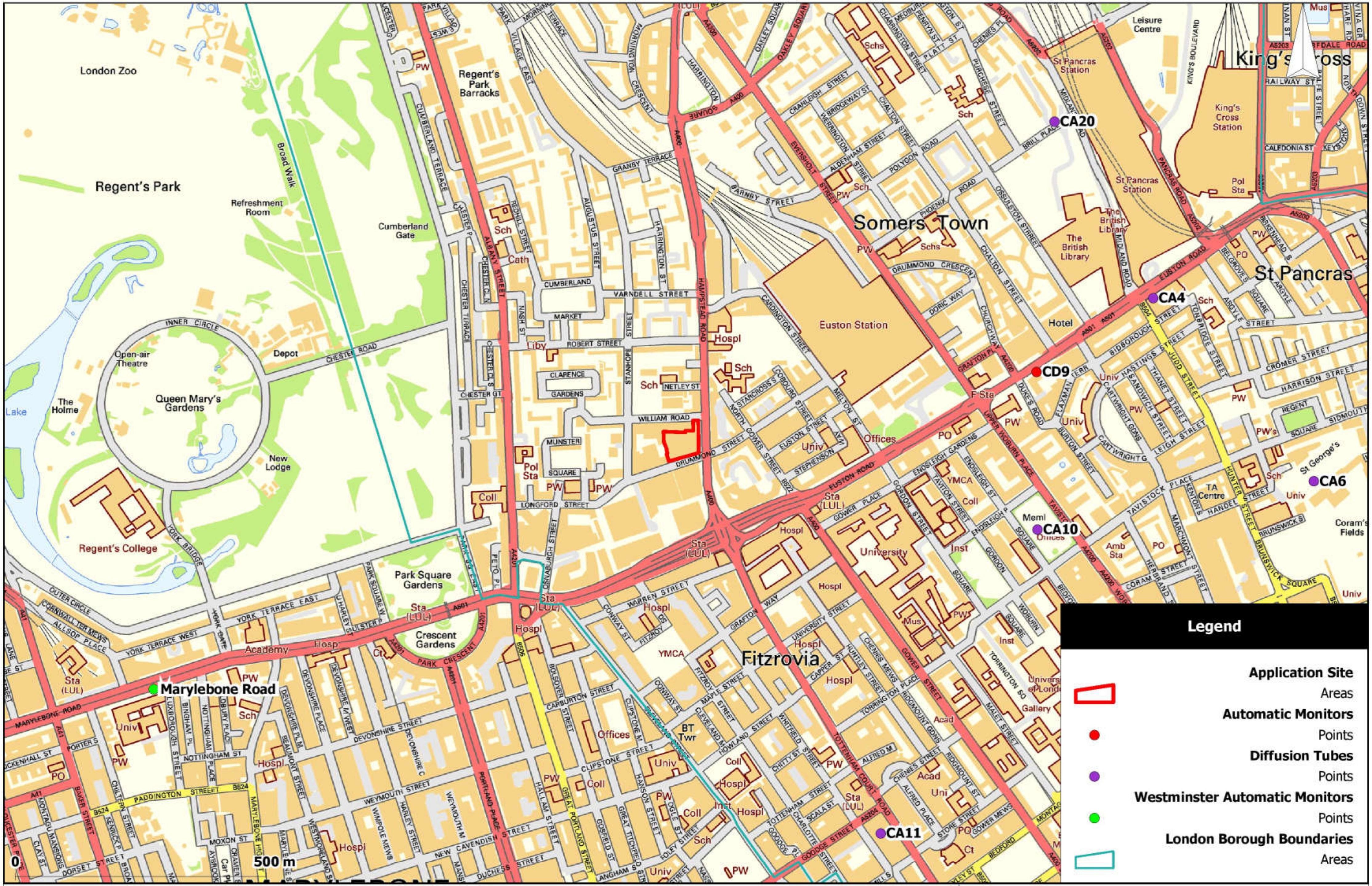


Figure 1: Site Location Plan

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Figure 2: Construction Phase Receptors

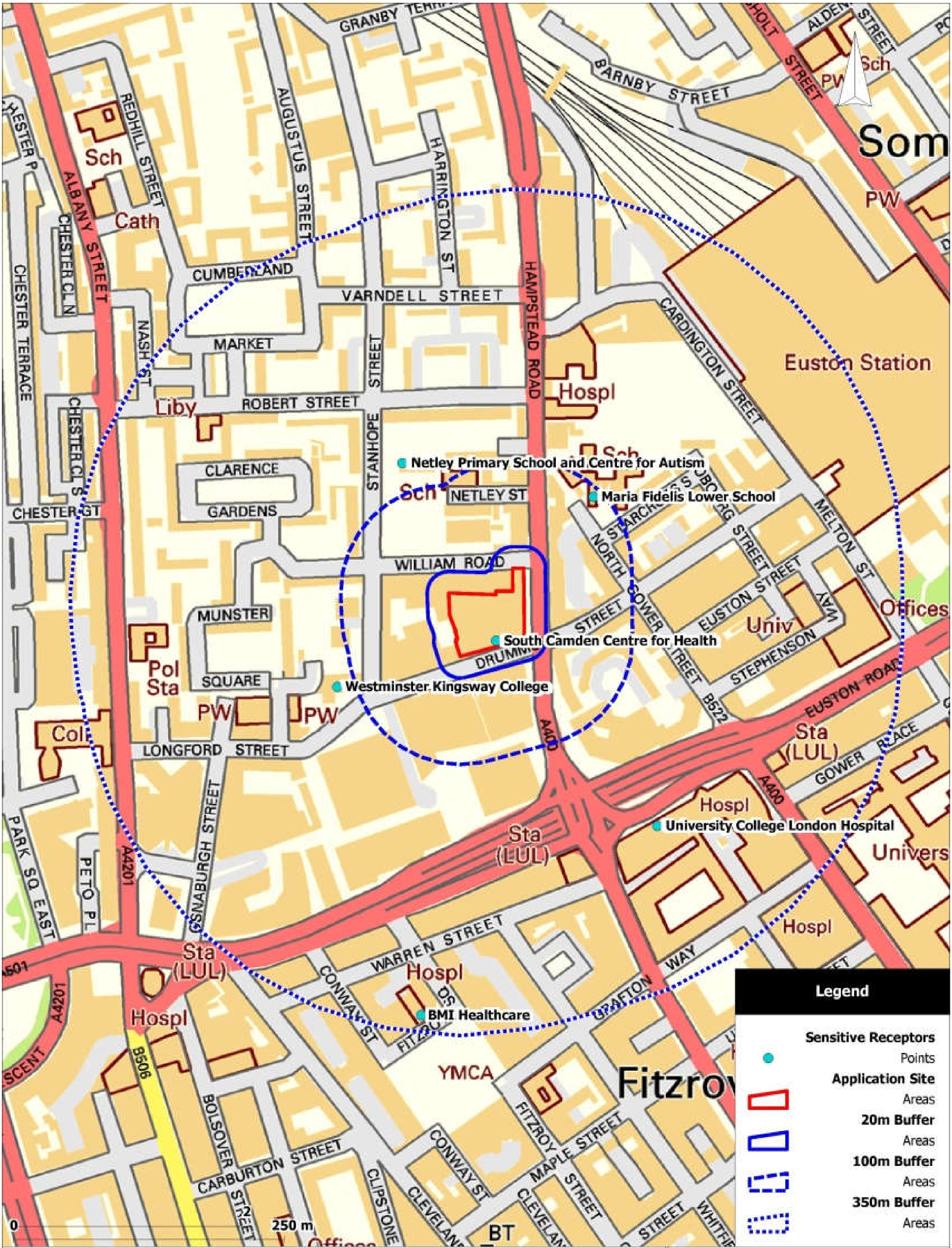

Figure 2: Construction Phase Receptors

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Figure 3: Operational Phase Receptors

Figure 3: Operational Phase Receptors

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Figure 4: Ground Floor NO_2 Contours for 2020

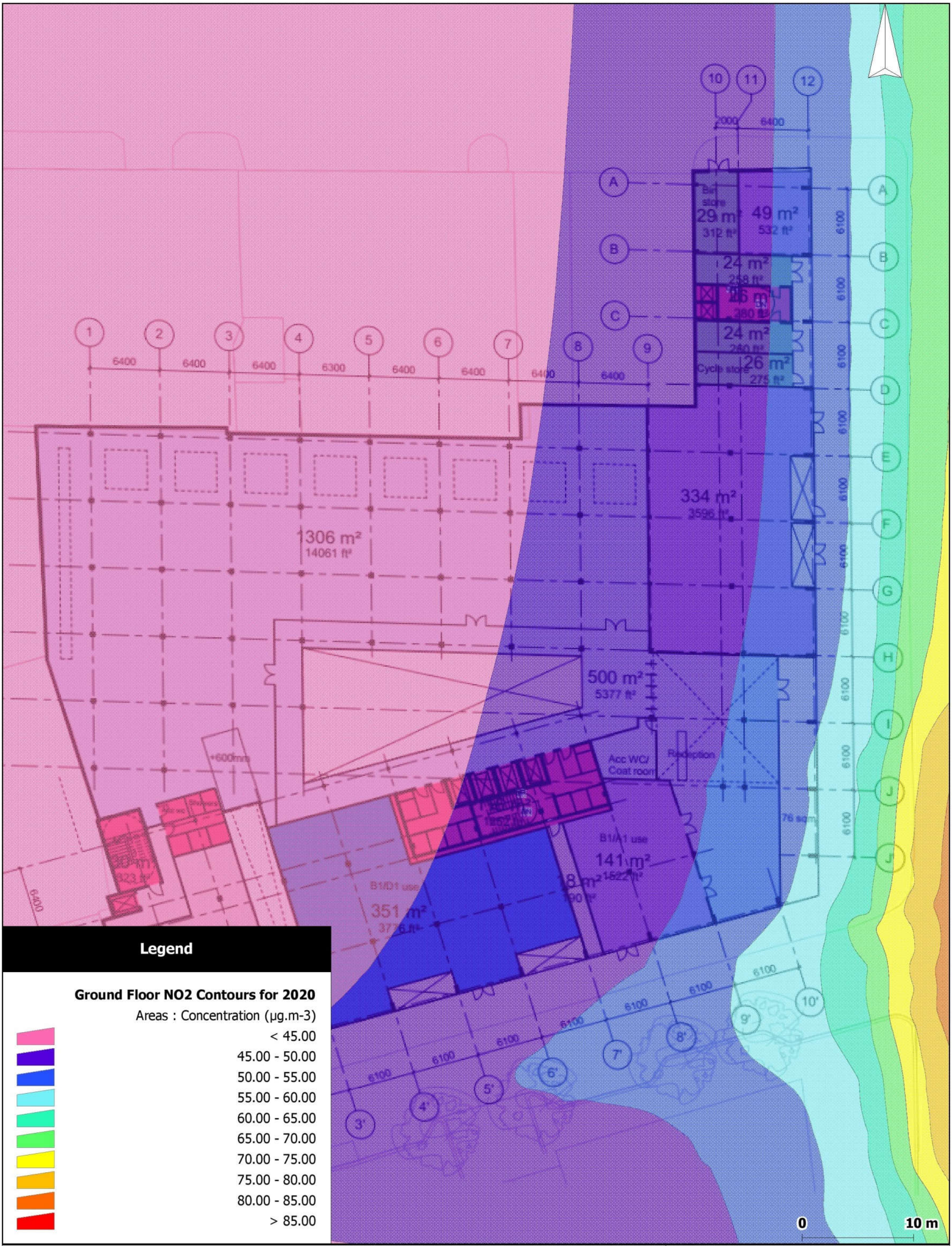

Figure 4: Ground Floor NO2 Contours for 2020

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Figure 5: First Floor NO_2 Contours for 2020

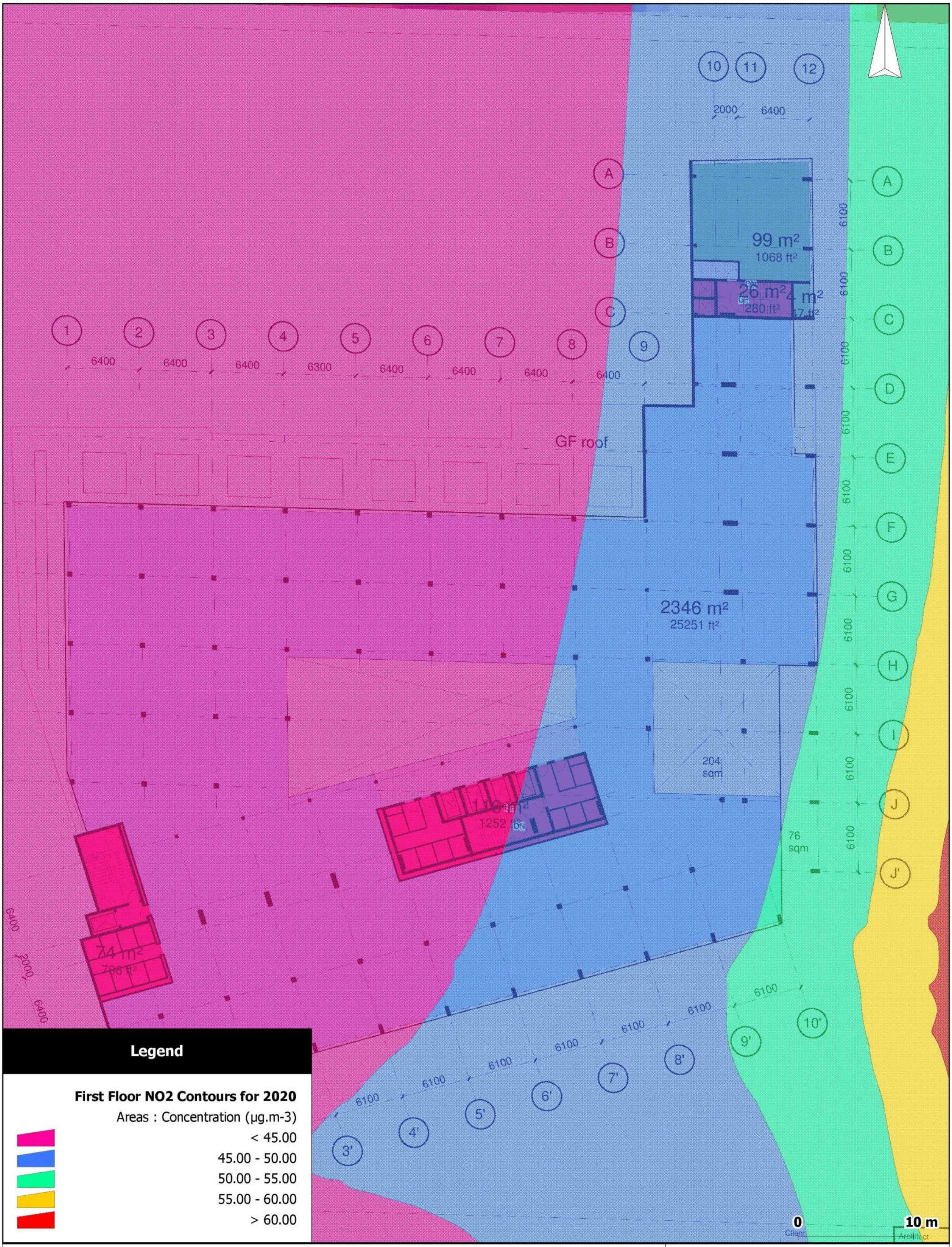

Figure 5: First Floor NO2 Contours for 2020

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Appendix A: EPUK & IAQM Significance Criteria

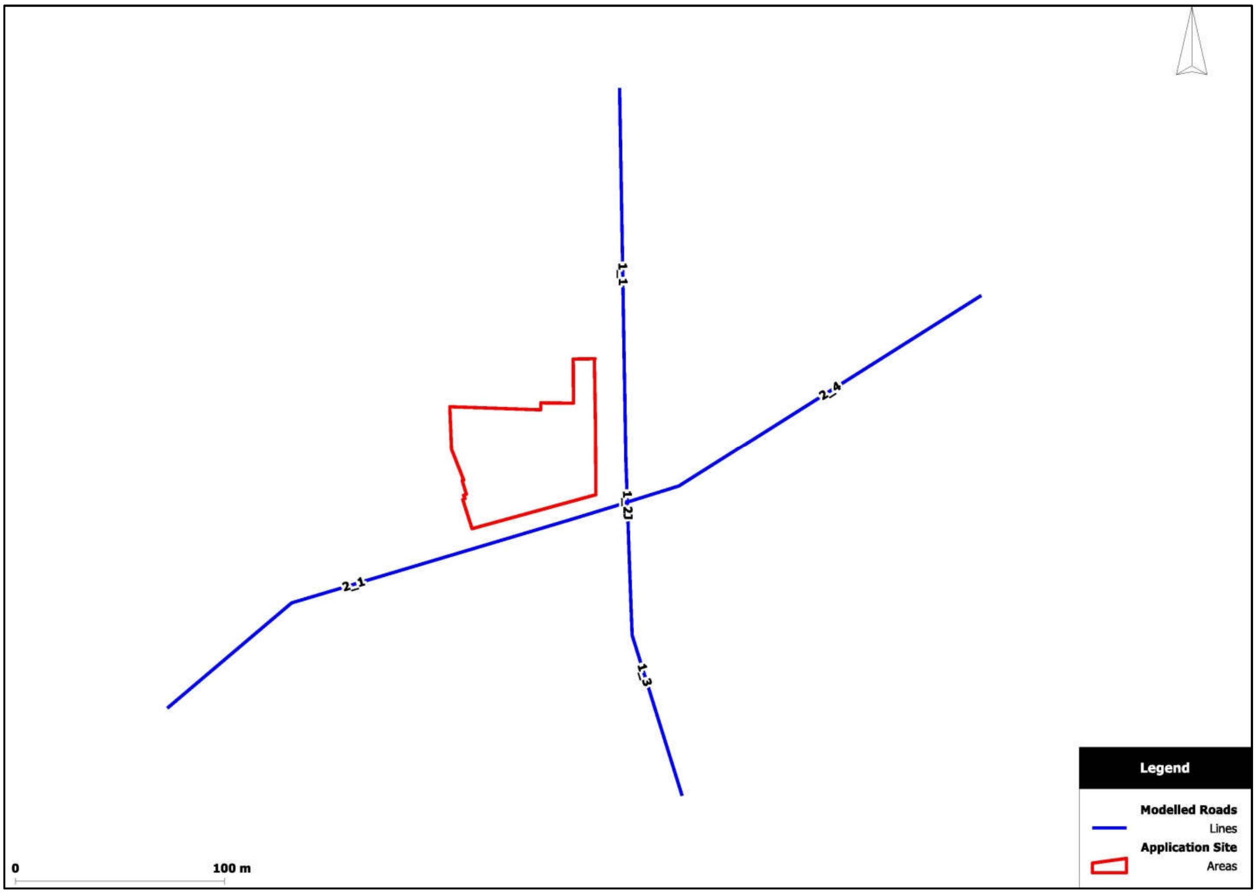
Long term average Concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate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

Explanation

1. AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.
2. The Table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. .less than 0.5% will be described as Negligible..
3. The Table is only designed to be used with annual mean concentrations.
4. Descriptors for individual receptors only; the overall significance is determined using professional judgement (see Chapter 7). For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.
5. When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.
6. The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.
7. It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

Appendix B: Model Input Data

Link Diagram



Traffic Data

Link ID	Road Name	Speed km.hr^{-1}		Baseline 2017		Baseline 2020	
		Freeflow	Congestion/ junction	AADT	% HDV	AADT	% HDV
1	Hampstead Road	30	15	21,642	14.56	22,528	14.56
2	Drummond Street	30	15	3,668	3.52	3,818	3.52

Appendix C: Model Verification Study

Model verification studies are undertaken in order to check the performance of dispersion models and, where modelled concentrations are significantly different to monitored concentrations, a factor can be established by which the modelled results can be adjusted in order to improve their reliability. The model verification process is detailed in LAQM.TG(16).

According to TG(16), no adjustment factor is necessary where the results of the model all lie within 25% of the monitored concentrations.

Model verification can only be undertaken where there is sufficient roadside monitoring data in the vicinity of the subject scheme being assessed. TG(16) recommends that a combination of automatic and diffusion tube monitoring data is used; although this may be limited by data availability. 2 diffusion tubes in Camden and one automatic monitor had appropriate corresponding DfT data, so were selected for this study.

Table C.1 compares monitored and modelled NO_2 concentrations at the monitoring locations.

Table C.1: Monitored and Modelled Total NO_2 at Roadside Monitoring Sites

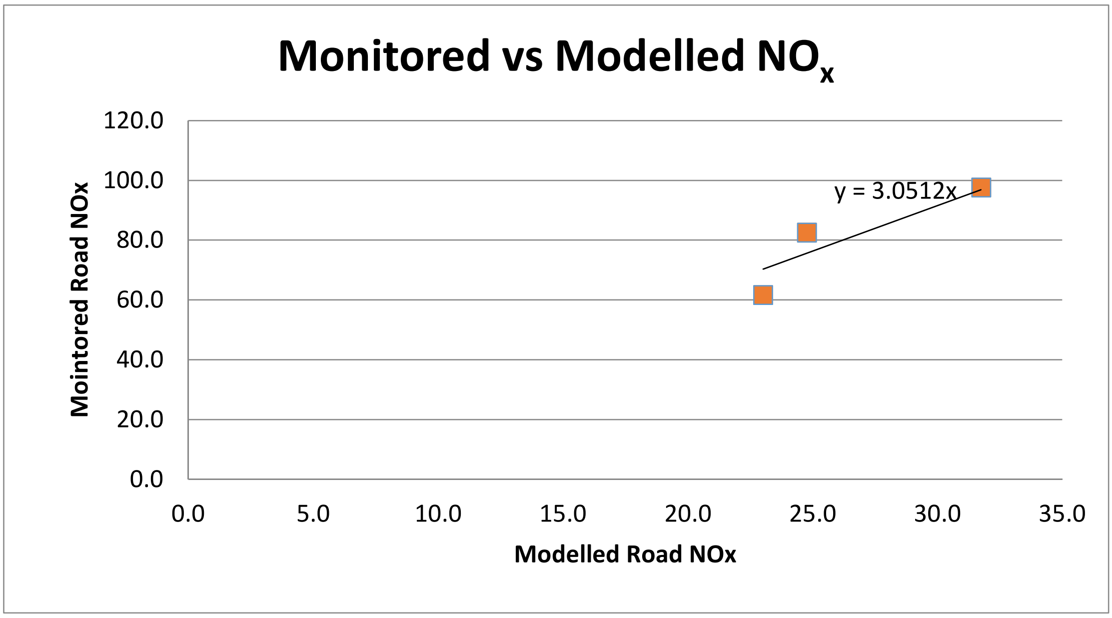
Monitor Location	Type	Concentrations ($\mu g.m^{-3}$)		Difference (%)
		Monitored	Modelled	
CA16	DT	57.8	43.7	-24.4%
CA23	DT	72.2	50.4	-30.2%
CD1	A	66.0	46.0	-30.4%

Note: "DT" = diffusion tube; "A" = automatic monitor.

The data in Table C.1 show that the model is consistently under-predicting NO_2 concentrations. This is not unusual and is likely to be the result of local dispersion conditions. As the model shows a tendency to under-predict, derivation of an adjustment factor is desirable to ensure a conservative assessment. This has been undertaken below.

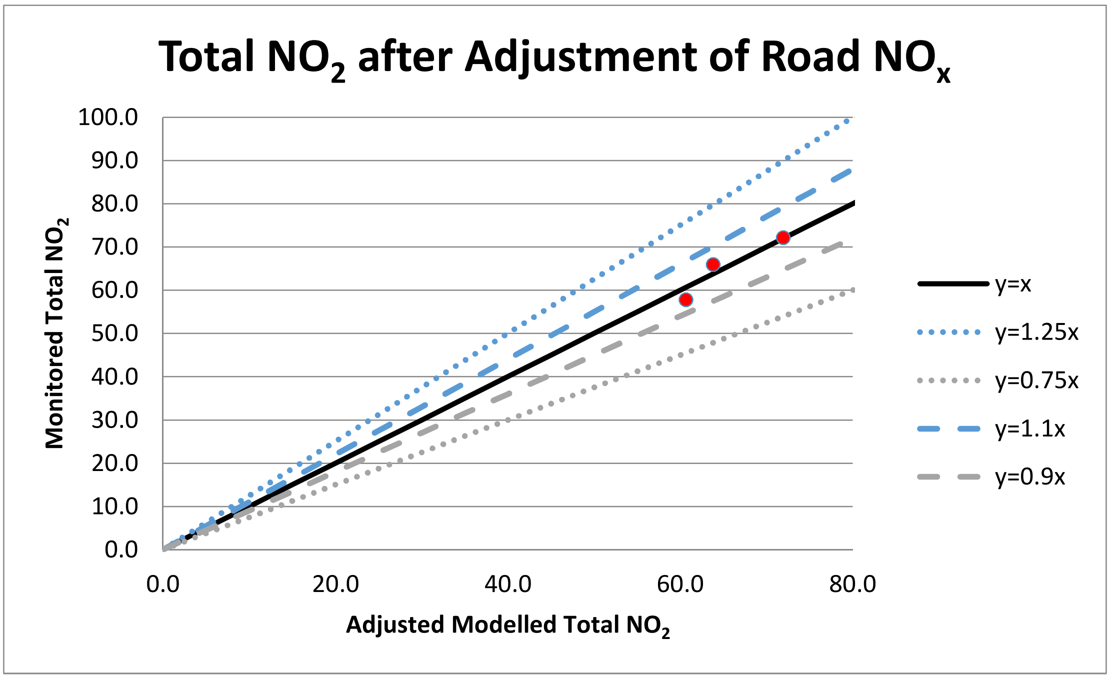
As it is primary NO_x, rather than secondary NO_2, emissions that are modelled, an adjustment factor must be derived for the road contribution of NO_x. A plot of modelled versus monitored NO_x concentrations shows a positive correlation. This graph is included in Figure C.1 below.

Figure C.1: Monitored vs Modelled NO_x



By plotting a trend line through the points on the graph, a factor of 3.05 was derived. Figure C.2 shows total monitored versus modelled NO_2 following the adjustment of the road contribution of NO_x by this factor. It shows that, following this adjustment, all five of the modelled concentrations of NO_2 are within 25% of monitored concentrations at these locations. The factor of 3.05 is therefore appropriate for the adjustment of all modelled road contributions of NO_x for the proposed development.

Figure C.2: Monitored NO_2 vs Modelled NO_2, following adjustment



Appendix D: Air Quality Neutral Assessment

Transport Emissions

Transport Emissions Benchmark (TEB)

Area: Central Area Zone (CAZ)							
Land Use	Gross Internal Area (m^2)	Trip Rate (Trip/m^2.annum^{-1})	Average Distance Travelled (km)	Emissions Factor NO_x (g/vehicle km)	Emissions factor (PM_{10}) (g /vehicle km)	TEB (NO_x)	TEB (PM_{10})
A1	894	43	9.3	0.4224	0.0733	169	29.3
B1	15,657	1	3.0	0.4224	0.0733	1.27	0.22
D1	901	1	3.0*	0.4224	0.0733	1.27*	0.22*
C3	2,194	129	4.3	0.4224	0.0733	234	40.7
Total Transport Emissions (kgNO_x.annum^{-1})						6.86	
Total Transport Emissions (kgPM_{10}.annum^{-1})						0.12	

*It was considered acceptable to use the TEB for B1 land use, as use of this area has been declared flexible and no TEB for D1 exists.

Proposed Development Transport Emissions

Pollutant	NO_x	PM_{10}
Development Trip Rate (vehicles/day)	-	-
Average trip length (km)	-	-
Vehicle.km/ annum	-	-
Emissions factor (g per vehicle.km)	-	-
Development Emissions	-	-

Building Emissions

Building Emission Benchmark (BEB)

Land Use	Gross Internal Area (m^2)	Emissions Factor NO_x (g/ m^2)	BEB NO_x (kgNO_x.annum^{-1})

A1	894	22.6	20.2
B1	15,657	30.8	482.2
D1	901	43	38.7
C3	2,194	26.2	57.5
Total Benchmarking Building Emissions:			**598.7**

Proposed Development Building Emissions

Type	Gas Boilers	-
Thermal Input (total)	300	kW
Time in use for one year (approx.)	4,000	Hours
Energy Use	1,200,000	kWh
Emission rate (NO_2)	39	mg/kWh
Development Emissions	**46.8**	**$kgNO_x.annum^{-1}$**

Appendix E: IAQM Highly Recommended Mitigation Measures

Please refer to the IAQM's Construction Dust Guidance for further, "desirable", mitigation measures.

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.
- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this Appendix. The DMP may include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections.

Site Management

- Record all dust and air quality complaints, identify cause(s), 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 exception 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.

Monitoring

- Carry out regular site inspections to monitor compliance with the Dust Management Plan, record inspection results, and make an inspection log available to the local authority when asked.
- Increase the frequency of inspections 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 dry or windy conditions.
- Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it is a large site, before work on a phase commences. Further guidance is provided by the IAQM[19] on *monitoring during demolition, earthworks and construction*.

Preparing and Maintaining the Site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.

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19 IAQM. (2012). *Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites.* http://www.iaqm.co.uk/text/guidance/monitoring_construction_sites_2012.pdf

- 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 they are being re-used on site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating Vehicle/Machinery and Sustainable Travel

- 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.

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter 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 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.

Waste Management

- Avoid bonfires and burning of waste materials.

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.

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.

Trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.

- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10m from receptors where possible.

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