Air Quality Assessment for the proposed development at 51 – 52 Tottenham Court Road, London

Report to Dome Assets Ltd

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Aether

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Customer	Dome Assets Ltd
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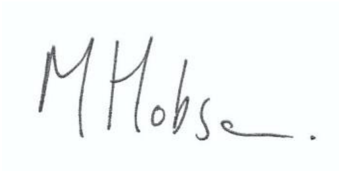
Author	Rosie Brook
Approved by	Melanie Hobson
Signature	
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Aether Contact Details	www.aether-uk.com enquiries@aether-uk.com
Aether Ltd Oxford Centre for Innovation New Road Oxford OX1 1BY	01865 261466
Registered office: Oxford Centre for Innovation, New Road, Oxford, OX1 1BY. Registered in England 6630896	

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1. Introduction

Aether has been commissioned by Dome Assets to undertake an air quality assessment for the proposed refurbishment and extension development at 51 – 52 Tottenham Court Road, London W1T 2EQ. The existing building consists of residential and office use at higher levels, and retail units at ground and basement levels. The proposal includes the extension of the second and third floors, and the creation of a fourth floor, to increase and redistribute the existing office and residential space. There is no car parking or on-site energy generation associated with the development. The development falls within the London Borough of Camden, which suffers from elevated levels of air pollution, primarily due to high levels of traffic. It is therefore important to assess whether there will be an exceedence of the air quality objectives for particulate matter (PM_{10}) or nitrogen dioxide (NO_2) at the proposed site and then advise whether any action is required.

The expected completion date of the proposed development is 2018. The assessment has therefore been completed for 2019, the expected first full year of occupation.

The London Borough of Camden's website[1] states that a detailed assessment is required for 'developments that bring sensitive receptors into an area of poor air quality'. It also states that the following needs to be included in a detailed air quality assessment:

A – Air quality dispersion modelling data carried out in accordance with the London Councils Air Quality and Planning Guidance. *ADMS-Roads, a comprehensive dispersion modelling tool for investigating air pollution problems due to small networks of roads and industrial sources has been used. See (B) with regard to the significance criteria.*

B – An indication of the number of receptors which will be exposed to poor air quality as a result of the development, and show their location on a map. The significance of air pollution exposure should be quantified in accordance with the "Air Quality Impact Significance Criteria – New Exposure" outlined in the NSCA Guidance Note. *This report is primarily concerned with the residents' exposure to air pollution due to existing pollutant concentrations at the development location rather than the impact of the development, as this will be minimal with no additional car parking associated with the development. Furthermore, an air quality neutral assessment (Section 3.5), found the proposed development to meet the air quality neutral requirements for buildings.*

C – An outline and justification of mitigation measures associated with the design, location and operation of the development in order to reduce air pollution and exposure to poor air quality. Where a proposed development is in an area of poor air quality it is essential to demonstrate that from the earliest stages, the building has been designed to reduce occupant exposure. This includes consideration of orientation, elevation of residences, and the use of green infrastructure such as green walls, screens and trees. *This is outlined in Section 3.3. In addition, the Guidance on the assessment of dust from demolition and construction from the Institute of air quality management has been referred to in Section 3.4.*

[1] https://www.camden.gov.uk/ccm/content/environment/planning-and-built-environment/two/planning-applications/making-an-application/supporting-documentation/air-quality-assessment/

D – Where a biomass boiler is proposed, this form must be completed: Biomass Boiler Information form. *This is not relevant for this assessment as no air pollutant emitting on-site energy generation will be provided.*

1.1 Assessment Criteria

A summary of the air quality objectives relevant to the Camden development, as set out in the UK Air Quality Strategy[2], is presented in Table 1 below.

Table 1: UK Air Quality Objectives for NO_2 and PM_{10}

Pollutant	Concentration	Measured as
Nitrogen Dioxide (NO_2)	40 µg/m^3	Annual mean
	200 µg/m^3	Hourly mean not to be exceeded more than 18 times per year (99.8th percentile)
Particulate Matter (PM_{10})	40 µg/m^3	Annual mean
	50 µg/m^3	24 hour mean not to be exceeded more than 35 times a year (90.4th percentile)

The oxides of nitrogen (NO_x) comprise principally of nitric oxide (NO) and nitrogen dioxide (NO_2). NO_2 is a reddish brown gas (at sufficiently high concentrations) and occurs as a result of the oxidation of NO, which in turn originates from the combination of atmospheric nitrogen and oxygen during combustion processes. NO_2 can also form in the atmosphere due to a chemical reaction between NO and ozone (O_3). Health based standards for NO_x generally relate to NO_2, where acute and long-term exposure may adversely affect the respiratory system.

Particulate matter is a term used to describe all suspended solid matter, sometimes referred to as Total Suspended Particulate matter (TSP). Sources of particles in the air include road transport, power stations, quarrying, mining and agriculture. Chemical processes in the atmosphere can also lead to the formation of particles. Particulate matter with an aerodynamic diameter of less than 10 µm is the subject of health concerns because of its ability to penetrate deep within the lungs and is known in its abbreviated form as PM_{10}.

Further information on the health effects of air pollution can be found in the reports produced by the Committee on the Medical Effects of Air Pollutants[3].

As defined by the regulations, the air quality objectives for the protection of human health are applicable:

- Outside of buildings or other natural or man-made structures above or below ground; and
- Where members of the public are regularly present.

[2] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007), Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland

[3] https://www.gov.uk/government/collections/comeap-reports

Using these definitions, the annual mean objectives will apply at locations where members of the public might be regularly exposed such as building façades of residential properties, schools and hospitals and will not apply at the building façades of offices or other places of work, where members of the public do not have regular access. Therefore in this assessment the annual mean objectives will apply to the first to fourth floors of the development where there will residential dwellings. The 24 hour objective will apply at all locations where the annual mean objective would apply together with hotels. The hourly objective will apply at all locations where members of the public could reasonably be expected to spend that amount of time. Therefore, in this assessment the annual and hourly mean objectives will apply at the first to fourth levels of the development.

1.2 Local Air Quality Management

Local authorities are required to periodically review and assess the current and future quality of air in their areas. Where it is determined that an air quality objective is not likely to be met, the authority must designate an Air Quality Management Area (AQMA) and produce an Air Quality Action Plan (AQAP).

The London Borough of Camden declared the whole borough as an AQMA[4] in 2002 due to exceedences of the NO_2 and PM_{10} objectives. The proposed development site therefore falls within an AQMA. An AQAP was produced covering the period 2013 to 2015[5]. The AQAP highlights the actions to be taken in the following five areas:

1. Transport emissions
2. Emissions associated with new developments
3. Emissions from gas boilers and industrial processes
4. Air quality awareness-raising initiatives
5. Lobbying and partnership working

1.3 The ADMS-Roads Method

Local air quality has been assessed using ADMS-Roads, a comprehensive dispersion model that can be used to predict concentrations of pollutants in the vicinity of roads and small industrial sources. The model has been used for many years in support of planning applications for new residential/commercial developments.

ADMS-Roads is able to provide an estimate of air quality both before and after development, taking into account important input data such as background pollutant concentrations, meteorological data, traffic flows and on-site energy generation (if applicable). The model output can be verified against local monitoring data to increase the accuracy of the predicted pollutant concentrations and this approach has been followed in this assessment.

[4] http://www.camden.gov.uk/ccm/content/environment/air-quality-and-pollution/air-quality/twocolumn/policies-reports-and-research/?page=3#section-3

[5] http://www.camden.gov.uk/ccm/navigation/environment/green-camden/air-quality/ See link to 'Clean Action Plan (2013-15)'

The use of dispersion modelling enables estimates of concentrations to be made at varying heights. As a result, suggestions for appropriate mitigation measures can be made where necessary, taking into consideration the identification of worst-case locations.

The most recent version of ADMS-Roads (v4.0) was issued in November 2015 and requires the following information to assess the impact at sensitive receptor locations:

- Setup: General site details and modelling options to be used;
- Source: Source dimensions and locations, release conditions, emissions;
- Meteorology: hourly meteorological data;
- Background: Background concentration data;
- Grids: Type and size of grid for output; and
- Output: Output required and sources/groups to include in the calculations.

2. Methodology

2.1 Local Pollutant Concentrations

It is good practice to include up-to-date local background pollutant concentrations in the assessment model, and also to verify modelled outputs against local monitoring data where available. This section provides an overview of the local data available for use in the assessment.

Local monitoring data

The London Borough of Camden has four automatic monitoring sites which monitor both nitrogen dioxide (NO_2) and particulate matter (PM_{10}). NO_2 concentrations are also measured passively at 14 diffusion tube sites across the borough. Two of these diffusion tube sites lie in close proximity to the development site. Details of the monitoring sites near to the development site are given in Table 2.

Monitoring results have been taken from the Council's latest Updating and Screening Assessment (USA) Report[6].

Table 2: Monitoring sites in Camden

Site Name	Site Type	Pollutant(s)	Grid Reference	Distance to Kerb (m)	Approx. Distance to development site (m)
Shaftesbury Avenue*	R	NO_2, PM_{10}	530060, 181290	<1	630
London Bloomsbury*	UB	NO_2, PM_{10}	530120, 182034	27	630
Tottenham Court Road	K	NO_2	529568, 181728	<1	30
Bloomsbury Street	R	NO_2	529962, 181620	<1	390

Note: R = roadside, UB = urban background, K= kerbside,* automatic monitor.

[6] At the time of completing this report, the 2015 USA was not publically available. Other London Borough of Camden air quality reports can be found via their website: http://www.camden.gov.uk/ccm/navigation/

The diffusion tubes were analysed by Gradko International Ltd, who participate in the Proficiency scheme[7]. Whilst diffusion tubes provide an indicative estimate of pollutant concentrations, they tend to under or over read. The data is therefore corrected using a bias adjustment factor. There are two types of bias adjustment factor – local and national. The local factor is derived from co-locating diffusion tubes (usually in triplicate) with automatic monitors, whereas the national factor is obtained from the average bias from all local authorities using the same laboratory. The London Borough of Camden has applied a combined local bias adjustment factor (0.97) to their 2014 diffusion tube results.

Monitoring results are presented in Table 3. The data shows that the annual mean NO_2 objective was exceeded at both the nearby automatic monitors, and diffusion tube sites, every year between 2012 and 2014. Whilst exceedences of the 1 hour mean NO_2 objective were recorded at the automatic monitoring sites, they remained below the objective (hourly mean not to be exceeded more than 18 times per year). As expected, greater NO_2 concentrations were recorded at the Shaftesbury Avenue automatic monitor compared with the London Bloomsbury site, which represents an urban background concentration. However, the background concentrations have consistently remained above the annual mean NO_2 objective of 40 µg/m^3.

Diffusion tubes do not provide information on hourly exceedences, but research[8] identified a relationship between the annual and 1 hour mean objective, such that exceedences of the latter were considered unlikely where the annual mean was below 60 µg/m^3. Therefore it is considered likely that exceedences of the 1 hour mean NO_2 objective occurred at both the nearby diffusion tube sites between 2012 and 2014.

No exceedences of either the annual or daily PM_{10} objective have been recorded at either of the automatic monitoring sites between 2012 and 2014.

Table 3: Monitoring results for sites close to the proposed development site, 2012-2014

Objective	Site Name	2012	2013	2014
Annual mean NO_2 (µg/m^3)	Shaftesbury Avenue*	**71**	**74**	**69**
	London Bloomsbury*	**55**	**44**	**45**
	Tottenham Court Road	**88.3**	**88.1**	**86.8**
	Bloomsbury Street	**71.7**	**76.1**	**80.8**
Hourly mean NO_2 (no. exceedences)	Shaftesbury Avenue*	12	6	1
	London Bloomsbury*	1	1	1
Annual mean PM_{10} (µg/m^3)	Shaftesbury Avenue*	29	29	25
	London Bloomsbury*	19	18	20
Daily mean PM_{10} (no. exceedences)	Shaftesbury Avenue*	18	17	16
	London Bloomsbury*	10	4	11

[7] This is a national QA/ QC scheme.

[8] As described in Section 2.31 of LAQM Technical Guidance (TG09).

Note: Values exceeding the 40 µg/m^3 annual mean objective are shown in bold, values above 60 µg/m^3 are also underlined, * automatic monitor

Background mapped data
Background pollutant concentration maps are available from the Defra LAQM website[9] and data has been extracted for Camden for this assessment. These 2011 baseline, 1 kilometre grid resolution maps are derived from a complex modelling exercise that takes into account emissions inventories and measurements of ambient air pollution from both automated and non-automated sites.

There are indications from national monitoring data that 2011 was an unusually high year for PM_{10}. Scaling factors have been derived to calculate a more typical case estimate for projections calculated from a reference year of 2011. A factor of 0.91 has been derived by comparing measured concentrations in 2011 with those for 2008, 2009, 2010 and 2012. This approach has been followed in this assessment[10].

The estimated mapped background NO_x, NO_2 and PM_{10} concentrations around the development site are 86.8 µg/m^3, 48.0 µg/m^3 and 23.2 µg/m^3 respectively in 2014 (the baseline year used in the assessment). The background maps also provide projections to future years. For 2019 (the first estimated year of occupation), the concentrations obtained for the same pollutants are 71.0 µg/m^3, 40.5 µg/m^3 and 21.8 µg/m^3 respectively.

The 2014 mapped background concentrations have been used in this assessment to provide a worst case scenario as the mapped concentrations are higher than the monitored background concentrations at the London Bloomsbury automatic monitoring site. In addition, to give a worst case scenario, the projected improvements in background air quality by 2019 have not been used in the dispersion modelling.

2.2 Traffic data

Average annual daily traffic (AADT) count data for 2014 (the selected baseline year) has been obtained for Tottenham Court Road (A400), Goodge Street (A5204), Bloomsbury Street (A400), New Oxford Street (A40), Shaftesbury Avenue (A401) and St Giles High Street (A40) from Department for Transport (DfT) Traffic Counts[11], which provides data for major roads. For the minor roads, estimates are based upon average values for an 'urban minor road, London' from the DfT National Road Traffic Survey, 2014[12]. All roads within 200 metres of the modelled receptors have been included in the assessment. The values are shown in Appendix B.

For the purpose of this assessment, the RTF[13] model has been utilised in order to predict traffic growth. A 7 % in traffic growth is predicted between 2014 and 2019. This is considered to be appropriate as a 1 % increase in traffic flow was observed on Tottenham Court Road between 2013

[9] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html
[10] http://laqm.defra.gov.uk/documents/Background-maps-user-guide-v1.0.pdf
[11] http://www.dft.gov.uk/traffic-counts
[12] http://www.dft.gov.uk/statistics/series/traffic/
[13] http://laqm.defra.gov.uk/documents/RTF-Automated-Traffic-Growth-Calculator-v3-1.xls

and 2014. No car parking is planned with the development. Results (Section 3 of this report) therefore refer to concentrations modelled in 2019 regardless of whether the development takes place or not. As a result, the assessment and its conclusions are focused on the exposure of residents to elevated levels of pollutant concentrations, rather than assessing the impacts of the development per se.

We have assumed an average speed of 14.1 kph on all surrounding roads, which is the average traffic speed for Central London during PM peak hours[14]. This provides a worst-case scenario, as it is the slowest time period reported, resulting in highest exhaust emissions.

Queuing Traffic

Special consideration has been given to notable junctions modelled in this assessment. CERC note 60[15] has been used for estimating emissions from queuing traffic. This defines a representative AADT for queuing traffic to be 30,000 at 5 kph, assuming an average vehicle length of 4m. These figures, along with the traffic composition of the corresponding roads were then input into the Emission Factor Toolkit (EFT)[16] to calculate emission rates. The emission rates were then used within the dispersion model as separate road sources of pre-defined length representing each queue with time-varying emission profiles applied to represent busy periods.

2.3 Model input data

Hourly meteorological data from Heathrow, 2014 has been used in the model. The wind-rose diagram (Figure 1) presents this below. Data from Heathrow has been used as this has been found to be the most representative of the development site location.

Figure 1: Wind-rose diagram for Heathrow, 2014

[14] Travel in London Report 7: http://www.tfl.gov.uk/corporate/publications-and-reports/travel-in-london-reports
[15] Cambridge Environmental Research Consultants Ltd, Modelling Queuing Traffic – note 60, 20th August 2004
[16] Latest version 6.0.2, http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

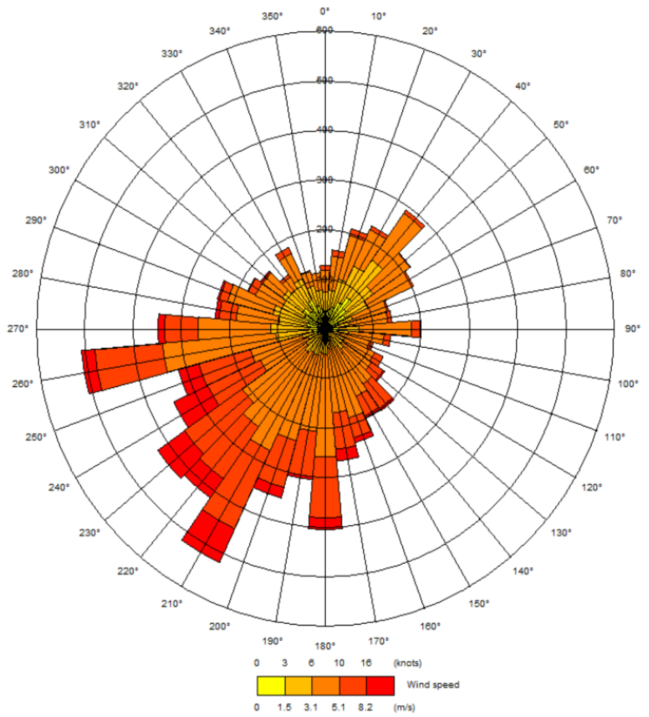
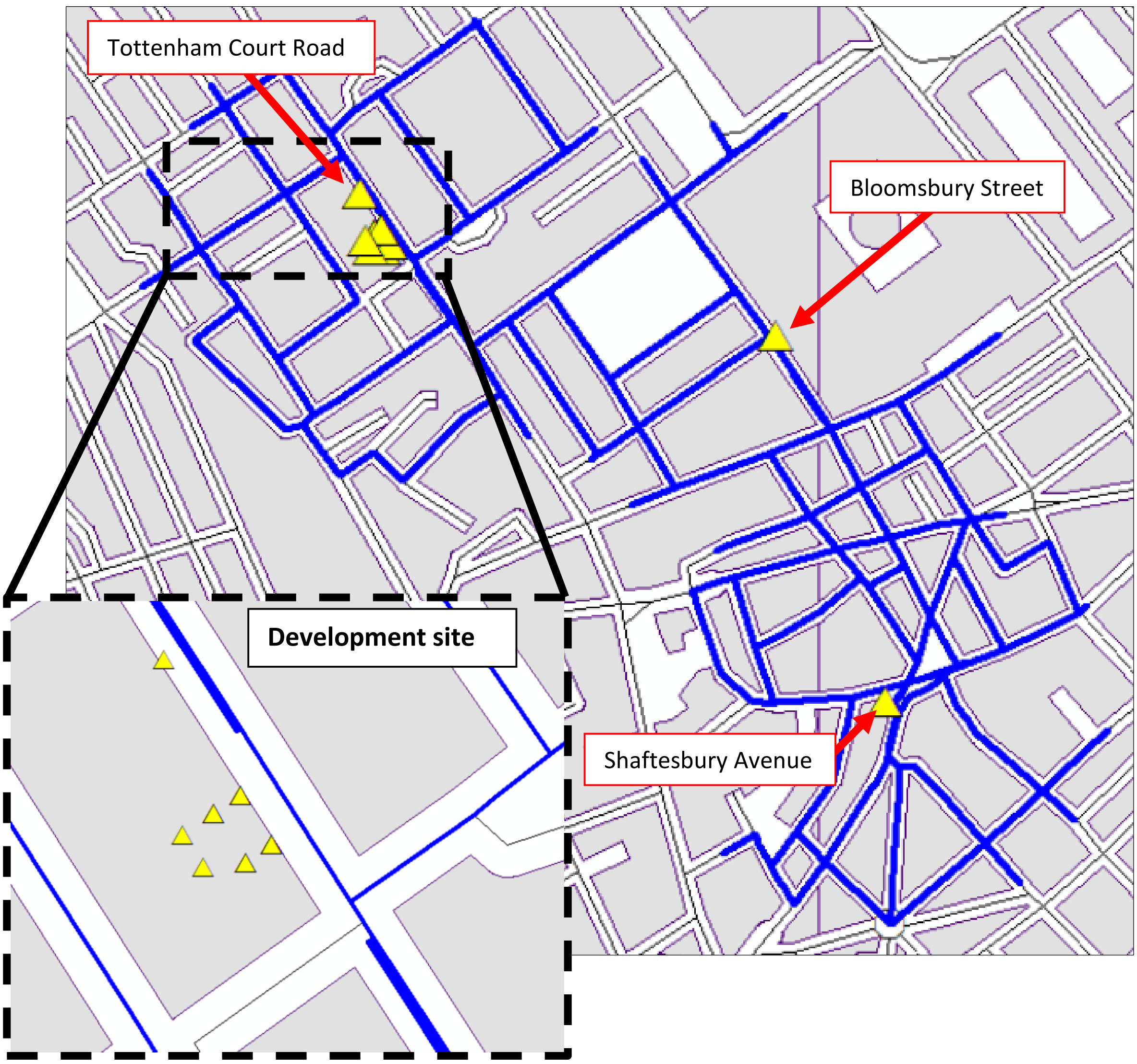


Figure 2: Road sources and receptors, the location of the development site is highlighted



ArcMap software has been used to model the road source locations (blue lines) that are within 200 metres of the receptor locations (yellow triangles). This data can then be automatically uploaded to ADMS-Roads. This generates an accurate representation of the surrounding area to be assessed in the model in terms of the length of roads and distances between sources and receptors. This is shown in Figure 2 above.

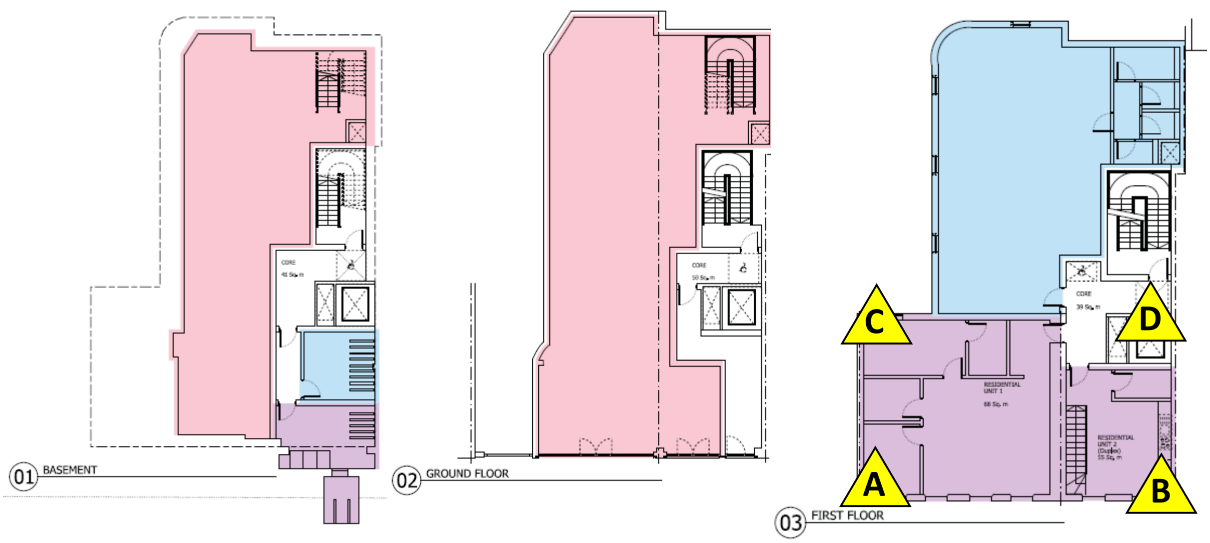
Sixteen sensitive receptor locations have been selected for the assessment:

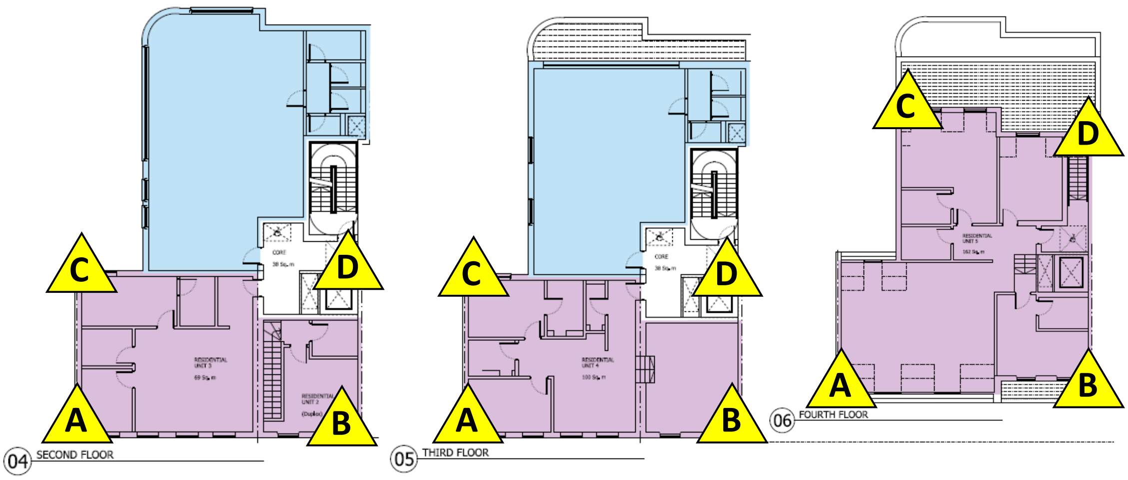
A. South-east corner the development, closest to Tottenham Court Road (1st, 2nd, 3rd and 4th floor level).
B. North-east corner the development, closest to Tottenham Court Road (1st, 2nd, 3rd and 4th floor level).
C. South-west corner the development, showing the drop off in pollutant concentration with distance from the road (1st, 2nd, 3rd and 4th floor level).
D. North-west corner the development, showing the drop off in pollutant concentration with distance from the road (1st, 2nd, 3rd and 4th floor level).

Air pollutant concentrations have only been modelled at the first to fourth floor level as the air quality objectives only apply to these locations due to the planned location of residential dwellings (Figure 3). Exposure has been assumed to be represented at the mid-point of each floor.

These sites have been chosen to reflect the extremities of the site and their proximity to road traffic sources. The architects plans (Figure 3) show the development site in more detail with receptor locations on each floor highlighted (yellow triangles).

Figure 3: The locations of the receptors used in the modelling at each floor, pink = retail, blue = office, purple = residential





2.4 Conversion of NO_x to NO_2

Recent evidence shows that the proportion of primary NO_2 in vehicle exhaust has increased[17]. This means that the relationship between NO_x and NO_2 at the roadside has changed from that currently used in the ADMS model. A NO_x to NO_2 calculator (Published in June 2014)[18] has therefore been developed and has been used in conjunction with the ADMS model to obtain a more accurate picture of NO_2 concentrations.

2.5 Model Verification

Model verification refers to checks that are carried out on model performance at a local level. This involves the comparison of predicted versus measured concentrations. Where there is a disparity, the first step is to check the input data and the model parameters in order to minimise the errors. If required, the second step will be to determine an appropriate adjustment factor that can be applied. In the case of NO_2, the model should be verified for NO_x as the initial step and should be carried out separately for the background contribution and the source (i.e. road traffic). Once the NO_x has been verified and adjusted as necessary, a final check should be made against the measured NO_2 concentration.

For this project, modelled annual mean road-NO_x estimates have been verified against the concentrations measured at the Shaftesbury Avenue automatic monitor and Tottenham Court Road and Bloomsbury Street diffusion tube sites (see Appendix A). These sites were chosen due to their close proximity to the development site, and are therefore considered to be representative of the air quality at the development site at ground floor level.

In addition, modelled annual mean PM_{10} estimates have been verified against the concentrations measured at the Shaftesbury Avenue automatic site (see Appendix A).

[17] http://uk-air.defra.gov.uk/assets/documents/reports/aqeg/primary-no-trends.pdf

[18] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOXNO2calc

3. Results

3.1 Results of the Dispersion Modelling

Table 4 below presents the worst-case scenario for development in 2019 and the baseline year (2014). To provide a worst case, background concentrations and vehicle fleet emission factors have been maintained at 2014 levels, and traffic growth predicted using the RFT calculator.

Table 4: Estimated worst-case pollutant concentrations in 2014 and 2019 (µg/m³)

		Annual mean NO_2 concentration (µg /m³)		Annual mean PM_{10} concentration (µg /m³)	
Floor level	Receptor	2014	2019	2014	2019
First	A	**56.5**	**56.8**	24.2	24.2
	B	**57.4**	**57.7**	24.3	24.4
	C	**55.3**	**55.6**	24.1	24.1
	D	**55.9**	**56.1**	24.2	24.2
Second	A	**53.0**	**53.1**	23.8	23.8
	B	**53.1**	**53.2**	23.8	23.9
	C	**52.8**	**52.9**	23.8	23.8
	D	**52.9**	**53.0**	23.8	23.8
Third	A	**50.8**	**50.9**	23.6	23.6
	B	**50.7**	**50.8**	23.6	23.6
	C	**50.8**	**50.9**	23.6	23.6
	D	**50.7**	**50.8**	23.6	23.6
Fourth	A	**49.5**	**49.6**	23.5	23.5
	B	**49.4**	**49.4**	23.5	23.5
	C	**49.5**	**49.5**	23.5	23.5
	D	**49.4**	**49.5**	23.5	23.5

Note: Exceedences of the objectives are highlighted

The model predicts annual mean NO_2 concentrations to be above the annual mean objective at all locations in both 2014 and 2019. The worst-case location is identified as the first floor receptor B, located closest to Tottenham Court Road and the busy Tottenham Court Road – Goodge Street junction, where roadside concentrations will be maximised. Air quality it shown to improve with distance from the road, and with height, however annual mean NO_2 concentrations remain above the annual mean objective, primarily due to the high background concentrations.

The annual mean NO_2 concentrations are reasonable when compared to the data collected at the Tottenham Court Road monitoring site. Concentrations are shown to be improved at the development site, this is assumed to be due to the development site being located further from the road (see Figure 2), and the increased elevation of the receptors at the development site. In addition, the Tottenham Court Road monitoring site is located closer to the busy Tottenham Court Road – Goodge Street junction (see Figure 2).

The Guidance states that authorities may assume exceedences of the mean hourly objective are only likely to occur where annual mean concentrations are 60$\mu g/m^3$ or above. Therefore, it is considered unlikely that this objective will be exceeded at any of the receptors.

The results indicate a slight worsening of air quality between 2014 and 2019. This is due to the assumed increase in traffic levels in the local area, and predicted improvements in background concentrations and vehicle fleet emission factors not being taken into account.

The model estimates no exceedence against either the annual or daily mean PM_{10} objectives.

3.2 Significance

Professional judgement is an important part of the assessment of significance. However, there are various documents available that attempt to qualitatively or quantitatively provide ways of assessing the significance of a development on air quality. The most commonly applied is Environmental Protection UK's Air Quality Guidance Document[19] which outlines how impacts may be assessed quantitatively. The assessment is made up of two steps – firstly to assess the magnitude of change in concentration (e.g. between with and without development) relative to the objective level, and secondly the percentage above / below the objective based upon the total modelled concentration at a given location or receptor. By combining these two values, you can obtain the impact descriptor. This method is presented in Table 5 below.

Table 5: Significance of change description

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% of more of AQAL	Moderate	Substantial	Substantial	Substantial

In this assessment no car parking will be provided and therefore there is no predicted change in pollution concentrations between the 'without' and 'with' development scenario.

[19] http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

3.3 Mitigation Measures

The development will not cause a significant worsening of air quality as no car parking will be provided and therefore there is no predicted increase in emissions as a result of the development. However, based on the ADMS results for estimated NO_2 concentrations, occupants at the development site will be exposed to concentrations above the NO_2 objective levels at all floor levels. It is recommended that mechanical ventilation is installed in order to improve air quality at lower floor levels. Inlets should be located furthest from Tottenham Court Road, at roof level, and air circulated to all residential dwellings on the first, second, third and fourth floors. It is worth noting the results presented are a conservative estimate; with expected improvements to the traffic fleet going forward, some improvements in pollutant concentrations are in fact likely. However recently the expected improvements have not met expectations and therefore no improvements are presented in this report.

The developer is encouraged to refer to the National House Builders Registration Council's (now NHBC) guidance for installing mechanical ventilation, found in Chapter 3.2 'Mechanical ventilation with heat recovery'[20]. Some best practice for installing and maintaining mechanical ventilation includes:

- Insulating ductwork and other components from the cold
- Ensuring the appropriate location of inlet and extract to allow for maintenance and change of filters
- Checking filters following construction as they may be blocked with construction dust

The London Borough of Camden on their air quality assessment website[1] encourages the consideration of the use of green infrastructure such as green walls, screens and trees to improve air quality. These are particularly aimed at reducing particulate matter concentrations[21], but at this location PM_{10} concentrations are predicted to be well below the objectives and it is the nitrogen dioxide concentrations that are of concern. Research is still being undertaken on their effectiveness in reducing this pollutant[22].

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[20] http://www.nhbc.co.uk/Builders/ProductsandServices/TechnicalStandards/

[21] http://www.tfl.gov.uk/corporate/projectsandschemes/21103.aspx

[22] http://www.hortweek.com/middlesex-university-embarks-green-wall-pollution-study/landscape/article/1311257

3.4 Mitigating the Impacts of the Construction Phase

Emissions and dust from the construction phase of a development can have a significant impact on local air quality. The Institute of Air Quality Management (IAQM) have produced a document titled 'Guidance on the assessment of dust from demolition and construction'[23] published in May 2015. This guidance contains a methodology for determining the significance of construction developments on local air quality using a simple four step process:

- STEP 1: Screen the requirement for a more detailed assessment
- STEP 2: Assess the risk of dust impacts
- STEP 3: Determine any required site-specific mitigation
- STEP 4: Define post mitigation effects and their significance

The risk of dust emissions from a demolition/ construction site causing loss of amenity and/ or ecological impacts is related to a number of factors, including: the activities being undertaken; the duration of these activities; the size of the site; the mitigation measures implemented and meteorological conditions. In addition, the proximity of receptors to the site and the sensitivity of these receptors to dust, impacts the level of risk from dust emissions. Receptors include both 'human receptors' and 'ecological receptors'. The former refers to a location where a person or property may experience adverse effects for airborne dust or dust soiling, or exposure to PM_{10}, over a time period relevant to the air quality objectives (see Table 1). Ecological receptors are defined as any sensitive habitat affected by dust soiling, through both direct and indirect effects. Following assessment of the impacts of dust as a result of the development, a qualitative risk impact level can be assigned, ranging from 'negligible' to 'high risk'. Based on the designated risk impact level the appropriate mitigation measures can be determined, applicable to all site and measures applicable specifically to demolition, earthworks, construction and trackout. Examples of the general measures include:

- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site
- 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
- Ensure all loads entering and leaving the site are covered
- Ensure an adequate water supply on the site for effective dust / particulate matter suppression / mitigation

The use of the outlined IAQM methodology for assessing the impacts of dust from demolition/ construction is considered to be current best practice. Therefore, it is recommended that the developer refers to the relevant IAQM documentation, to help reduce the impact of dust and vehicle exhaust emissions, and liaises with the Local Authority to come up with an acceptable dust management strategy.

In addition to the IAQM guidance referred to above, the Mayor of London is introducing new standards to reduce emissions of pollutants from construction and demolition activity and

[23] http://iaqm.co.uk/guidance/

associated equipment. In August 2014 the Mayor adopted the Control of Dust and Emissions from Construction and Demolition Supplementary Planning Guidance following extensive consultation. The SPG includes the world's first Non-Road Mobile Machinery Low Emission Zone (NRMM LEZ) combining standards to address both nitrogen oxide (NO_x) and particulate matter (PM) emissions[24].

From 1st September 2015, construction equipment used on the site of any major development within Greater London will be required to meet the EU Stage IIIA as a minimum; and construction equipment used on any site within the Central Activity Zone or Canary Wharf will be required to meet the EU Stage IIIB standard as a minimum. Some exemptions will be provided where pieces of equipment are not available at the emission standard stipulated or in the volumes required to meet demand in a construction environment as dynamic as London.

3.5 Air Quality Neutral Assessment

London Plan Policy 7.14 requires development proposals within Greater London to be at least 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as areas designated as AQMAs). A method for assessing this is outlined in the Sustainable Design and Construction Supplementary Planning Guidance (SPG) April 2014[25]. Building emissions benchmarks are outlined for NO_x and PM_{10} for all land use classes and are presented in Table 6 below. This development comes under land use classes A1 (Retail), A2, B1 (Financial/ professional services/business) and C3 (residential dwellings).

Table 6: Building Emission Benchmarks by Land Use Category

Land use class	NO_x (g/m^2)	PM_{10} (g/m^2)
A1 (Retail)	22.60	1.29
A3-A5 (Restaurants, drinking establishments, hot food takeaway)	75.20	4.32
A2, B1 (Financial/professional services/business)	30.80	1.77
B2-B7 (General industrial)	36.60	2.95
B8 (Storage and distribution)	23.60	1.90
C1 (Hotels)	70.90	4.07
C2 (Residential institutions)	68.50	5.97
C3 (Residential dwellings)	26.20	2.28
D1 (a) (Medical and health services)	43.00	2.74
D1 (b) (Crèche, day centres etc.)	75.00	4.30
D1 (c-h) (Schools, libraries, places of worship etc.)	31.00	1.78
D2 (a-d) (Cinemas, concert halls etc.)	90.30	5.18
D2 (e) (Swimming pools, gymnasium etc.)	284.00	16.30

New major developments[26] must meet these benchmarks, or implement mitigation measures to reduce emissions either on-site or off-site. Where this is not practical or desirable, some form of

[24] https://nrmm.london/

[25] https://www.london.gov.uk/sites/default/files/Revised%20SD%26C%20SPG_0.pdf

[26] As outlined in the London Plan (10 or more residential dwellings (or where the number is not given, an area of more than 0.5 ha; or for all other uses, where the floor space is 1,000 m^2 or more, or the site area is 1 ha or more).

pollutant offsetting could be applied. One route would be to enforce the necessary "air quality neutral" measures via a Section 106 agreement or via the Community Infrastructure Levy (CIL). The potential use for the CIL is, however, restricted, in that even though the CIL will be used to fund infrastructure from April 2014 (earlier for London Boroughs that have adopted it), the charges will be determined by floor space alone and be based on a set fee, and it would not be possible to distinguish between developments that meet the benchmarks and those that do not.

The guidance on application of Air Quality Neutral[27] has been followed in this assessment. Building Emission Benchmarks have been developed for the proposed building based upon:

- Gross Floor Area (m^2) of development
- On-site emissions of NO_x and PM_{10} associated with building use (kg/annum) calculated from energy use (kWh/annum) and a default emission factor (kg/kWh)

Table 8 presents the input data used for the building emissions benchmark calculation. Figures on gross internal area (GIA) were provided by the architect. Annual energy use has been estimated based upon CIBSE TM46:2008 energy benchmarks[28].

Table 8: Building Emissions Benchmark Input Data

Land use class	Boiler fuel	GIA (m^2)	Energy Use (kWh/ annum)	NO_x EF (kg/kWh)
A1 (Retail)	Gas	312	0	0.00004
A2, B1 (Financial/ professional services/business)	Gas	474	85,320	0.00004
C3 (Residential dwellings)	Gas	662	417,060	0.00004

It has been possible to estimate annual building NO_x emissions from the input data gathered and compare this total against the relevant Building Emissions Benchmarks (Table 9). The results indicate that the **proposed development site meets the air quality neutral requirements for buildings.**

Table 9: Comparison of development building emissions to NO_x and PM_{10} Building Emissions Benchmark

Pollutant	Land use class	BEB (g/yr)	Development (g/yr)	+/- (kg/yr)
NO_x	A1 (Retail)	7,051.2	0	-7.1
NO_x	A2, B1 (Financial/ professional services/business)	14,599.2	3,413	-11.2
NO_x	C3 (Residential dwellings)	17,344.4	16,682	-0.7
				-18.9

[27] http://www.london.gov.uk/sites/default/files/GLA%20AQ%20Neutral%20Policy%20Final%20Report%20April%202014%20J1605.pdf

[28] CIBSE TM46:2008 Table 1 Benchmark categories and values – values for "long term residential" and "general office" applied

There is no car parking associated with the development, therefore no assessment of the transport emissions associated with the development has been completed. **The proposed development meets the air quality neutral requirements for transport and no further action is required.**

4. Summary and Conclusions

An air quality assessment has been undertaken for a proposed mixed use retail, office and residential development at 51 – 52 Tottenham Court Road, London. The London Borough of Camden declared the whole borough as an AQMA in 2002 due to exceedences of NO_2 and PM_{10} objectives. The proposed development therefore lies within an AQMA.

An air quality assessment has been carried out using the ADMS-Roads dispersion model to determine the impact of emissions from road traffic on sensitive receptors. No car parking or on-site energy generation is associated with the development. The assessment is therefore primarily concerned with the potential exposure of residents in the new development to elevated concentrations of NO_2 and PM_{10}, the primary pollutants associated with road traffic, rather than the impact of the development per se.

Predicted concentrations have been compared with the air quality objectives. The results of the assessment indicate that annual mean NO_2 concentrations are above the objective in the worst case scenario at all receptor locations. Concentrations of PM_{10} are predicted to be below annual mean objective in 2019. Based on the evidence it is considered unlikely that there will be exceedences of either short term objective for NO_2 or PM_{10}. With expected improvements to the traffic fleet, improvements in pollutant concentrations are predicted. It is recommended however that mechanical ventilation is installed, with inlets located at the rear of the building at roof level, and air circulated to all residential dwellings. However, based on the modelled exceedences of annual mean NO_2 concentrations at fourth floor level receptors, it is not considered that mechanical ventilation will result in a significant reduction in pollutant concentrations below the objective level.

In addition, the developer is encourage to refer to the IAQM's 'Guidance on the assessment of dust from demolition and construction' in order to minimise the impact of the construction and demolition phases on local air quality.

The proposed development has been assessed, and found to be compliant with London's 'air quality neutral' guidance for buildings. No assessment was completed for transport, as no car parking is associated with the development.

Appendix A – Model Verification

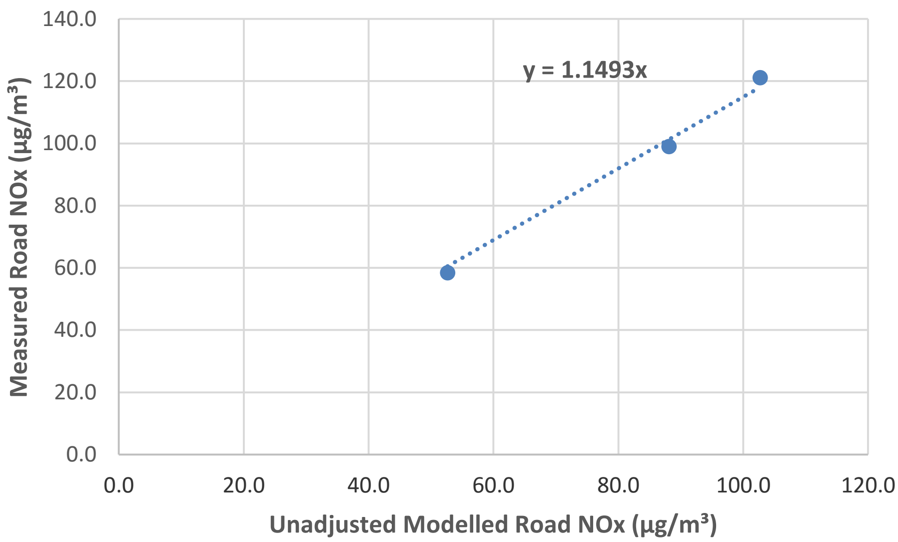
In order to verify modelled pollutant concentrations generated in the assessment, the model has been run to predict the annual mean road-NO_x concentration during 2014 at the Shaftesbury Avenue automatic monitor site and Tottenham Court Road and Bloomsbury Street diffusion tube sites described in Table 2.

The model output of road-NO_x has been compared with the 'measured' road-NO_x. Measured road-NO_x for the monitoring sites was calculated using the NO_x to NO_2 calculator[18].

A primary adjustment factor was determined to convert between the 'measured' road contribution and the model derived road contribution (Figure A.1). This factor was then applied to the modelled road-NO_x concentration for each receptor to provide adjusted modelled road-NO_x concentrations. Total NO_2 concentrations were then determined by combining the adjusted modelled road-NO_x concentrations with the 2014 background NO_2 concentration.

The results imply that the model was slightly under-predicting the road-NO_x contribution. This is a common experience with ADMS and most other models.

Figure A.1: Comparison of Measured road-NO_X to unadjusted modelled road-NO_X concentrations



In addition, the measured total PM_{10} at the Shaftesbury Avenue automatic monitoring site has been compared to the unadjusted measured total PM_{10}. A primary adjustment factor was determined to convert between the 'measured' and model derived PM_{10} concentration. The results imply the model was slightly over-estimating the total PM_{10} concentration (Table A.1). A conversion factor of 0.9286 was applied to all of the modelled PM_{10} concentrations.

Table A.1: Comparison of Measured PM_{10} to unadjusted modelled PM_{10} at the Shaftesbury Avenue automatic monitoring site

Unadjusted Modelled Total PM_{10}	Measured Total PM_{10}
26.9	25

Appendix B – Traffic Data

Table B.1: Traffic data for 2014 (and prediction for 2019)

Development / verification site	Road links	Annual Average Daily Traffic (AADT)	% Heavy Duty Vehicles (HDV)	Speed (kph)
Development site	Tottenham Court Road (A400)	13,835 (14,926)	11.5	14.1
	Goodge Street (A5204)	6,185 (6,673)	3.7	14.1
	Minor roads	2,200 (2,374)	2.6	14.1
Verification sites	Bloomsbury Street (A400)	12,293	15.4	14.1
	New Oxford Street (A40)	12,213	36.0	14.1
	Shaftesbury Avenue (A401)	20,616	4.6	14.1
	St Giles High Street (A40)	8,321	3.6	14.1

Aether

Oxford Centre for Innovation
New Road
Oxford
OX1 1BY

01865261466
www.aether-uk.com