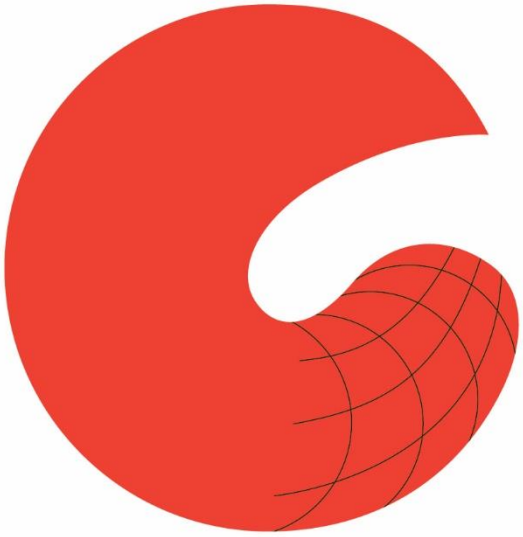
Panther House and 156-164 Grays Inn Road

Panther House Developments Limited

Air Quality Assessment

August 2019



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P15-908 - 156-164 GRAYS INN ROAD & PANTHER HOUSE

Air Quality Assessment

P15-908 - 156-164 GRAY'S INN ROAD & PANTHER HOUSE
Air Quality Assessment

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Contents

REGISTRATION OF AMENDMENTS

Revision	Amendment Details	Revision Prepared By	Revision Approved By

1.0 INTRODUCTION

1.1 An air quality assessment has been produced by Create Consulting Engineers Ltd for the proposed mixed-use development at 156-164 Gray's Inn Road and Panther House located in London Borough of Camden (LBC).[1]

1.2 The site is located within the administrative boundary of the London Borough of Camden, between Gray's Inn Road and Mount Pleasant. The proposed site plan is illustrated in Figure 1.1.

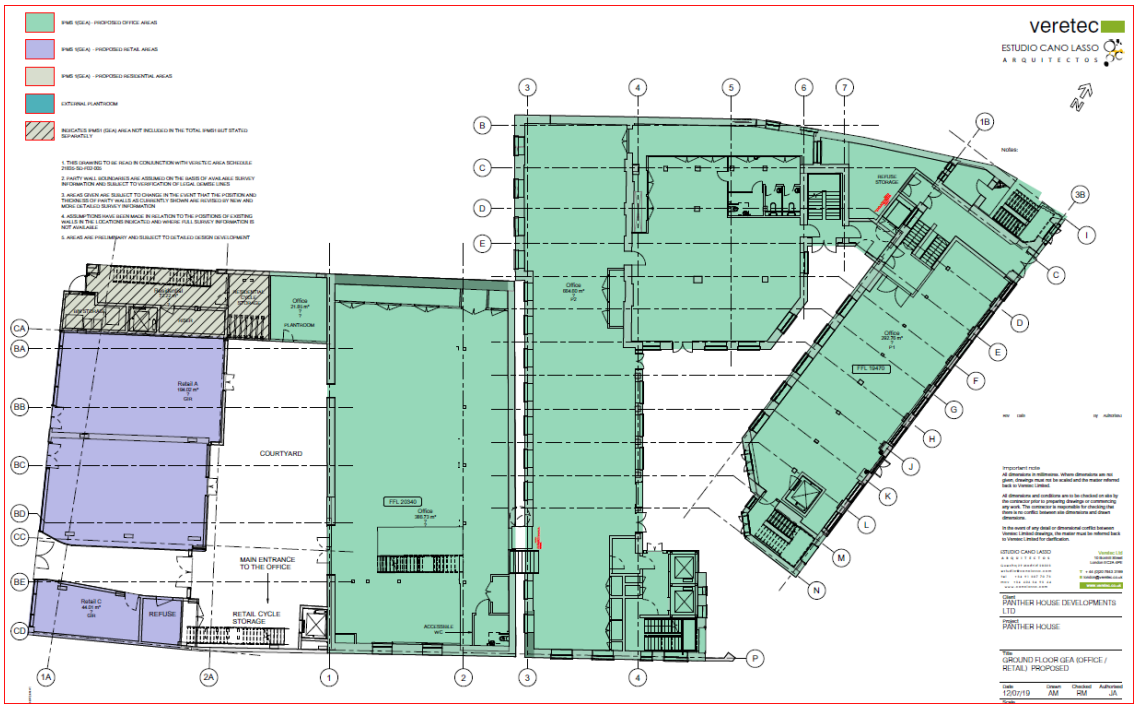


Figure 1.1, Proposed Site Plan

1.3 This assessment was undertaken following comments provided by the relevant air quality officers at LBC in particular by considering the following:

- *Air quality neutral assessment to demonstrate that traffic and building emissions, associated with the development, are within the relevant benchmarks detailed in the GLA Sustainable Design and Construction Supplementary Planning Guidance[2];*

and

- *The impacts of traffic emissions on future occupants of the residential properties fronting Gray's Inn Road.*

[1] Create Consulting Engineers, 2015. P15-908 - 156-164 GRAY'S INN ROAD & PANTHER HOUSE. Air Quality Assessment. November 2015.

[2] Greater London Authority (2014). Sustainable Design and Construction SPG.

2.0 AIR QUALITY NEUTRAL ASSESSMENT

2.1 The 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 SPG April 2014[2].

2.2 The Guidance sets out Building Emissions Benchmarks (BEB) and Transport Emissions Benchmarks (TEB) based upon the Gross Floor Area (GFA m^2) and on-site emissions of NOx and PM_{10}. Developments that do not exceed these benchmarks will be considered to avoid any increase in NOx and PM_{10} emissions. BEB and TEB for NOx and PM_{10} for all land use classes are presented in Table 2.1 and Table 2.2.

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

Table 2.1: Building Emissions Benchmarks Emissions for Different Land Use Classes

*****_Source: Air Quality Neutral Planning Support Update: GLA 80371, April 2014_

Land Use Class	Central Activity Zone (CAZ)	Inner	Outer
NOx (g/m^2/annum)			
Retail (A1)	169	219	249
Office (B1)	1.27	11.4	68.5
NOx (g/dwelling/annum)			
Residential (C3)	234	558	1553
PM_{10} (g/m2/annum)			
Retail (A1)	29.3	39.3	42.9
Office (B1)	0.22	2.05	11.8
PM_{10} (g/dwelling/annum)			
Residential (C3)	40.7	100	267

Table 2.2: Transport Emissions Benchmarks Emissions for Different Land Use Classes

*****_Source: Air Quality Neutral Planning Support Update: GLA 80371, April 2014_

Building Emissions

2.3 The proposed development is wholly based on air source heat pumps. There are no gas systems, or systems with combustion processes being proposed. Therefore, development will not include any NOx or PM_{10} emissions. Building emissions related to the Retail land use will depend on future occupiers and therefore they have not been considered in this assessment.

Transport Emissions

2.4 The assessment considers NOx and PM_{10} emissions from delivery vehicles associated with the retail and office uses of the developments. The residential use will not generate any traffic movements and therefore has not been considered in this assessment.

2.5 Transport emission were calculated using the Emission Factor Toolkit v7[3]. Results are presented in Table 2.3 and calculations of Transport Emissions Benchmarks (TEB) are presented in Table 2.4. Results indicate that NOx and PM_{10} emissions are within the relevant benchmarks and therefore no mitigation is required, and the proposed development is air quality neutral

Land Use	Daily Vehicle Trips	Average Distance (km)*	Pollutant	Vehicle Emissions (kg/annum)
Retail	30	9.3	NOx	57.5
			PM_{10}	4.6
Office	15	3	NOx	9.3
			PM_{10}	0.7
		Total Transport Emissions (kg/annum)	NOx	**66.8**
			PM_{10}	**5.3**

Table 2.3: Calculations of transport emissions

*Based on the London Travel Survey Demand (LTSD) destination. These are based on a straight line between the origin and destination of a trip not the actual distance travelled.

[3] http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

Land Use	Pollutant	Emission Factor	GIA (m^2)	TEB (kg/annum)
Retail (g/m^2/annum)	NOx	169	1,014	171.4
	PM_{10}	29.3		29.7
Office (g/ m^2/annum)	NOx	1.27	7046	8.9
	PM_{10}	0.22		1.6
		Emission Factor	**Number of dwellings**	**TEB (kg/annum)**
Residential (g/dwelling/annum)	NOx	234	15	3.5
	PM_{10}	40.7		0.6
			Total NOx TEB (kg/annum)	**183.8**
			Total PM10 TEB (kg/annum)	**31.9**

Table 2.4: Calculations of the total Transport Emissions Benchmark (TEB)

3.0 TRAFFIC EMISSIONS MODELLING METHODOLOGY

3.1 Air pollutant concentrations were predicted at the residential building façade fronting Gray's Inn Road using the dispersion model ADMS-Roads. This model is a new generation dispersion modelling system produced by Cambridge Environmental Research Consultants which can be used to assess the impact of road vehicles on local air quality. The model is widely used by Local Authorities in the UK as part of their review and assessment obligations.

3.2 This assessment considers traffic-related pollutant concentrations (NO_2 and PM_{10}) at the development building façade. Receptor points were selected at each floor of the proposed residential building.

Traffic emissions

3.3 Traffic data used in the assessment were obtained from the Department for Transport (DfT) website[4]. It consisted of Average Annual Daily Traffic (AADT) for Light Duty Vehicles (LDV) and Heavy-Duty Vehicles (HDV) for the year 2015. Traffic data used in the assessment are presented in Table 3.1 and illustrated in Figure 3.1 with a detailed site plan of the proposed site in Figure 3.2.

Road	Count Point	AADT		
		LDV	HDV	%
Gray's End Road	17688	11515	923	8.02
Noseberry Avenue	38592	5290	1579	29.85
Theobald Road	37827	16310	3118	19.12
Clerkenwell Road	7717	14647	1229	8.39
Gray' s End Road	47785	10627	1320	12.42

Table 3.1 Traffic data used in the traffic emissions modelling

3.4 Traffic flows were input into the model as link flows and emissions were calculated using the latest UK emission factor dataset which is built-in ADMS-Roads model. Emission factors for the year 2015 were used in this assessment.

3.5 In order to account for the slowing traffic movement at the junction, and subsequently elevated vehicle emissions, it was assumed the vehicles approach the junction at a speed of 15 to 10 miles per hour (mph). Also, it was assumed that the speed at the junction is 5mph.

[4] http://www.dft.gov.uk/traffic-counts/cp.php

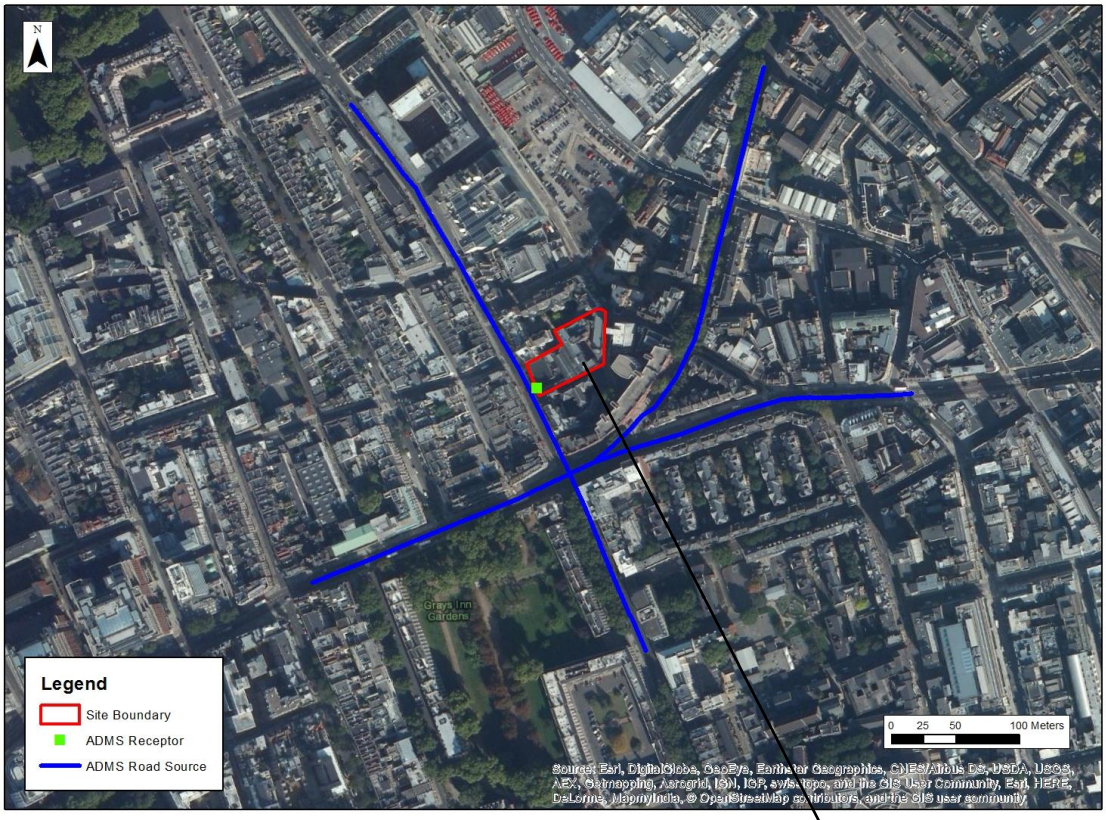


Figure 3.1: Road network and receptor point modelled

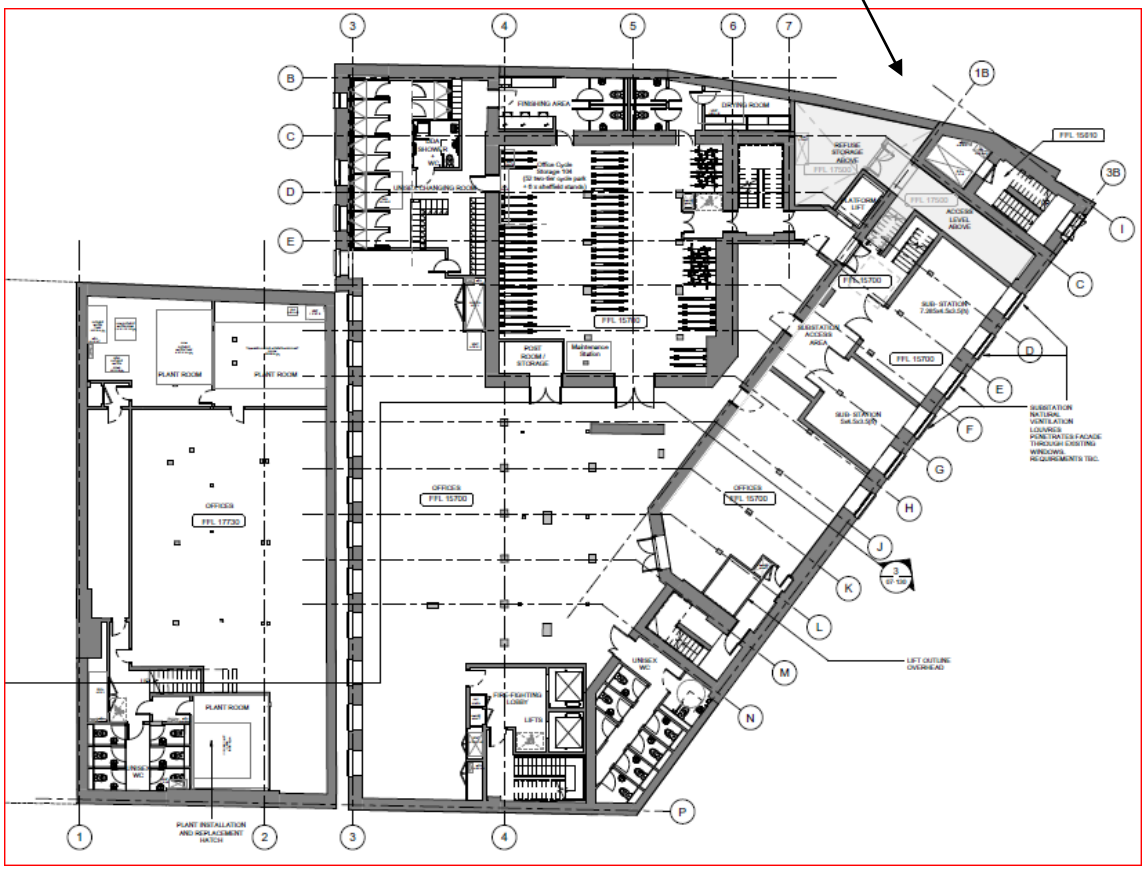
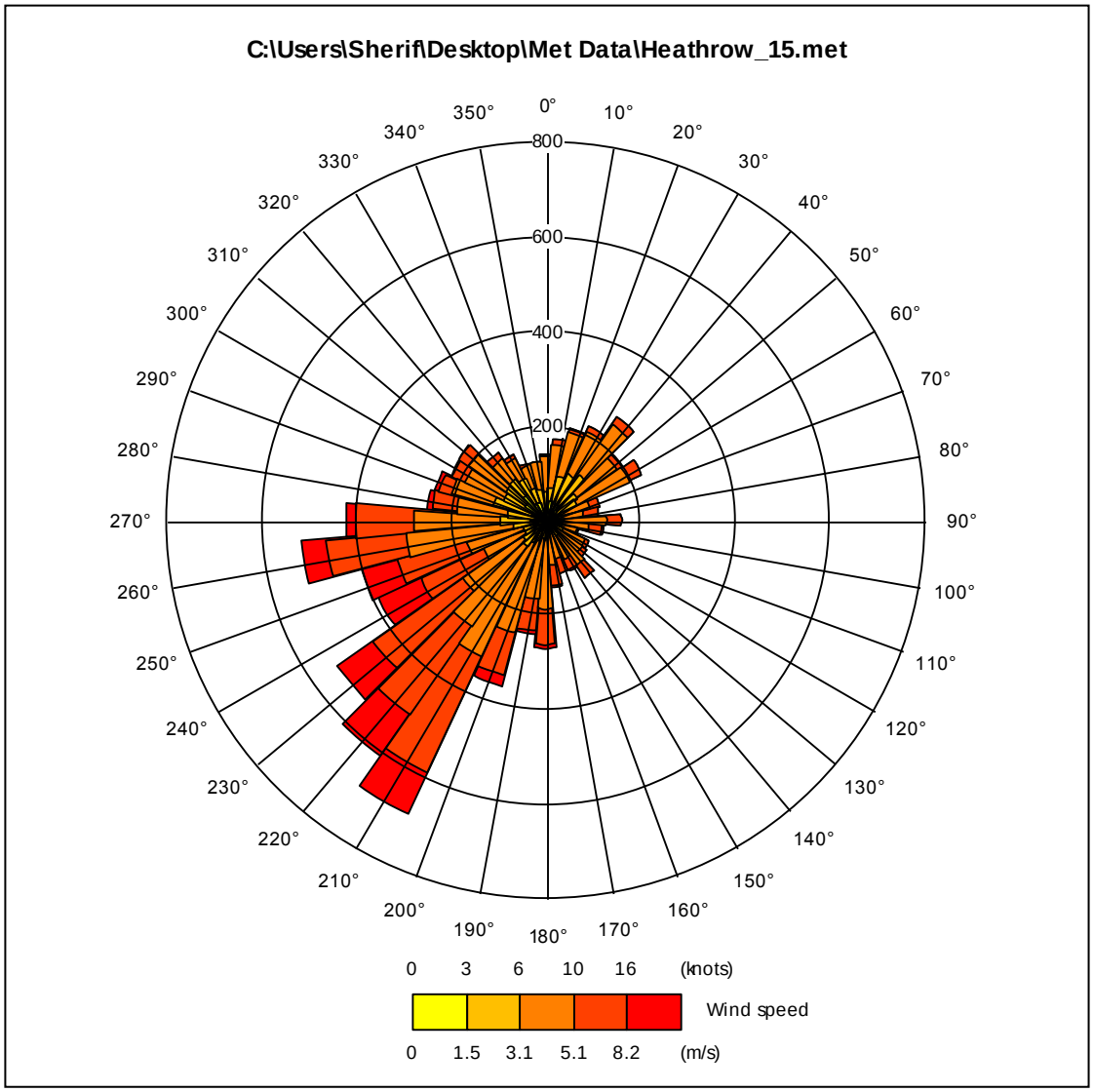


Figure 3.2: Detailed Site Plan

3.6 Street canyon effect has also been taken into account where the road width is less that the building heights on both sides. Canyon height of 21m was used at the road link facing the receptor point.

Meteorological data

3.7 Meteorological data from Heathrow Airport were used in the dispersion modelling. The data provide information on hourly wind speed and direction and the extent of cloud cover for 2015. For the purpose of model verification (see section-4) 2014 meteorological data from the same meteorological station were used. Wind rose of meteorological data at this station is shown in Figure 3.2. The prevalent wind direction is south-westerly.



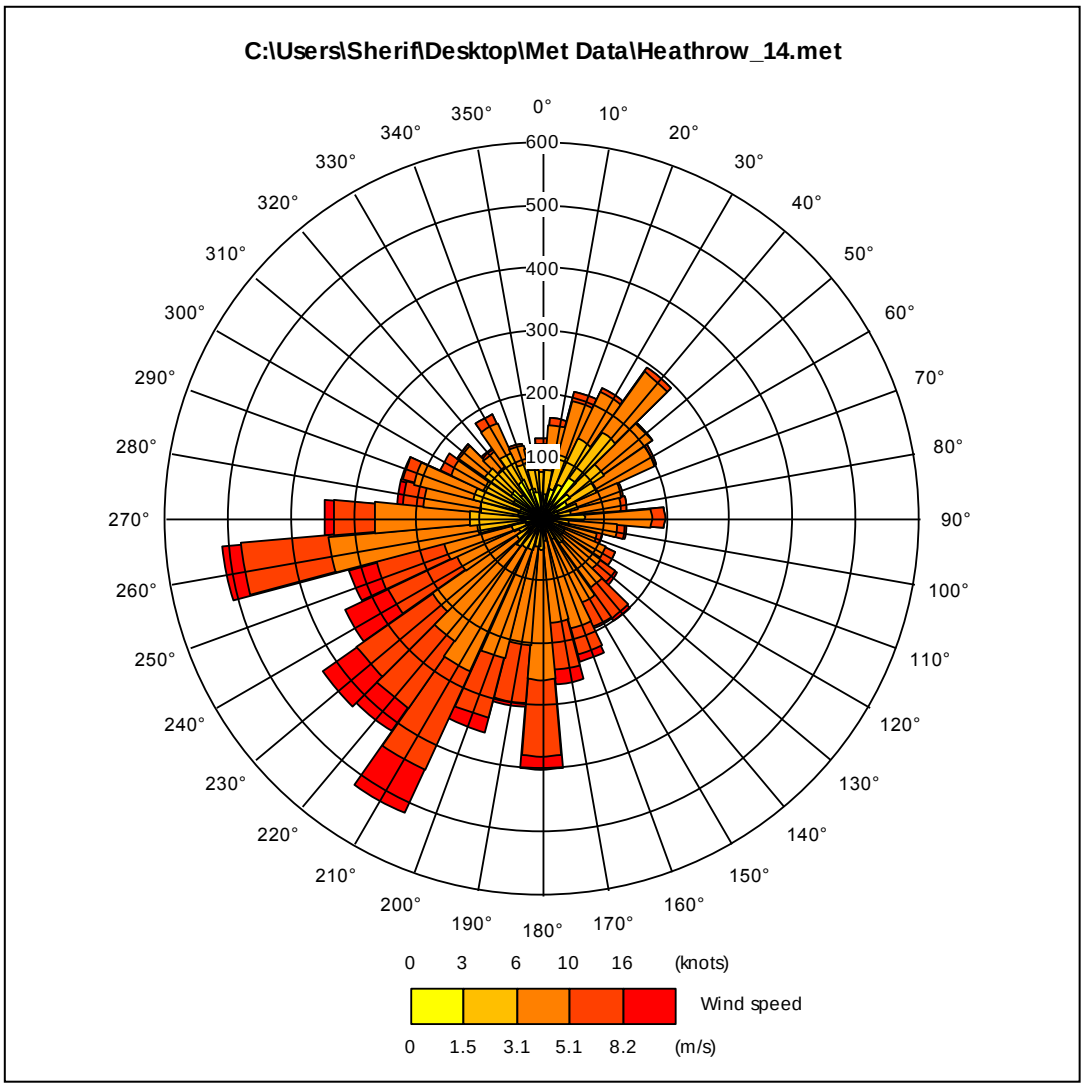


Figure 3.2: Wind rose of 2015 and 2014 meteorological data from Heathrow airport station

Surface roughness

3.8 One of the modelling parameters is the surface roughness which represents the extent of mechanical turbulence in the atmosphere caused by the roughness of the ground over which the air is passing. A surface roughness value of 1.5m was used at the study area which represents large urban areas and a value of 0.5m was used at the meteorological measurement site representing parkland and open suburbia.

Model output

3.9 The model was used to predict NOx and PM_{10} road contribution concentrations at the receptor points. These values were then added to relevant ambient background concentrations to enable the comparison with air quality objectives. NOx, NO_2 and PM_{10}

background concentrations for the year 2015 and 2019 were obtained from the air pollution background concentrations maps[5] for the year 2015 and 2020 (Table 3.2).

Grid Square	Years	Annual Mean Concentrations (µg/m^3)		
X-Y Axis		NOx	NO_2	PM_{10}
(Site) 530500, 182500	2015	85.83	47.04	21.48
(Site) 530500, 182500	2017	85.64	43.68	19.92
(Site) 530500, 182500	2018	77.07	40.72	19.55
(Site) 530500, 182500	2019	63.04	35.59	18.93

Table 3.2: 2015- 2019 Pollutant Background Concentrations at the development site

3.10 Background concentrations were then added to the predicted road increment to give the total pollutant concentrations at receptor points. The NOx to NO_2 conversion spreadsheet, available from the Defra LAQM website[6], has been used to calculate NO_2 concentrations from established NOx.

3.11 This assessment concentrates on the modelling of annual mean concentrations as it is inherently more difficult to make satisfactory predictions for short-term behavior of pollutants than it is to model an annual mean value.

[5] https://uk-air.defra.gov.uk/data/laqm-background-home
[6] http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html

4.0 MODEL VERIFICATION

4.1 In order to verify the accuracy of the modelled results, modelling has also been completed at Euston Road automatic monitoring site.

4.2 Traffic data were obtained from the DfT website[4] in relation to all the roads within 200m from the monitoring station. Traffic data used in the assessment are presented in Table 4.1 and illustrated in Figure 4.2.

4.3 Street canyon effect has also been taken into account where the road width is less that the building heights on both sides. Canyon height of 26m was used at the road link facing the Euston Road monitoring station.

4.4 Nearby roadside monitoring locations were disregarded due to lack of traffic data for those sites.

Road	Count Point	AADT		
		LDV	HDV	HDV%
Evershot Street	56990	10851	1268	11.69
Euston Road	56815	48740	5553	11.39
Euston Road	17169	36901	4390	11.90
Upper Woburn Place	7671	11889	2502	21.04

Table 4.1 Traffic data used in the model verification

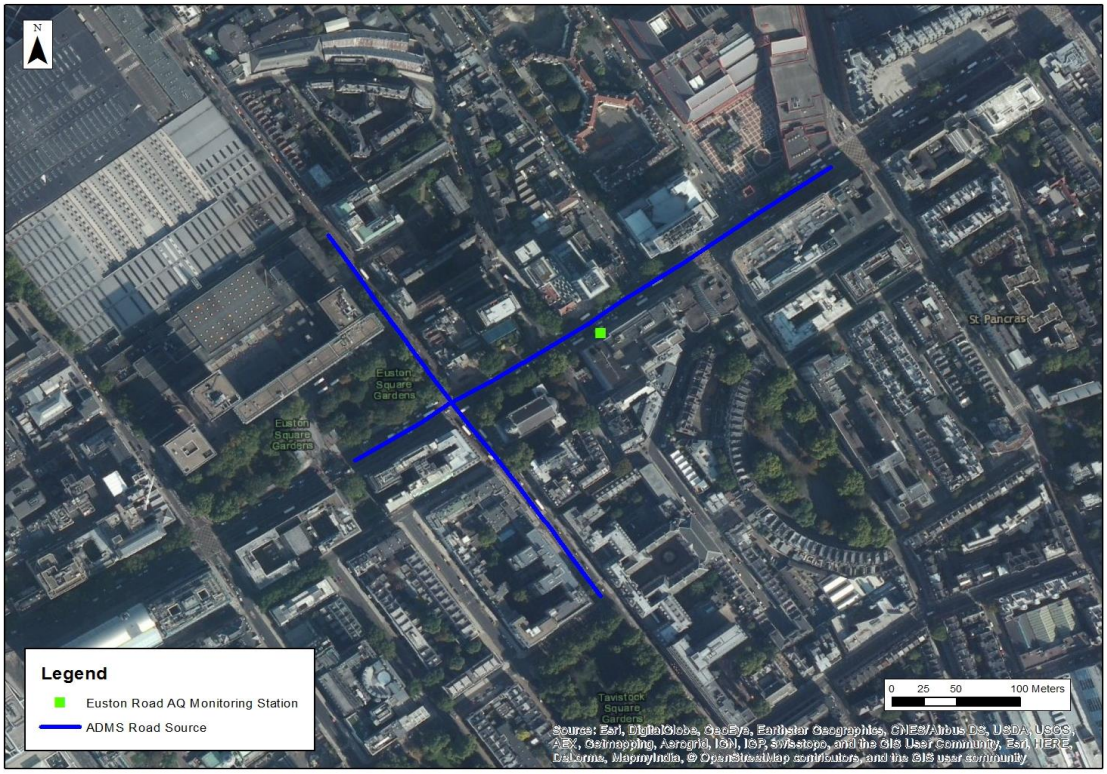


Figure 4.1: Location of Automatic Monitoring Station (CD-9) and the modelled road network.

4.5 Background pollutant concentrations were obtained from the background maps for the year 2014 (see Table 4.2)

Grids	2014 Annual Mean Concentrations µg/m^3)		
X-Y axis	NOx	NO_2	PM_{10}
529500, 182500	87.6	47.8	22.9

Table 4.2: 2014 Pollutant background concentrations

4.6 Pollutant concentration data for the year 2014 were obtained from LBC's air quality review and assessment report[7]. Data from Euston Road are presented in Table 4.3 below. These data indicate that existing NO_2 concentrations are breaching the national annual mean objective of 40µg/m^3, whilst the PM_{10} concentrations are below the relevant annual mean objective of of 40µg/m^3.

ID and Monitoring Station Name	2014 Annual Mean Concentrations µg/m^3	
	NO_2	PM_{10}
CD9 – Euston Road	**98**	29

Table 4.3: 2014 Roadside Pollutant concentration

4.7 Results of model verification indicated that the model was under predicting the total NO_2 and PM_{10} concentrations at Euston Road station by 12% and 2% respectively. However, this difference is considered small being under the threshold of 25% as devised in TG16 and therefore model adjustment is not required.

Pollutant	Modelled annual mean roadside contribution concentrations µg/m^3	Modelled annual mean concentrations µg/m^3	% difference*
NO_2	38.2	86.0	-12%
PM_{10}	5.5	28.4	-2%

Table 4.4: Model verification and adjustment results

**(modelled-monitored)/monitored*

[7] London Borough of Camden (2015). 2015 Updating and Screening Assessment for London Borough of Camden.

5.0 ASSESSMENT RESULTS

5.1 Predicted pollutant NO_2 and PM_{10} concentrations at assessment receptors are presented in Table 5.1 and Table 5.2. The results indicate that annual mean NO_2 concentrations exceed the national objective of 40µg/m^3 at all receptors.

5.2 Annual mean NO_2 concentrations at receptors 1, 2 and 3 are above 60µg/m^3. It is therefore assumed that the NO_2 short term hourly objective (200µg/m^3 not to be exceeded more than 18 time per year) is breached at those receptor points, as per Defra LAQM.TG [16] guidance.

Receptor	OS Grid Ref. X(m)	OS Grid Ref. Y(m)	Receptor Height (m)	Annual mean NOx roadside contribution (ug/m^3)	Total annual mean NO2 (ug/m^3)
1	530967.2	182042.6	2 (Ground Floor)	41.5	60.8
2	530967.2	182042.6	5.3 (First Floor)	40.6	60.5
3	530967.2	182042.6	8.6 (Second Floor)	39.3	60.0
4	530967.2	182042.6	11.9 (Third Floor)	38.1	59.6
5	530967.2	182042.6	15.2 (Forth Floor)	37.1	59.2
6	530967.2	182042.6	18.5 (Fifth Floor)	36.3	58.9
7	530967.2	182042.6	21.8 (Sixth Floor)	31.4	44.6

Table 5.1 Predicted annual mean NO_2 concentrations at modelled receptors

5.3 PM_{10} concentrations are predicted to be well below the national air quality objective of 40 µg/m^3 at all receptors.

5.4 With regards to short-term PM_{10}, dispersion models are inherently less accurate at predicting the number of exceedances of the 24-hour mean objective for PM_{10} than the annual mean objective. Accordingly, the relationship between annual mean and the number of 24-hour mean exceedances of 50µg/m^3, devised by Defra LAQM.TG [16] guidance, has been used for assessment of the short-term PM_{10} objective[8]. The maximum number of days exceeding the objective concentration is 23 days which is predicted at Receptor 3. This is within the allowable 35 exceedances which are permitted in the objective.

[8] No. 24-hour mean exceedences = -18.5 + 0.00145 x annual mean^3 + (206/annual mean)

Receptor	OS Grid Ref. X(m)	OS Grid Ref. Y(m)	Receptor Height (m)	Annual mean PM_{10} roadside contribution (ug/m^3)	Total annual mean PM_{10} (ug/m^3)	Number of 24-hr mean PM_{10} exceedances
1	530967.2	182042.6	2 (Ground Floor)	2.0	24.3	11
2	530967.2	182042.6	5.3 (First Floor)	1.9	24.3	11
3	530967.2	182042.6	8.6 (Second Floor)	1.9	24.2	11
4	530967.2	182042.6	11.9 (Third Floor)	1.8	24.2	11
5	530967.2	182042.6	15.2 (Forth Floor)	1.8	24.1	11
6	530967.2	182042.6	18.5 (Fifth Floor)	1.7	24.1	11
7	530967.2	182042.6	21.8 (Sixth Floor)	0.1	22.4	8

Table 5.2 Predicted annual mean PM_{10} concentrations at modelled receptors

NOx to NO2 trends

5.5 All combustion processes produce oxides of nitrogen (NOx). In London, road transport and heating systems are the main sources of these emissions. NOx is primarily made up of two pollutants - nitric oxide (NO) and nitrogen dioxide (NO_2)[9].

5.6 Urban background and roadside nitrogen dioxide (NO_2) pollution has shown long-term improvement. In 2018 the lowest average annual mean concentrations since the start of the time series for both roadside and urban background monitoring sites were recorded.[10]

5.7 There were on average fewer hours of moderate or higher levels of nitrogen dioxide pollution in 2018 compared with 2017 at roadside sites. This continues a trend for reduction in short-term moderate or high NO2 pollution since 2007, mainly due to reductions in this measure at monitoring sites in London.

5.8 This down trend can be observed from Table 3.2 for NOx and NO_2 concentrations. It should be noted that lower floors are proposed for retail services but not in sensitive use so based on this, proposal will not breach AQOs it is not predicted that concentrations will exceed the 1-hour mean AQO for NO_2 across the development site in the 2020 opening year scenarios also it is predicted that air quality will be improved in London.

[9] https://www.london.gov.uk/sites/default/files/air_quality_for_public_health_professionals_-_city_of_london.pdf
[10] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/796887/Air_Quality_Statistics_in_the_UK_1987_to_2018.pdf

6.0 FUTURE EXPOSURE

6.1 The results of the dispersion modelling assessment will be compared against the Air Pollution Exposure Criteria (APEC) contained within the London Councils Air Quality and Planning Guidance from the London Air Pollution Planning and the Local Environment (APPLE) working group. These are outlined in Table 6.1.

Category	Applicable Range	Recommendation
APEC - A	Below 5% of the annual mean AQO	No air quality grounds for refusal; however, mitigation of any emissions should be considered
APEC - B	Between 5% below or above the annual mean AQO	May not be sufficient air quality grounds for refusal, however appropriate mitigation must be considered e.g. maximise distance from pollutant source, proven ventilation systems, parking considerations, winter gardens, internal layout considered and internal pollutant emissions minimised
APEC - C	Above 5% of the annual mean AQO	Refusal on air quality grounds should be anticipated, unless the LA has a specific policy enabling such land use and ensure best endeavours to reduce exposure are incorporated. Worker exposure in commercial/industrial land uses should be considered further. Mitigation measures must be presented with air quality assessment, detailing anticipated outcomes of mitigation measures.

Table 6.1 Air Pollution Exposure Criteria

6.2 It should be noted that a significant area of London would fall under APEC - C due to high NO_2 concentrations throughout the city. As such, a presumption against planning consent in these locations may result in large areas of land becoming undevelopable and prevent urban regeneration. The inclusion of suitable mitigation measures to protect future users is therefore considered a suitable way to progress sustainable schemes in these locations and has been considered within this assessment.

7.0 MITIGATION MEASURES

7.1 The assessment indicates that long term and short term NO_2 objectives are predicted to be breached at the building façade fronting Gray's Inn Road. However, the design of the mechanical ventilation system is expected to mitigate the impact of existing poor air quality on future occupants. Ventilation supply intakes will be located away from Gray's Inn Road. All intakes will be located at the central courtyard to the rear of the 156-164 Gray's Inn Road Building. This will minimize ingress of air pollutants into the building and subsequent exposure of residents to air pollution.

7.2 Also, all the ventilation intakes for the 156-164 Gray's Inn Road Building will be fitted with NO_2 and NOx chemical scrubbing systems[11]. This system will provide an effective mean of reducing high NO_2 levels down to the levels within the national annual mean objective of 40ug/m^3.

7.3 The residents and occupants of the proposed development should be made aware of the air pollution monitoring services available in London, the free services providing text messages and information relating to air quality as shown in Table 6.1 below.

Name of Service	Website	Service Provided
airText	www.airtext.info	Free text message service providing air quality alerts for Greater London.
London Air	www.londonair.org.uk	Free downloadable air quality app providing real time air quality index across London, in addition LAQM data for London Boroughs is available.

Table 6.1: London Air Quality Services

[11] AAC Swiftpack with Nitrosorb media for - NO2 and NOx Removal

8.0 CONCLUSIONS

8.1 An air quality assessment has been produced by Create Consulting Engineers Ltd for the mixed-use development at 156-164 Gray's Inn Road and Panther House located in London Borough of Camden (LBC).

8.2 This assessment was undertaken following comments provided by the relevant air quality officers at LBC and in particular by considering the following:

- *Air quality neutral assessment to demonstrate that traffic and building emissions, associated with the development, are within the relevant benchmarks detailed in the GLA Sustainable Design and Construction Supplementary Planning Guidance[12];*

and

- *The impacts of traffic emissions on future occupants of the residential properties fronting Gray's Inn Road.*

8.3 The operational phase of this assessment demonstrates that transport air emissions generated by the proposed development are below the relevant GLA benchmarks. Accordingly, this development is considered air quality neutral and no mitigation measures are required in that respect.

8.4 Modelling of traffic emissions and background concentrations indicate that NO_2 concentrations at 156-164 Gray's Inn Road building façade are breaching the relevant national air quality objectives. However, concentrations of PM_{10} are within the relevant national objectives.

8.5 The overall significance of potential impacts for APEC fell under category APEC-C and have been discussed in section 6 of this assessment. However, inclusion of mitigation could protect future users from the poor Air Quality.

8.6 The design of the mechanical ventilation system is expected to mitigate the impact of existing poor air quality on future occupants by locating air intakes to the rear of the building. Also, the use of chemical scrubbers will reduce the NO_2 concentrations to levels within the national objective.

8.7 The overall significance of potential impacts was therefore determined to be **not significant.**

8.8 Based on the assessment results based on the assessment results and inclusion of mitigation methods, air quality is not considered a constraint to planning consent for the proposed development.

[12] Greater London Authority (2014). Sustainable Design and Construction SPG.

9.0 DISCLAIMER

9.1 Create Consulting disclaims any responsibility to the Client and others in respect of any matters outside the scope of this report.

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