

9-13 Grape Street, London Borough of Camden

Air Quality Review

Executive Summary

As part of a planning application being made for 9-13 Grape Street (the site), the London Borough of Camden (LBC) has requested a review of air quality. The planning application seeks permission for the extension, alteration and change of use of the existing building (*sui generis*) into residential (C3).

Scotch Partners have, on behalf of Project Met, commissioned Environmental Planning & Assessment Ltd. (EPAL) to carry out an air quality review for 9-13 Grape Street. The review has been carried out by John Towner, a qualified environmental consultant and Director at EPAL.

The air quality review is based on results from two monitoring stations within the vicinity of Grape Street: Shaftesbury Avenue (roadside site) and Bloomsbury (urban background site). The Bloomsbury station is 668m from Grape Street and the closest in terms of site type; it therefore provides the best indication of relevant background air quality at the Grape Street site.

Based on the Bloomsbury station results, the review concludes that the Grape Street development slightly exceeds the Air Quality Objective (AQO) annual mean NO₂ level by 4µg/m³. However, it can be seen that concentrations have generally been falling on an annual basis. It is therefore reasonable to assume that the AQO will be met by the time the redeveloped building is ready for occupation.

In terms of the 1hour mean objective for NO₂ concentrations, this is met at both monitoring stations and thus expected to be met at the Grape Street site.

With regard to the two AQOs for particulate matter less than 10 (PM10), the review concludes that both of these objectives are met at both the Shaftesbury Avenue roadside and Bloomsbury urban background sites. It is thus expected that both of the PM10 objectives would be met at the Grape Street site.

It should also be noted that the proposed redevelopment will be a zero car scheme and that the use of boilers has been avoided through the specification of air to water heat pumps. As a result, the proposed scheme will not have a negative impact on local air quality.

The Site and Context

The site is located close to Shaftesbury Avenue in the West End of London. The Cuban Embassy is at the southern end of the street and the Shaftesbury Theatre is located to the south west of the site on the corner of Shaftesbury Avenue and High Holborn.

Grape Street is a narrow street with relatively high buildings (4-6 storeys) on either side of the street, which is lightly trafficked. The street joins High Holborn (A40) to the south and Shaftesbury Avenue (A400) –Bloomsbury Way (A401) to the north, while New Oxford Street (A40) runs north of the Site. The emissions from these roads would be expected to be the principal influences on local air quality in Grape Street.

Air Quality Review

Air Quality Management Area

The site is located in the southern part of the LBC. The whole of the Borough was declared an Air Quality Management Area (AQMA) in 2001, and continues to be designated an AQMA. The south of the borough, where the site is located, is densely developed and is subject the highest volumes of traffic and congestion.

LBC carries out comprehensive monitoring of air quality in the borough, especially in the south of Camden. This comprises the use of continuous air quality monitoring stations, which provide the most comprehensive data on air quality, and nitrogen dioxide diffusion tubes, that provide greater geographical coverage but are less accurate and precise.

Air Quality Monitoring Relevant to Grape Street

In the vicinity of the site there has been a continuous monitoring station in operation since 20th April 2000. The station is at the corner of Shaftesbury Avenue and High Holborn (NGR: 530057, 181285), opposite the Shaftesbury Theatre. In terms of the quality of data, this type of data provides an accurate basis for understanding air quality at Grape Street. Although there are also diffusion tube sites at Euston Road and Tottenham Court Road, these are at greater distance from the site.

The site is about 140m (north east) from the Shaftesbury Avenue monitoring location. The monitoring station is a roadside location, which is set back from the road by about 3m and the sampling height is 4m above ground level. It monitors oxides of nitrogen (NO_x), including nitrogen dioxide (NO₂), and particulate matter of less than 10 (PM₁₀). The PM₁₀ measurements are made using a TEOM (tapered element oscillating microbalance) detector, which requires adjustment of data (using the volatile correction model –VCM) to provide the gravimetric equivalent concentration required by the EU and UK legislation.

As the monitoring location is a roadside location it will be affected by high concentrations of pollutants resulting from vehicle emissions that dissipate (quite rapidly) with distance from the road. Thus, the levels experienced at the Grape Street site would be expected to be lower than at the monitoring location. LBC and Defra (Automatic Urban and Rural Network (AURN)) operate a background monitoring station at Bloomsbury, which is located near the Senate House (Russell Square) of the University of London and has operated since 1992. This is one of the most comprehensive monitoring locations in London (and the UK). This provides an indication of the relevant background air quality at the Site, without the influence of local road emissions. The Bloomsbury station is located about 668m north of the Site.

Review of Monitoring Data

LBC provided Scotch Partners with a copy of the draft 2013 Air Quality Progress Report, which provides a good overview of air quality in the borough and also reviews trends at key monitoring locations. This has been supplemented by a review of data available on the LondonAir (<http://www.londonair.org.uk>) and Defra website (<http://uk-air.defra.gov.uk>).

Tables 1-4 summarise air quality for the Shaftesbury Avenue and Bloomsbury locations, expressed relative to the Air Quality Objectives (AQO) for these pollutants. The data capture at Shaftesbury Avenue for NO₂ in 2012 was slightly less than 90% but exceeded 90% for PM₁₀. In general at Bloomsbury, the data capture rates have been excellent.

Table1: Results of Automatic Monitoring for NO₂: Comparison with Annual Mean Objective (AQO)

Site Name	Site Type	AQO Annual Mean NO ₂ µg/m ³	Annual Mean Concentration µg/m ³						
			2007	2008	2009	2010	2011	2012	2013
London Bloomsbury	Urban Background	40	61	55	54	55	50	55	44
Shaftesbury Ave	Roadside	40	77	80	88	89	76	71	74

Table2: Results of Automatic Monitoring for NO₂: Comparison with 1-hour Mean Objective

Site Name	Site Type	Number of 1 hour Mean NO ₂ >200µg/m ³	Number of Exceedances of Hourly Mean (200 µg/m ³)						
			2007	2008	2009	2010	2011	2012	2013
London Bloomsbury	Urban Background	<18 per year	6	0	2	1	0	1	6
Shaftesbury Ave	Roadside	<18 per year	22	9	13	21	15	12	12

Table3: Results of Automatic Monitoring for PM₁₀: Comparison with Annual Mean Objective (AQO)

Site Name	Site Type	AQO Annual Mean PM ₁₀ µg/m ³	Annual Mean Concentration µg/m ³						
			2007	2008	2009	2010	2011	2012	2013
London Bloomsbury	Urban Background	40	21	23	23	18	22	19	18
Shaftesbury Ave	Roadside	40	26	30	30	29	32	29	29

Table4: Results of Automatic Monitoring for PM₁₀: Comparison with 24-hour Mean Objective

Site Name	Site Type	Number of 24 hour mean PM ₁₀ levels of 50µg/m ³ per year	Number of Exceedances of 24-Hour Mean (50 µg/m ³)						
			2007	2008	2009	2010	2011	2012	2013
London Bloomsbury	Urban Background	<35	0	13	15	2	17	10	4
Shaftesbury Ave	Roadside	<35	26	30	30	29	27	18	12

From Table 1 it can be seen that based on the data for both the Shaftesbury Avenue roadside and the Bloomsbury urban background site, the concentrations of NO₂ at Grape Street would be expected to exceed the annual mean AQO of 40µg/m³ by 4µg/m³. Exceedance of this objective is the principal air quality issue in the borough. A downward trend in concentrations is indicated by the data for both locations however. The downward trend in NO₂ concentration decreases has been less marked than that for NO_x emissions and concentrations. The work by the Air

Quality Expert Group (2006)¹ has shown that whilst NO_x emission rates have declined steadily, the rate of decline of NO₂ emission rates has been at a less steep rate. Thus the fraction of NO₂ of the NO_x emissions (often referred to as fNO₂) has increased with time. This has been particularly marked in London.

The data in Table 2 indicate, by contrast, that the 1hour mean objective for NO₂ concentrations is met at both the Shaftesbury Avenue roadside and Bloomsbury urban background sites. It is thus highly probable that this objective would be met at the Grape Street site.

With regard to the AQOs for PM₁₀ the data in Tables 3 and 4 indicate that both of these objectives are met at both the Shaftesbury Avenue roadside and Bloomsbury urban background sites. It is thus highly probable that both of the PM₁₀ objectives would be met at the Grape Street site.

Trends in Traffic and Air Quality

As noted above, the trend in air quality indicated in Tables 1-4 suggests that there have been either slight improvements or limited changes relative to Air Quality Objectives. For annual mean NO₂ concentrations the increase in the proportion of NO_x emitted as NO₂ (fNO₂) has confounded the general downward trend that might be expected due to improved emission controls on vehicles.

Nevertheless it is notable that there have been marked decreases in traffic in the vicinity of the site. Figures 1 and 2 show the trends in Annual Average Daily Flows for the two road locations closest to the Site where traffic counts have been recorded. The data has been obtained from the Department for Transport website (<http://www.dft.gov.uk/traffic-counts/cp.php>). The data for both High Holborn and Bloomsbury Way show sustained reductions in total traffic volumes since 2008, with no indication of recent upturns that might reflect the economic recovery in London. There has been a slight increase in bus flows but this has been offset by reduced HGV movements. The traffic data suggest that given static or slightly reducing trends in traffic movements, and improvements in average vehicle emission rates (subject to matters related to fNO₂), air quality can be expected to improve slightly with time.

Considerations of Air Quality at the Grape Street Site

The foregoing review has established that the principal air quality consideration at the Grape Street Site is the annual mean NO₂ concentration. In other regards the air quality will meet the relevant Air Quality Objectives as required by EU and National legislation.

Grape Street itself is a very narrow street, lined on both sides by relatively tall buildings on either side. This forms something of street canyon form, where dispersion of pollutants would be affected by the resulting local wind and air mixing characteristics. Depending on wind directions, the narrow form is likely to be subject to wind pressure differences from north to south, generating longitudinal winds along the street from the Venturi effect. The narrow road width relative to building height could also reduce wind from higher level penetrating into the street. These factors would suggest that there will be a noticeable difference in air quality at street level from that at roof level, which would be of better quality.

An estimate of the annual mean concentration of NO₂ at ground level at the Site has been made using the spreadsheet method of Laxen and Marner (2008)². This does not constitute a proper air quality model but provides

¹ Air Quality Expert Group (2006) *Trends in Primary Nitrogen Dioxide in the UK*, 71pp, DEFRA, Scottish Executive, Welsh Assembly Government and DoE Northern Ireland

² Laxen, D and Marner, B (2008) NO₂ Concentrations and Distance from Roads. Report to Defra by Air Quality consultants, 28pp

an indication of the concentration, based on monitoring data provided in Table 1. Based on this procedure the concentration of NO₂ at ground level adjacent to the site is estimated to be 59.4µg/m³.

Based on the foregoing review of air quality, it is apparent that air quality at the Site is likely to meet the AQOs for PM₁₀ and hourly mean NO₂ concentration. However, the annual mean NO₂ AQO will likely be exceeded slightly. The air quality at street level in Grape Street is expected to be of lower air quality than that at roof level. Currently it is intended to ventilate units at first floor level and above with air taken from roof level, where air quality would be expected to be noticeably better than at street level.

Figure 1 Trends in Traffic (AADF) on High Holborn

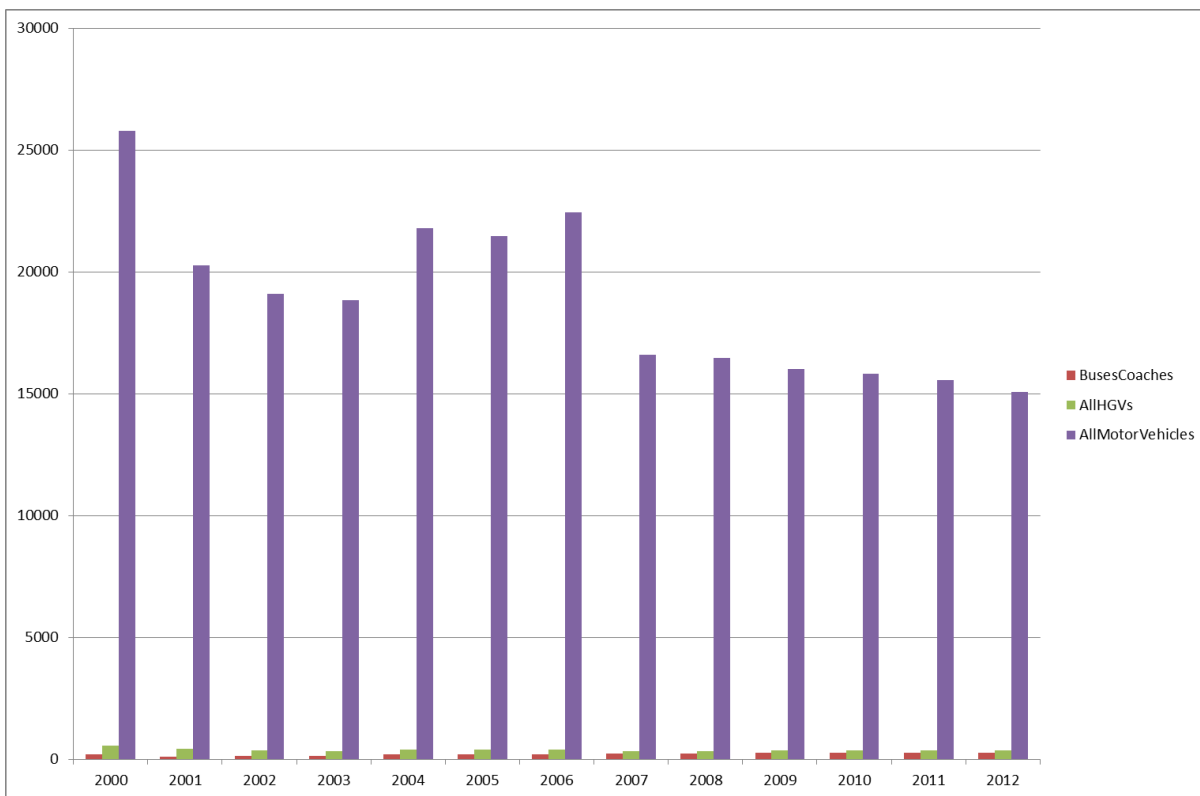


Figure 2: Trends in Traffic (AADF) on Bloomsbury Way

