WELLCOME TRUST

AIR QUALITY ASSESSMENT

BENTLEY HOUSE DEVELOPMENT

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Executive Summary

The report details the results of an air quality assessment carried out for the planning application for a proposed student residential accommodation on Euston Road in the London Borough of Camden. The development would convert the exciting Bentley House in to 170 student residential units.

The Transport Statement for the proposals suggests that the development would not result in any additional traffic flows on local road network. However, the proposals would introduce new residential exposure in the area where concentrations of two pollutants, nitrogen dioxide (NO_2) and particulates (PM_{10}) have been assessed to be in breach of the standards set out by the government. The entire Borough of Camden has been declared as Air Quality Management Area (AQMA) for these two pollutants. The monitoring data from the area shows particularly the breaches of annual mean NO_2 objective, even at background locations, sites away from major roads.

The assessment of air quality has been carried out using advanced dispersion models. the assessment of road traffic emissions has been carried out using ADMS-Roads model and ADMS 4.1 model has been used for the assessment of emissions from the stack of the proposed CHP plant. The assessment has been carried out for two pollutants, NO_2 and PM_{10}, the pollutants of great concern within the Borough. The latest technical guidance provided by Defra, LAQM.TG(09), has been followed in undertaking the air quality assessment.

Twenty eight receptors have been selected at Bentley House facades at various heights. Additional 20 receptors have been chosen to model impact from stack emissions over wider area.

The model predictions show that the annual and daily mean PM_{10} objectives are likely to be achieved at the proposed development site in 2009 and 2012, when the development would complete.

The NO_2 background concentrations used in the assessment for 2009 and 2012 are significantly above the annual mean objective. Hence, the model results for 2009 and 2012 show exceedence of the NO_2 annual mean objective at all the Bentley House receptors. The predicted concentrations are higher at receptors placed at Euston Road façade compared to Stephenson Way Façade. The predicted concentrations show a decrease with increasing height. The receptors placed along Stephenson Way façade and at height along both facades, Euston Road and Stephenson Way, tend to approach the background levels.

The assessment results for stack emissions show that it would result in an increase of about 1µg/m^3 NO_2 annual mean at Bentley House receptors. This is equivalent to about 2% increase in annual mean concentration at Bentley House receptors. The impact significance has been assessed based on the latest guidance provided by the EPUK. The significance of modelled increase in annual mean NO_2 has been adjudged as 'Slight Adverse' for Bentley House receptors. At all other modelled receptors, the increase due to stack emissions is imperceptible and its significance has been considered as 'Negligible'.

The mitigation measures for the construction phase have been recommended based on the best practice guidance. The measures would minimise the impact from nuisance dust and PM_{10} due to construction and demolition activities.

An overview of the generic mitigation measures and mitigation measures included in the design for the operational phase of the development has been presented. It is anticipated that the mitigation included in design would minimise the impact of air pollution. Recommendations are made for stack associated with the proposed CHP plant. It is expected that these would further reduce the impact from stack emissions.

1 Introduction

1.1 Scope of the Assessment

Bureau Veritas has been commissioned by Wellcome Trust Construction Ltd. to undertake an air quality assessment in support of a planning application for the redevelopment of Bentley House on Euston Road in the London Borough of Camden. The development proposals include converting Bentley House to provide circa 170 student residential bedrooms. The development would comprise of basement plus seven floors (ground + six floors). The current use of the building is warehousing for The Wellcome Trust, which is situated adjacent to the site.

The proposed development is not anticipated to result in any additional traffic flows on the local road network. However, the development seeks to introduce new exposure in an area designated for poor air quality through the provisions of student residential units. The entire London Borough of Camden has been declared an Air Quality Management Area (AQMA) for nitrogen dioxide NO_2 and particles (PM_{10}). The Council's own statutory work on air quality and monitoring data from the borough shows that the health-based objectives set out by the Government for NO_2 and PM_{10} have been exceeded in the borough.

The following are the main objectives of the assessment:

- To assess the air quality at selected locations ("receptors") at the development site for the baseline year 2009, and the proposed year of completion, 2012. The predictions to be made resulting from traffic on local road network and from the stack of Combined Heat and Power (CHP) plant proposed for the development
- To compare the predicted concentrations against the objectives set out by the Government in the Air Quality (England) Regulations 2000[1] and (Amended 2002 version[2]) in order to identify any risks to health of the occupants from NO_2 and PM_{10}.
- To assess, qualitatively, the short-term impacts of construction/demolition phase and review mitigation measures available to minimise these impacts
- To review options for mitigation that have been provided as part of design and additional measures that may be considered where exposure to poor air quality is predicted

The approach adopted in this assessment is based on using advanced dispersion model, ADMS-Roads[3] to assess the impact of road traffic on air quality for NO_2 and PM_{10} at selected location 'receptors' at the development site. The emissions from stacks of CHP unit, considered as energy options for the scheme, have been assessed using advanced dispersion modelling system, ADMS4.1. The predicted concentration are compared against the objectives set out by the Government in the Air Quality (England) Regulations 2000[4] and (Amended 2002 version[5]) in order to identify any risks to health from air pollution.

In order to provide consistency with the Council's own work on air quality the guiding principles for air quality assessment – as set out in the latest guidance and tools provided by Defra for air quality assessment (LAQM.TG(09)[6]) have been used. Defra issued the LAQM.TG (09) and associated tools

[1] The Air Quality (England) Regulations 2000 (Statutory Instrument 928)

[2] The Air Quality (England) (Amendments) Regulations 2002 (Statutory Instrument 3043)

[3] Cambridge Environmental Research Consultants, ADMS-ROADS version 2.3 Build 2.27

[4] The Air Quality (England) Regulations 2000 (Statutory Instrument 928)

[5] The Air Quality (England) (Amendments) Regulations 2002 (Statutory Instrument 3043)

[6] Local Air Quality Management Technical Guidance LAQM.TG(09). February 2009. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland

in February 2009. In Jan 2010, Defra updated data and tools such as background maps[7] of airborne pollutants and a NO_x/NO_2 conversion tool[8]. These updated tools and data have been used in this assessment.

The report provides the following information:

- Overview of the relevant legislation;
- Review of the London Borough of Camden's reports carried out under the Local Air Quality Management (LAQM) regime;
- Prediction of air quality concentrations for NO_2 and PM_{10} at the selected sensitive receptors for the baseline year (2009) and the proposed year of completion (2012);
- Comparison of the results against the air quality objectives to identify any issues relevant to the exposure of occupants;
- Overview of available mitigation measures and the measures included in the design to mitigate impacts during the operational phase ; and
- Summary and conclusions

1.2 Site Characteristics

Bentley House is owned by the Wellcome Trust and has been lying vacant since 2007. The building is located along Euston Road with traffic flows in the range of 50,000 vehicles per day. At that location, Euston Road has very wide pavements and the property is setback by about 10m from the road kerb. The front façade of the building is shown in Figure 1. There are tall buildings of variable height on either side of the road. These tall buildings would be causing restriction to air dispersion but as such do not constitute typical street canyons. The street width at that location, from façade to façade is about 38m which is greater than typical building height of about 30m. The rear façade of the building is located along Stephenson Way, which is a minor road.

Based on the monitoring data and the Council's own assessment the air quality in the area is in breach of the air quality objectives for NO_2. It should be noted that the site is in central London, which is known to suffer from poor air quality, to the extent that even the background concentrations for NO_2 in the area are above the annual mean objective.

Figure 1 – Existing Front Façade of Bentley House*

* Reproduced with permission from tp bennett LLP

[7] http://www.airquality.co.uk/laqm/tools.php?tool=background08

[8] http://www.airquality.co.uk/laqm/tools.php, An updated version of the calculator, Version 2.1, released 22 January 2010

1.3 Background to Urban Air Quality

Emissions from road traffic contribute significantly to ambient pollutant concentrations in urban areas. The main constituents of vehicle exhaust emissions, produced by the combustion of hydrocarbon fuel in the presence of air, are carbon dioxide (CO_2) and water vapour (H_2O). However, combustion engines are not perfectly efficient and partial combustion of fuel results in emissions of carbon monoxide (CO), particulates, hydrocarbons and Volatile Organic Compounds (VOCs). In addition, some of the nitrogen in the air is oxidised under the high temperature and pressure during combustion; this results in emissions of oxides of nitrogen (NO_x). NO_x emissions from vehicles predominately consist of nitrogen oxide (NO), but also contain nitrogen dioxide (NO_2). Once emitted, NO can be oxidised in the atmosphere to produce further NO_2.

The quantities of each pollutant emitted depend upon the type and quantity of fuel used, engine size, speed of the vehicle, and the type of emissions abatement equipment fitted. Once emitted these pollutants disperse in the air; pollutant concentrations generally decrease further from the road until concentrations reach background levels.

The pollutants commonly associated with road traffic emissions are nitrogen dioxide (NO_2), fine particulates (PM_{10}), carbon monoxide (CO), 1,3 - butadiene and benzene, as well as carbon dioxide (CO_2). This air quality assessment focuses on NO_2 and PM_{10}, as these pollutants are least likely to meet their AQS objectives near roads. In March 2004, the Review and Assessment process culminated in the declaration of around 120 separate AQMAs across the UK. Of these, 89 % were apportioned to road traffic emissions. Of the 89% of road traffic AQMAs around 55% represent problems in the attainment of the AQS objectives for NO_2 alone, whilst the remaining 45% have been declared on NO_2 in combination with PM_{10}[9].

The reports produced by the Council under the LAQM regime have shown that road traffic within the borough is the main contributing source of these pollutants and exceedences of NO_2 and PM_{10}. An overview of these two pollutants, describing briefly the sources and processes influencing the ambient concentrations, is presented below.

1.3.1 Particulate Matter (PM_{10})

Particulate matter is a mixture of solid and liquid particles suspended in the air. There are a number of ways in which airborne particulate matter may be categorised. The most widely used categorisation is based on the size of particles such as $PM_{2.5}$, particles of diameter less than 2.5 µm, PM_{10}, particles of diameter less than 10 µm. Generically particulate residing in low altitude air is referred to as Total Suspended Particulate (TSP) and comprises coarse and fine material including dust.

Particulate matter is composed of a wide range of materials arising from a variety of sources. Examples of anthropogenic sources are carbon particles from incomplete combustion, bonfire ash, re-condensed metallic vapours and so-called secondary particles (or aerosols) formed by chemical reactions in the atmosphere. As well as being emitted directly from combustion sources, man-made particles can arise from mining, quarrying, demolition and construction operations, from brake and tyre wear in motor vehicles and from road dust re-suspension from moving traffic or strong winds. Natural sources of particles included wind-blown sand and dust, forest fires, sea salt and biological particles such as pollen and fungal spores.

The health impacts from particulate matter depend upon size and chemical composition of the particles. For the purposes of AQS objectives, the particulate matter, PM_{10} and $PM_{2.5}$, is solely defined on size rather than chemical composition. This enables a uniform method of measurement and comparison. The short and long-term exposure to particulate matter has been associated with increased risk of lung and heart diseases[10]. Particles may also carry surface-absorbed carcinogenic compounds. Smaller particles have a greater likelihood of penetrating the respiratory tract and reaching the lung to blood interface and causing the above adverse health effects.

[9] Evaluation of Local Authority Air Quality Action Planning through Local Air Quality Management. Casella Stanger and Transport Travel Research Ltd on behalf of Department for Environment, Food and Rural Affairs. May 2004

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

The emissions of PM_{10} have declined significantly since 1970, particularly due to reduction in coal use. In the UK emissions of PM_{10} are estimated to be 150 ktonnes in 2005[11]. In addition, re-suspension results in 21 ktonnes of PM_{10} per annum being released Road transport, stationary combustion and industries and related processes remain the largest sources of PM_{10} emissions. The transport sector contributed 31% (47 ktonnes) of PM_{10} emissions in 2005[11]. Almost half of the transport sector emissions for PM_{10} came from road transport. The main source within road transport is exhaust emissions from diesel vehicles.

It is important to note that these estimates only refer to primary emissions, that is, the emissions directly resulting from sources and processes and do not include the secondary particles. These are the particles resulting from the interaction of various gaseous components in the air, such as ammonia, sulphur dioxide and oxides of nitrogen. These secondary particles can come from further a field and impact on the air quality in the UK and vice versa.

Similar to PM_{10}, emissions of $PM_{2.5}$ have declined since 1970. In 2005, emissions of $PM_{2.5}$ were estimated to be 95 ktonnes[11], which makes over 60% of PM_{10} emissions. In 2005, the transport sector made 40% (39 ktonnes) and stationary fuel combustion and industrial sources made another 39% (36 ktonnes) of the total $PM_{2.5}$ emissions in the UK.

1.3.2 Nitrogen Oxides

Nitric oxide (NO) and nitrogen dioxide (NO_2) are collectively known as nitrogen oxides (NO_x). Nitrogen oxides are produced during the high temperature combustion processes involving the oxidation of nitrogen. Nitrogen oxides are initially emitted mainly as nitric oxide. This nitric oxide then undergoes further oxidation in the atmosphere, particularly with ozone, to produce secondary NO_2. The production of secondary NO_2 could also be favoured due to a class of compounds, VOCs (Volatile Organic Compounds), typically present in urban environments, and under certain meteorological conditions such as hot sunny days and stagnant anti-cyclonic winter conditions.

Of nitrogen oxides it is NO_2 that is associated with health impacts. Exposure to NO_2 can bring about reversible effects on lung function and airway responsiveness. It may also increase reactivity to natural allergens and exposure to NO_2 puts children at increased risk of respiratory infection and may lead to poorer lung function in later life.

The emissions for NO_x have decreased by 48% in 2005 compared to 1970. For 2005, NO_x (as NO_2) emissions are estimated to be 1627 ktonnes[11]. The transport sector remained the largest source of NO_x emissions. Road transport contributed 34% (550 ktonnes) and other transport sources contributed 13% (210 ktonnes) to total NO_x emissions. Power generation and industrial sectors are the next large contributors to NO_x emissions with respective estimated contribution of 23% and 15%.

[11] UK Emissions of Air Pollutants 1970 to 2005 (2007), UK Emissions Inventory team, AEA Energy and Environment

2 Air Quality – Legislation and Planning Policy

2.1 Air Quality Strategy

The significance of existing and future pollutant levels can be assessed against national air quality standards and objectives established by Government. The Air Quality Strategy (AQS)[12] for the UK provides the over-arching strategic framework for air quality in the UK and contains national air quality standards and objectives established by the UK Government and devolved administrations to protect human health. The air quality objectives incorporated in the AQS and UK Legislation are derived from the Limit Values prescribed in the EU Directives transposed into national legislation by member states.

The Clean Air for Europe (CAFE) programme was initiated in the late 1990s to draw together previous directives (with exception of the Fourth Daughter Directive) into a single EU Directive on air quality. The Directive 2008/50/EC[13] introduces new obligatory standards for $PM_{2.5}$ for Government but places no statutory duty on local Government to work towards achievement of these new standards.

The Air Quality Standards (England) Regulations 2007[14] came into force on 15th February 2007 in order to align and bring together in one statutory instrument the Government's obligations to fulfil the requirements of the CAFE Directive.

The objectives for ten pollutants (benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide (NO_2), sulphur dioxide (SO_2), particulates - PM_{10} and $PM_{2.5}$, ozone and Polycyclic Aromatic Hydrocarbons (PAHs)) have been prescribed within the Air Quality Strategy[12] based on The Air Quality Standards (England) Regulations 2007.

This assessment focuses only on NO_2 and PM_{10}, as these are the pollutants of main concern within the Council's administrative area. The objectives set out in the AQS for these pollutants are presented in the table below.

Table 1– AQS Objectives and Standards for England Relevant to this Assessment

Pollutant	Objective	Concentration measured as	Date to be achieved by and maintained thereafter
Nitrogen dioxide	200 µg/m^3, not to be exceeded more than 18 times a year	hourly mean	31st December 2005
	40 µg/m^3	annual mean	31st December 2005
Particles (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24 hour mean	31st December 2004
	40 µg/m^3	annual mean	31st December 2004

The UK Government and the Devolved Administrations have also set new national air quality objectives for $PM_{2.5}$. These objectives have not been incorporated into LAQM Regulations, and local authorities do not have a statutory obligation to review and assess air quality against them.

The locations where the AQS objectives apply are defined in the AQS as locations outside buildings or other natural or man-made structures above or below ground where members of the public are regularly present and might reasonably be expected to be exposed [to pollutant concentrations] over

[12] 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

[13] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

[14] The Air Quality Standards Regulations 2007, Statutory Instrument No 64, The Stationary Office Limited

the relevant averaging period of the AQS objective. Typically these include residential properties and schools/care homes for longer period (i.e. annual mean) pollutant objectives and high streets for short-term (i.e. 1-hour) pollutant objectives.

2.2 Local Air Quality Management (LAQM)

As established by the Environment Act 1995 Part IV, all local authorities in the UK are under a statutory duty to undertake an air quality assessment within their area to determine whether they are likely to meet the air quality objectives set down by Government for a number of pollutants. The process of Review and Assessment of air quality undertaken by local authorities is set out under the Local Air Quality Management (LAQM) regime. Where the results of the Review and Assessment process highlight that problems in the attainment of health-based objectives for air quality will arise, the local authority is required to declare an Air Quality Management Area (AQMA) – a geographic area defined by high levels of pollution and exceedences of health-based standards.

2.3 National Planning Policy

Planning Policy Statement (PPS23) on Planning and Pollution Control explicitly states that air quality can be a material consideration in planning decisions. The following provides an extract of the existing planning policy context of such issues set down within the Planning Policy Statement (PPS) 23: "Planning and Pollution Control", and its Annex 1: "Pollution Control, Air and Water Quality" states:

…Any air quality consideration that relates to land use and its development is capable of being a material planning consideration. Wherever a proposed development is likely to have significant air quality impacts, close co-operation between [Local Authorities] and those with responsibilities for air quality and pollution control will be essential.

The policy recommends for generally more weight to be given to air quality considerations, for example*, where a development would have a significant impact on air quality inside, or adjacent to, an AQMA.*

However, the policy does not automatically reject every development in an AQMA as it further states:

'It is not the case that all planning applications for developments inside or adjacent to AQMAs should be refused if the developments would result in a deterioration of local air quality. Such an approach could sterilise development, particularly where authorities have designated their entire areas as AQMAs. LPAs, transport authorities and pollution control authorities should work together to ensure development has a beneficial impact on the environment, for example by exploring the possibility of securing mitigation measures that would allow the proposal to proceed. Road transport is recognised as a significant contributor to poor local air quality, particularly in urban areas. LPAs can play a key role by ensuring that developments reduce the need to travel and encouraging more sustainable travel choices.'

The Transport Statement[15] produced for the development concludes, '*The proposals are not expected to generate any more vehicle trips than the previous consented use. Due to the location of the university it is expected that the majority of students will walk or cycle. Additional journeys will be undertaken on public transport.'*

One of the objectives of the LAQM regime is for local authorities to enhance integration of air quality into the planning process. Current Air Quality Policy Guidance (LAQM.PG (09))[16] clearly recognises land-use planning as having a significant role in terms of reducing population exposure to elevated levels of pollution. Generally, the decisions made on land use allocation can play a major role in improving the health of the population, particularly in sensitive areas - where likelihood of exposure to pollutants is higher.

[15] TPP (May 2010), Welcome Trust Bentley House, 200 Euston Road Transport Statement

[16] LAQM Policy Guidance LAQM.PG(09) - Guidance document produced by Defra

2.4 London-wide Policy

The London Plan[17] is the statutory strategic plan produced by the Mayor of London outlining the spatial development strategy for Greater London. All the London Boroughs are required to regard the London Plan in their development plans, planning decisions and spatial strategies. The Plan consists of a number of policies to employ land use and traffic planning to reduce air pollution and exposure. The Plan requires the local authorities to ensure that the new development is sustainable, safe, secure, well designed and improves the environment particularly the air quality.

Policy 7.14, Improving air quality of the Plan deals with air quality and states:

'A
The Mayor will work with strategic partners to ensure that the spatial, climate change, transport and design policies of this plan support implementation of his Air Quality Strategy to achieve reductions in pollutant emissions and public exposure to pollution.

Planning decisions

B Development proposals should:

a 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'

b where biomass boilers are included, set out a detailed air quality assessment comparing forecast pollutant concentrations with that of a conventional gas boiler. Permission should only be granted if no adverse impacts from the biomass boiler relative to the use of a conventional gas boiler are identified

c aim to be 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as areas designated as Air Quality Management Areas (AQMAs)). Offsetting should be used to ameliorate negative impacts associated with development proposals. Increased exposure to existing poor air quality should be minimised'

The development area, Euston, has been identified as an Opportunity Area in the Plan. The Plan requires a special focus on Opportunity Areas that are well served by public transport, such as Euston, in terms of intensification of development. The Plan recommends:

'As part of the process of producing Sub Regional Implementation Frameworks, strategic partners should work with the Mayor to prepare, and then implement, spatial planning frameworks for Opportunity Areas as shown on Map 2A.1, or to build on frameworks already developed.

These frameworks will set out a sustainable development programme for each Opportunity Area, to be reflected in DPDs, so as to contribute to the overall strategy of the London Plan to:

- *Seek to exceed the minimum guidelines for housing having regard to indicative estimates of employment capacity set out in the sub-regional tables (see Chapter 5)*
- *Maximise access by public transport*
- *Promote social and economic inclusion and relate development to the surrounding areas, especially any nearby Areas for Regeneration*
- *Take account of the community, environmental and other distinctive local characteristics of each area'*

The Plan's policy, Policy 4.10 New and emerging economic sectors is relevant to this development and states:

'A ***Strategic***

The Mayor will:

[17] Mayor of London, The London Plan: Spatial Development Strategy for Greater London, (Consultation draft replacement plan), October 2009