# 1-11A Swain's Lane and 109-110 Highgate West Hill

**The Earl of Listowel**

## Air Quality Assessment

Air Quality Consultants

October 2013

# Air Quality Assessment:
## Swain's Lane, Camden

October 2013

Experts in air quality
management & assessment

## Document Control

| Client | Earl of Listowel | Principal Contact | Juliet Heap (Cundall Johnston & Partners LLP) |
|---|---|---|---|

| Job Number | J1532 |
|---|---|

| Report Prepared By: | Caroline Odbert and Laurence Caird |
|---|---|

Document Status and Review Schedule

| Report No. | Date | Status | Reviewed by |
|---|---|---|---|
| 1532/1/F1 | 7 October 2013 | Final Report | Penny Wilson (Principal Consultant |



**Air Quality Consultants Ltd**
**23 Coldharbour Road, Bristol BS6 7JT Tel: 0117 974 1086**
**12 Airedale Road, London SW12 8SF Tel: 0208 673 4313**
**aqc@aqconsultants.co.uk**

Registered Office: 12 St Oswalds Road, Bristol, BS6 7HT
Companies House Registration No: 2814570

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# 1 Introduction

1.1 This report describes the potential air quality impacts associated with the proposed redevelopment of land at Swain's Lane in the London Borough (LB) of Camden. The assessment has been carried out by Air Quality Consultants Ltd on behalf of The Earl of Listowel (Lord Listowel).

1.2 The proposed development would consist of two mixed-use buildings with retail on the ground floor and a total of 13 residential apartments on the first and second floors. It lies within an Air Quality Management Area (AQMA) declared by the LB of Camden for exceedences of the nitrogen dioxide and particulate matter ($PM_{10}$) objectives. The scale of the development is such that it will not significantly increase traffic on local roads (an increase of 0.1% is predicted as an Annual Average Daily Traffic (AADT) flow), therefore the impact on existing receptors has been scoped out of the assessment. The new residential properties will, however, be subject to the impact of road traffic emissions from the adjacent road network and this has been assessed. The main air pollutants of concern related to traffic emissions are nitrogen dioxide and fine particulate matter ($PM_{10}$ and $PM_{2.5}$).

1.3 A mini Combined Heat and Power (CHP) plant and a gas condensing boiler are proposed to be installed. These are both relatively small, the CHP is gas-fired with 15.5 kW thermal (5.5 kW electrical) output and the gas boiler is 80 kW. Based on experience elsewhere, plant of this size are unlikely to have a significant impact upon surrounding receptors. Therefore, the potential impact of the CHP and gas condensing boiler upon the proposed and existing receptors has not been considered in detail.

1.4 There is the potential for the construction activities to impact upon both existing and new properties. The main pollutants of concern related to construction activities are dust and $PM_{10}$.

1.5 This report describes existing local air quality conditions, and the predicted air quality at the proposed development in 2012, to include predicted development flows. In reality the residential units will not be occupied until at the earliest 2015 and therefore predicting concentrations in 2012 will represent a worst case scenario as the modelling will have overestimated the traffic emissions.

1.6 The assessment of construction dust impacts focuses on the anticipated duration of the works.

1.7 This report has been prepared taking into account all relevant local and national guidance and regulations, and follows a methodology agreed with Poppy Lyle, Senior Sustainability Officer (Air Quality) at LB of Camden.

# 2 Policy Context and Assessment Criteria

## Policy Context

### *Air Quality Strategy*

2.1 The Air Quality Strategy published by the Department for Environment, Food, and Rural Affairs (Defra) provides the policy framework for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment (Defra, 2007). It also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives. Local authorities are seen to play a particularly important role. The strategy describes the Local Air Quality Management (LAQM) regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

### *Clean Air Act 1993*

2.2 Small combustion plant of less than 20 MW net rated thermal input are controlled under the Clean Air Act 1993. This requires the local authority to approve the chimney height. Plant which are smaller than 366kW have no such requirement.

### *National Planning Policy Framework*

2.3 The National Planning Policy Framework (NPPF) (2012) introduced in March 2012 now sets out planning policy for the UK in one place. It replaces previous Planning Policy Statements, including PPS23 on Planning and Pollution Control. The NPPF contains advice on when air quality should be a material consideration in development control decisions. Existing, and likely future, air quality should be taken into account, as well as the EU limit values or national objectives for pollutants, the presence of any AQMAs and the appropriateness of both the development for the site, and the site for the development.

2.4 The NPPF places a general presumption in favour of sustainable development, stressing the importance of local development plans, and states that the planning system should perform an environmental role to minimise pollution. One of the twelve core planning principles notes that planning should *"contribute to…reducing pollution"*. To prevent unacceptable risks from air pollution, planning decisions should ensure that new development is appropriate for its location.

The NPPF states that the effects of pollution on health and the sensitivity of the area and the development should be taken into account.

2.5 The need for compliance with any statutory air quality limit values and objectives is stressed, and the presence of AQMAs must be accounted for in terms of the cumulative impacts on air quality from individual sites in local areas. New developments in AQMAs should be consistent with local air quality action plans.

### The London Plan

2.6 The London Plan 2011 (GLA, 2011) sets out the spatial development strategy for London. It brings together all relevant strategies, including those relating to air quality.

2.7 Policy 7.14, 'Improving Air Quality', addresses the spatial implications of the Mayor's Air Quality Strategy and how development and land use can help achieve its objectives. It recognises that Boroughs should have policies in place to reduce pollutant concentrations, having regard to the Mayor's Air Quality Strategy. Further details of the London Plan in relation to planning decisions are provided in Appendix A1.

### The Mayor's Air Quality Strategy

2.8 The revised Mayor's Air Quality Strategy (MAQS) was published in December 2010 (GLA, 2010). The overarching aim of the Strategy is to reduce pollution concentrations in London to achieve compliance with the EU limit values as soon as possible. The Strategy commits to the continuation of measures identified in the 2002 MAQS, and sets out a series of additional measures. These additional measures and the role of the Low Emission Zone are described in Appendix A1.

### Local Transport Plan

2.9 Objective 1 of the LB of Camden's Transport Strategy 2011 is to:

*"Reduce motor traffic levels and vehicle emissions to improve air quality, mitigate climate change and contribute to making Camden a 'low carbon and low waste borough'."*

2.10 There are three polices that refer specifically to air quality to help achieve this objective these are:

*"Policy 1.2 – The Council will continue to encourage travel by sustainable modes, reduce motor vehicle dependency and the dominance of motor traffic in the borough. The Council will aim to increase the permeability of streets and remove one-way gyratories.*

*Policy 1.4 – Camden will continue to promote Low Emission Vehicles and support the staged introduction of the Low Emissions Zone in London. The Council would also like to see further development of national policy to support local level efforts to improve air quality and tackle climate change.*

*Policy 1.5 – For essential car journeys, Camden will encourage more residents and businesses to change to electric vehicles, (with electricity generated by renewable sources), to help reduce air and noise pollution…."*

### *Camden Local Development Framework*

2.11 Changes to the planning legislation require the Council to replace the Development Plan with a Local Development Framework (LDF). The LDF is a portfolio of planning documents, individually known as Local Development Documents, which will deliver the spatial development strategy for the LB of Camden and build upon existing local and regional strategies and initiatives.

2.12 The LB of Camden's Core Strategy 2010 – 2025 includes four policies which refer to air quality:

- *"Policy CS5 Managing the impact of growth and development: … Protecting and enhancing our environment…*
- *Policy CS9 Achieving a successful Central London:…k) continue to designate Central London as a Clear Zone Region to reduce congestion, promote walking and cycling and improve air quality…*
- *Policy CS11 Promoting sustainable and efficient travel. The Council will promote the delivery of transport infrastructure and the availability of sustainable transport choices in order to support Camden's growth, reduce the environmental impact of travel, and relieve pressure on the borough's transport network.*
- *Policy CS16 Improving Camden's health and well-being: recognise the impact of poor air quality on health and implement Camden's Air Quality Action Plan which aims to reduce air pollution levels."*

2.13 There are also two development policies referring to air quality:

- *"DP22 Promoting sustainable design and construction: The Council will require development to be resilient to climate change by ensuring schemes include appropriate climate change adaption measures such as: i) reducing air pollution.*
- *DP32 Air quality and Camden's clear zone: The Council will require air quality assessments where development could potentially cause significant harm to air quality. Mitigation measures will be expected in developments that are located in areas of poor air quality…"*

### *Air Quality Action Plan*

2.14 The LB of Camden has declared an AQMA for nitrogen dioxide and $PM_{10}$ that covers the whole Borough. The Council has since developed an Air Quality Action Plan (London Borough of Camden, 2009). There are four main objectives focused on in the plan these are:

- "*Reducing transport emissions including: encouraging the use of sustainable transport and low emission vehicles, encouraging changes in driver behaviour and supporting initiatives introduced by the mayor.*
- *Reducing emissions associated with new development including: controlling emissions from construction sites, measures to reduce transport and gas boiler emissions.*
- *Reducing emissions from gas boilers and industrial processes including: reducing the Council's gas boiler emission and controlling air pollution form small industrial processes.*
- *Air quality awareness raising initiatives including: provision of air quality information and strengthening promotional work relating to air pollution and health.*"

2.15 The LB of Camden has produced an update to the action plan which covers the period 2013-2015 (London Borough of Camden, 2013). This is currently a draft consultation document, the plan focuses on five sections:

1. *"Reducing transport emissions.*
2. *Reducing emissions associated with new development.*
3. *Reducing emissions from gas boilers and industrial processes.*
4. *Air quality awareness raising initiatives.*
5. *Lobbying and partnership working."*

2.16 The Air Quality Action Plan is also linked with the LB of Camden's Environmental Sustainability Plan (London Borough of Camden, 2011) which aims to:

- *"Reduce levels of $NO_2$ by up to 50% by 2015 on our most polluted roads, in partnership with regional and national government, to achieve the $NO_2$ air quality objectives.*
- *Continue to comply with the air quality objectives for $PM_{10}$ concentrations and endeavour to reduce these in the long term in order to protect public health."*

This will be achieved by:

- *"Lower levels of road traffic and increased use of sustainable transport*
- *Higher proportion of low emissions vehicles on our roads such as biomethane, electric, hybrid*

- *Reduced energy use from gas boilers*
- *Improved awareness of the sources and health impacts of air pollution and how to avoid generating pollution."*

## Assessment Criteria

### *Health Criteria*

2.17 The Government has established a set of air quality standards and objectives to protect human health. The 'standards' are set as concentrations below which effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of an individual pollutant. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The objectives for use by local authorities are prescribed within the Air Quality Regulations, 2000, Statutory Instrument 928 (2000) and the Air Quality (England) (Amendment) Regulations 2002, Statutory Instrument 3043 (2002).

2.18 The objectives for nitrogen dioxide and $PM_{10}$ were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. The $PM_{2.5}$ objective is to be achieved by 2020. Measurements across the UK have shown that the 1-hour nitrogen dioxide objective is unlikely to be exceeded where the annual mean concentration is below 60 $\mu g/m^3$ (Defra, 2009). Therefore, 1-hour nitrogen dioxide concentrations will only be considered if the annual mean concentration is above this level.

2.19 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. Defra explains where these objectives will apply in its Local Air Quality Management Technical Guidance (Defra, 2009). The annual mean objectives for nitrogen dioxide and $PM_{10}$ are considered to apply at the façades of residential properties, schools, hospitals etc.; they do not apply at hotels. The 24-hour objective for $PM_{10}$ is considered to apply at the same locations as the annual mean objective, as well as in gardens of residential properties and at hotels. The 1-hour mean objective for nitrogen dioxide applies wherever members of the public might regularly spend 1-hour or more, including outdoor eating locations and pavements of busy shopping streets.

2.20 The European Union has also set limit values for nitrogen dioxide, $PM_{10}$ and $PM_{2.5}$. Achievement of these values is a national obligation rather than a local one (Directive 2008/50/EC of the European Parliament and of the Council, 2008). The limit values for nitrogen dioxide are the same levels as the UK objectives, but applied from 2010 (The Air Quality Standards Regulations 2010 (No. 1001), 2010). The limit values for $PM_{10}$ and $PM_{2.5}$ are also the same level as the UK statutory objectives, but applied from 2005 for $PM_{10}$ and will apply from 2015 for $PM_{2.5}$. As the latter is more stringent than the UK objective (as it applies from 2015 rather than 2020) it is used as the relevant assessment criterion in this assessment.

2.21 The relevant air quality criteria for this assessment are provided in Table 1.

**Table 1: Air Quality Criteria for Nitrogen Dioxide, $PM_{10}$ and $PM_{2.5}$**

| Pollutant | Time Period | Objective |
|---|---|---|
| Nitrogen Dioxide | 1-hour mean | 200 µg/m$^3$ not to be exceeded more than 18 times a year |
| | Annual mean | 40 µg/m$^3$ |
| Fine Particles ($PM_{10}$) | 24-hour mean | 50 µg/m$^3$ not to be exceeded more than 35 times a year |
| | Annual mean | 40 µg/m$^3$ |
| Fine Particles ($PM_{2.5}$) [a] | Annual mean | 25 µg/m$^3$ |

[a] The $PM_{2.5}$ objective, which is to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it. The EU limit value is the same, but is to be met by 2015.

### *Construction Dust Criteria*

2.22 There are no formal assessment criteria for dust. In the absence of formal criteria, the approach developed by the Institute of Air Quality Management (IAQM)[1] (Institute of Air Quality Management, 2011) has therefore been used. Full details of this approach are provided in Appendix A1.3.

### *Descriptors for Air Quality Impacts and Assessment of Significance*

#### *Operational Significance*

2.23 There is no official guidance in the UK on how to describe air quality impacts nor to assess their significance. The approach developed by the IAQM[1] (Institute of Air Quality Management, 2009), and incorporated in Environmental Protection UK's (EPUK) guidance document on planning and air quality (Environmental Protection UK, 2010), has therefore been used. This approach includes elements of professional judgement. Full details of this approach are provided in Appendix A3, with the professional experience of the consultants preparing the report set out in Appendix A4.

#### *Construction Dust Significance*

2.24 In the absence of official guidance, the approach developed by the IAQM (Institute of Air Quality Management, 2011) to assess the significance of construction dust has been used. This approach includes elements of professional judgement. Full details of this approach are provided in

[1] The IAQM is the professional body for air quality practitioners in the UK.

Appendix A1.3, with the professional experience of the consultants preparing the report set out in Appendix A4.

# 3 Assessment Approach

## Consultation

3.1 The assessment follows a methodology agreed with the LB of Camden via email between Poppy Lyle (Senior Sustainability Officer (Air Quality) at LB Camden) and Caroline Odbert (Air Quality Consultants) on 10th September 2013.

## Existing Conditions

3.2 Existing sources of emission within the study area have been defined using a number of approaches. A site visit has been carried out to identify existing sources from a visual inspection of the area. Industrial and waste management sources that may affect the area have been identified using Defra's Pollutant Release and Transfer Register (Defra, 2013a). Local sources have also been identified through discussion with the LB of Camden's Air Quality Team, as well as through examination of the Council's air quality Review and Assessment reports.

3.3 Information on existing air quality has been obtained by collating the results of monitoring carried out by the local authority. This covers nearby sites used to provide context for the assessment. The background concentrations across the study area have been defined using the national pollution maps published by (Defra, 2013b). These cover the whole country on a 1x1 km grid.

## Receptor Locations

3.4 Concentrations of nitrogen dioxide, $PM_{10}$ and $PM_{2.5}$ have been predicted at a number of locations within the proposed development. Receptors have been identified to represent worst-case exposure within these locations. When selecting these receptors, particular attention has been paid to assessing impacts close to junctions, where traffic may become congested, and where there is a combined effect of several road links. The receptors have been located on the façades of the properties closest to the sources.

3.5 Eighteen receptor locations have been identified within the new development, which represent exposure to existing traffic sources. These include windows, doors and balconies of proposed residential units. These locations are shown in Figure 1. In addition, concentrations have been modelled at the diffusion tube monitoring site located on Chetwynd Road, in order to verify the modelled results (see Appendix A5 for verification method).

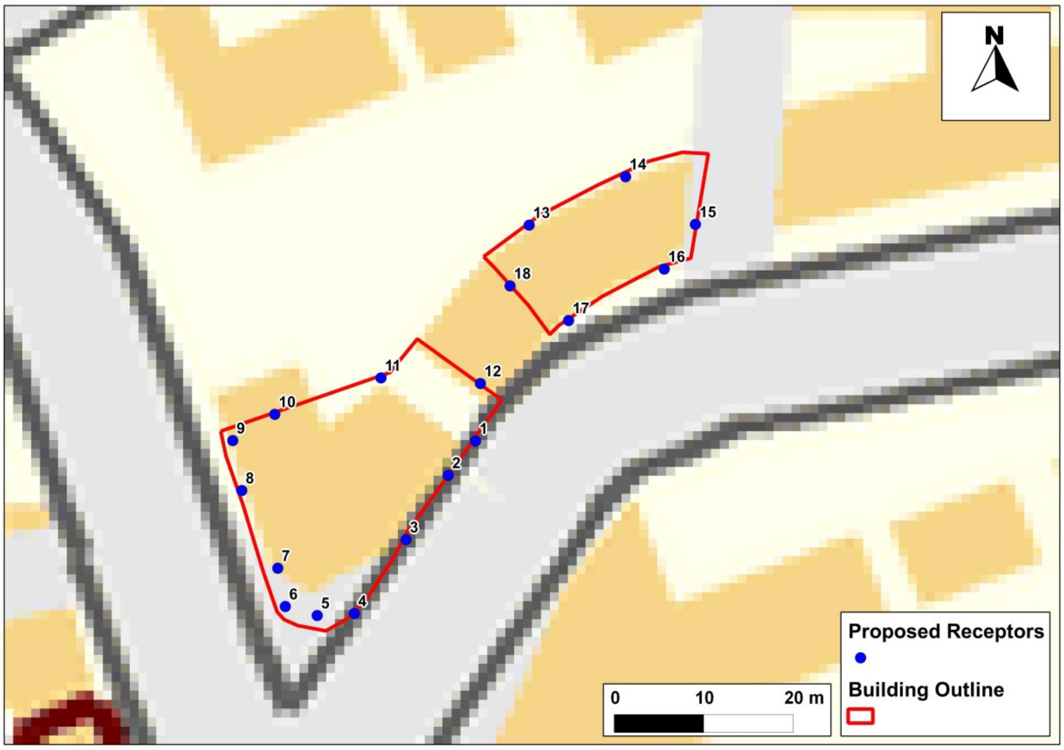


**Figure 1: Receptor Locations**

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## Assessment Scenarios

### *Road Traffic Impacts*

3.6 Predictions of nitrogen dioxide, $PM_{10}$ and $PM_{2.5}$ concentrations have been carried out for a base year (2012) to present a worst case scenario. Details of the model inputs and the model verification are provided in Appendix A5, together with the method used to derive background nitrogen dioxide concentrations.

### *Construction Impacts*

3.7 Locations sensitive to dust emitted during construction will be places where members of the public are regularly present. Residential properties and commercial operations close to the site will be most sensitive to construction dust. Any areas of sensitive vegetation or ecology that are very close to dust sources may also be susceptible to some negative effects.

3.8 It is very difficult to quantify emissions of dust from construction activities. It is thus common practice to provide a qualitative assessment of potential impacts, making reference to the assessment criteria set out Appendix A1.3.

# 4 Site Description and Baseline Conditions

4.1 The proposed development site is located to the east of Hampstead Heath. The site is bounded by Highgate West Hill to the west and Swains Lane to the south. It currently consists of commercial properties and garages. There are existing residential properties surrounding the proposed development site.

## Industrial sources

4.2 A search of the UK Pollutant Release and Transfer Register website (Defra, 2013a) did not identify any industrial or waste management sources within 1 km of the proposed development.

## Site Visit

4.3 A site visit was carried out on 20th July 2012. Other than road traffic, no other sources were identified during the site visit. No significant changes are expected to have occurred within the area since this site visit was undertaken.

## Air Quality Review and Assessment

4.4 The LB of Camden has investigated air quality within its area as part of its responsibilities under the LAQM regime. In 2000 an Air Quality Management Area (AQMA) was declared across the whole borough for exceedences of the nitrogen dioxide and $PM_{10}$ objectives.

## Local Air Quality Monitoring

4.5 The LB of Camden operates three automatic monitoring stations within its area. None of these are in close proximity to the proposed development site. The Council also operates a number of nitrogen dioxide monitoring sites using diffusion tubes prepared and analysed by Gradko Environmental (using the 50% TEA in acetone method). These include one deployed on Chetwynd Road approximately 600 m south-east of the proposed development. Up until 2010 there were also diffusion tubes located on Mansfield Road and Croftdown Road, within 800m of the proposed development. Results for Chetwynd Road for the years 2007 to 2012 are summarised in Table 2. The results for Mansfield Road and Croftdown Road from 2007 to 2010 are also presented for information. The monitoring locations are shown in Figure 2.

**Table 2: Summary of Nitrogen Dioxide ($NO_2$) Monitoring (2007-2012) [a]**

| Site No. | Site Type | Location | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| **Diffusion Tubes - Annual Mean ($\mu g/m^3$) [b]** | | | | | | | | |
| **CA3** | Roadside | Mansfield Road | **40.4** | **42.9** | **45.6** | **42.0** | - | - |
| **CA8** | Urban Background | Croftdown Road | 31.4 | 36.4 | 35.5 | 35.0 | - | - |
| **CA24** | Roadside | Chetwynd Road | - | - | **50.0** | **68.0** | **44.1** | **43.7** |
| **Objective** | | | **40** | | | | | |

[a] Exceedences of the objectives are shown in bold

[b] 2007 to 2010 data have been taken from the 2010 Air Quality Progress Report (The London Borough of Camden, September 2011) , 2011 and 2012 data have been provided by the LB of Camden.

4.6 Concentrations at the roadside sites (CA3 Mansfield Road and CA24 Chetwynd Road) have exceeded the annual mean nitrogen dioxide objective in all years presented. The concentrations at the urban background site (CA8 Croftdown Road) are below the annual mean objective. Although the roadside sites are within 800 m of the proposed development, concentrations are expected to be lower across the development site, this is because the volume of traffic along Swains Lane is expected to be lower than on both Mansfield and Chetwynd Road.

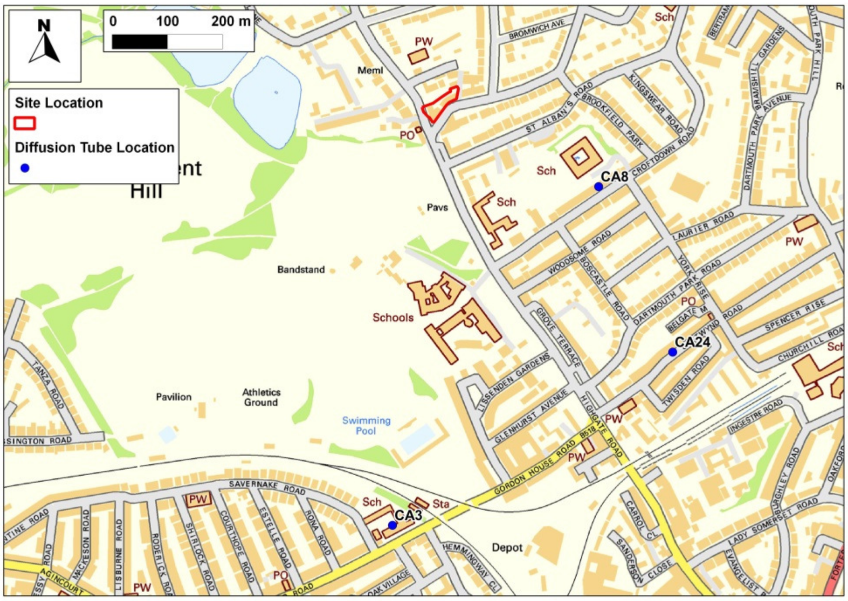


**Figure 2: Monitoring Locations**

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4.7 The Swiss Cottage kerbside automatic monitoring station, approximately 2.5 km south west of the proposed development site, is the closest station which measures $PM_{10}$ and $PM_{2.5}$ concentrations. Results for the years 2007 to 2012 are summarised in Table 3.

4.8 Annual mean concentrations of $PM_{10}$ and $PM_{2.5}$ have been below the relevant objectives and limit values in all years presented. There was one exceedence of the 24-hour mean $PM_{10}$ objective recorded in 2007.

**Table 3: Summary of $PM_{10}$ and $PM_{2.5}$ Automatic Monitoring (2007-2012) [a, b]**

| Site No. | Site Type | Location | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| **$PM_{10}$ Annual Mean (µg/m$^3$)** | | | | | | | | |
| **CD1** | Kerbside | Swiss Cottage | 30.2 | 27.5 | 25.4 | 26.1 | 26.8 | 22.6 |
| **Objective** | | | **40** | | | | | |
| **$PM_{10}$ No. Days >50 µg/m$^3$** | | | | | | | | |
| **CD1** | Kerbside | Swiss Cottage | **37** | 19 | 11[c] (46) | 10 | 31 | 20 |
| **Objective** | | | **35 (50)** | | | | | |
| **$PM_{2.5}$ Annual Mean (µg/m$^3$)[d]** | | | | | | | | |
| **CD1** | Kerbside | Swiss Cottage | **-** | **-** | 17.4 | 16.5 | 16.1 | 13.3 |
| **Objective** | | | **25 [d]** | | | | | |

[a] Exceedences of the objectives are shown in bold

[b] Reference equivalent. Data downloaded from the London Air Website (King's College London, 2013).

[c] Data capture was below 75%, and thus for $PM_{10}$ the 90$^{th}$ percentile of daily means is provided in parentheses.

[d] There are no objectives for $PM_{2.5}$ that apply during these years, however the European Union limit value of 25 µg/m$^3$ is to be met by 2015.

## Background Concentrations

### *National Background Pollution Maps*

4.9 In addition to these locally measured concentrations, estimated background concentrations in the study area have been determined for 2012 (Table 7). The derivation of background concentrations is described in Appendix A5. The background concentrations are all well below the objectives.

**Table 4: Estimated Annual Mean Background Pollutant Concentrations in 2012 (µg/m$^3$)**

| Year | $NO_2$ | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|
| **2012 [a]** | 28.8 | 18.3 | 13.0 |
| **Objectives** | **40** | **40** | **25 [b]** |

[a] This assumes vehicle emission factors in 2012 remain the same as 2010 (See Appendix A5).

[b] There are no objectives for $PM_{2.5}$ that apply during these years, however the European Union limit value of 25 µg/m$^3$ is to be met by 2015.

# 5 Impact Assessment

## Operational Impacts

5.1 The modelled impacts of the combined existing and development generated traffic on air quality conditions for residents occupying the new residential units in the proposed development are set out in Table 5 for Receptors 1 to 18 (see Figure 1 for receptor locations). All the values are below the objectives. Air quality for future residents within the development would thus be acceptable.

**Table 5: Predicted Concentrations of Nitrogen Dioxide ($NO_2$), $PM_{10}$ and $PM_{2.5}$ in 2012 for New Receptors in the Development Site**

| Receptor | $NO_2$ (µg/m$^3$) | | $PM_{10}$ (µg/m$^3$) [a] | | | | $PM_{2.5}$ (µg/m$^3$) | |
|---|---|---|---|---|---|---|---|---|
| | Annual Mean | | Annual Mean | | No. Days >50 µg/m$^3$ | | Annual Mean | |
| | 1st [b] | 2nd [b] | 1st | 2nd | 1st | 2nd | 1st | 2nd |
| **1** | 32.5 | 31.3 | 18.8 | 18.6 | 2 | 2 | 13.4 | 13.3 |
| **2** | 32.8 | 31.4 | 18.8 | 18.6 | 2 | 2 | 13.4 | 13.3 |
| **3** | 33.6 | 31.7 | 18.9 | 18.7 | 2 | 2 | 13.5 | 13.3 |
| **4** | 35.0 | n/a | 19.1 | n/a | 2 | n/a | 13.6 | n/a |
| **5** | 35.2 | n/a | 19.1 | n/a | 2 | n/a | 13.6 | n/a |
| **6** | 35.2 | n/a | 19.1 | n/a | 2 | n/a | 13.6 | n/a |
| **7** | 34.6 | n/a | 19.0 | n/a | 2 | n/a | 13.5 | n/a |
| **8** | 33.9 | n/a | 19.0 | n/a | 2 | n/a | 13.5 | n/a |
| **9** | 33.5 | n/a | 18.9 | n/a | 2 | n/a | 13.5 | n/a |
| **10** | 32.9 | n/a | 18.8 | n/a | 2 | n/a | 13.4 | n/a |
| **11** | 32.1 | 31.2 | 18.7 | 18.6 | 2 | 2 | 13.3 | 13.3 |
| **12** | 32.0 | 31.1 | 18.7 | 18.6 | 2 | 2 | 13.3 | 13.2 |
| **13** | 31.1 | 30.7 | 18.6 | 18.5 | 2 | 2 | 13.3 | 13.2 |
| **14** | 30.9 | 30.5 | 18.6 | 18.5 | 2 | 2 | 13.2 | 13.2 |
| **15** | 31.1 | 30.6 | 18.6 | 18.5 | 2 | 2 | 13.3 | 13.2 |
| **16** | 31.4 | 30.7 | 18.6 | 18.5 | 2 | 2 | 13.3 | 13.2 |
| **17** | 31.6 | 30.9 | 18.7 | 18.6 | 2 | 2 | 13.3 | 13.2 |
| **18** | 31.4 | 30.8 | 18.6 | 18.6 | 2 | 2 | 13.3 | 13.2 |
| **Objectives** | 40 | | 40 | | 35 | | 25 [c] | |

[a] The numbers of days with $PM_{10}$ concentrations greater than 50 µg/m$^3$ have been estimated from the relationship with the annual mean concentration described in LAQM.TG (09) (Defra, 2009).

[b] First floor has been modelled at 4.5 m and the second floor at 8.0 m.

[c] There are no objectives for $PM_{2.5}$ that apply during these years, however the European Union limit value of 25 µg/m$^3$ is to be met by 2015.

### *Uncertainty in Road Traffic Modelling Predictions*

5.2 There are many components that contribute to the uncertainty of modelling predictions. The model used in this assessment is dependent upon the traffic data that have been input, which will have inherent uncertainties associated with them. There are then additional uncertainties, as the model is required to simplify real-world conditions into a series of algorithms. An important stage in the process is model verification, which involves comparing the model output with measured concentrations (see Appendix A5). Because the model has been verified and adjusted, there can be reasonable confidence in the prediction of the 2012 concentrations.

5.3 A disparity between the road transport emission projections and measured annual mean concentrations of nitrogen oxides and nitrogen dioxide has been identified by Defra (Carslaw et al., 2011). This is evident across the UK, although the effect appears to be greatest in inner London; there is also considerable inter-site variation. Whilst the emission projections suggested that both annual mean nitrogen oxides and nitrogen dioxide concentrations should have fallen by around 15-25% over the past 6 to 8 years, at many monitoring sites levels have remained relatively stable, or have even shown a slight increase.

5.4 This disparity led to a detailed review of the emission factors and fleet mix for UK conditions, and in July 2012, Defra issued a revised Emissions Factors Toolkit (ETFv5.1.3). This has since been updated to version EFTv5.2c, which has undergone some further, more minor, revisions. The new EFT utilises revised nitrogen oxides emissions factors and also incorporates revised vehicle fleet composition data (Defra, 2012). The new EFT goes some way to addressing the disparity between air quality measurements and emissions, but does not fully address it, and it is recognised that the forecast reductions may still be optimistic in the near-term (i.e. the next five years or so).

5.5 The reason for the disparity is thought to relate to the on-road performance of modern diesel vehicles. New vehicles registered in the UK have to meet progressively tighter European type approval emissions categories, referred to as "Euro" standards. While the nitrogen oxides emissions from newer vehicles should be lower than those from equivalent older vehicles, the on-road performance of some modern diesel vehicles is often no better than that of earlier models (Carslaw et al., 2011). The best current evidence is that, where previous standards have had limited on-road success, the 'Euro VI' and 'Euro 6' standards that new vehicles will have to comply with from 2013/15[2] will achieve the expected on-road improvements, as, for the first time, they will require compliance with the World Harmonized Test Cycle, which better represents real-world driving conditions and includes a separate slow-speed cycle for heavy duty vehicles.

[2] Euro VI refers to heavy duty vehicles, while Euro 6 refers to light duty vehicles. The timings for meeting the standards vary with vehicle type and whether the vehicle is a new model or existing model.

5.6 Modelling has been undertaken for 2012 thus presenting a worst-case scenario. In reality the residential units will not be occupied until at the earliest 2015 and therefore the modelling will have overestimated the traffic emissions, which will, in part, offset any potential underestimation in future concentrations using the official emission factors as described above.

### Significance of Operational Air Quality Impacts

5.7 The operational air quality impacts are judged to be *insignificant*. This professional judgement is made in accordance with the methodology set out in Paragraph A3.1 (Appendix A3) taking into account the factors set out in Table 6, and also taking into account the uncertainty over future projections of traffic-related nitrogen dioxide concentrations, which may not decline as rapidly as expected. The latter has been addressed by undertaking the modelling for a worst-case year of 2012.

5.8 More specifically, the judgement that the air quality impacts will be *insignificant* takes account of the assessment that concentrations will be below the air quality objectives.

**Table 6: Factors Taken into Account in Determining the Overall Significance of the Scheme on Local Air Quality**

| Factors | Outcome of Assessment |
|---|---|
| The number of people exposed to levels above the objective or limit value, where new exposure is being introduced. | There are no predicted exceedences of the air quality objectives or limit values. |
| Uncertainty, including the extent to which worst-case assumptions have been made | Undertaking the modelling for a baseline year of 2012 and including the proposed development traffic covers the uncertainty over vehicle emission factors. |
| The extent to which an objective or limit value is exceeded | None of the objectives are exceeded. |

## Construction Impacts

5.9 The construction works will give rise to a risk of dust impacts during demolition, earthworks and construction, as well as from trackout of dust and dirt by vehicles onto the public highway. There are various sensitive receptors that may be affected by dust, including residential properties, and less sensitive commercial premises. There are no sensitive ecological receptors that might be affected.

### *Demolition*

5.10 There will be a requirement to demolish two brick buildings and garages; the method of demolition has not yet been decided. There will be four receptors within 20 m of these buildings and garages, however, there will be up to 100 dwellings and commercial premises between 20-100 m of the demolition area in all directions, and further dwellings and commercial premises between 100-350 m, on all sides. A mobile crusher may be used on site before removal of the material, but this has not yet been decided. The dust emission class for the demolition is considered to be *small*.

### *Earthworks*

5.11 The site covers some 1,500 $m^2$ and most of this will be subject to earthworks, involving removal of the foundations of the demolished buildings and breaking up of paved areas. There will be a small number of residential dwellings and commercial buildings within 20 m of the area subject to earthworks and a larger number of dwellings and commercial premises (up to 100) between 20-100 m, with further dwellings and commercial premises between 100-350 m from the site, on all sides. During the earthworks dust will arise mainly from the vehicles travelling over unpaved ground and from the handling of dusty materials. Most of the earthworks will though involve the removal of subsoil, which will largely be damp and not prone to creating dust. The dust emission class for the earthworks is considered to be *small*.

### *Construction*

5.12 The construction will involve two brick built mixed-use properties, with a total building volume of less than 25,000 $m^3$. Dust will arise from vehicles travelling over unpaved ground, the handling and storage of dusty materials, and from the cutting of concrete. There will be a small number of residential and commercial dwellings within 20 m of the area subject to earthworks and a larger number of dwellings and commercial premises (up to 100) between 20-100 m, with further dwellings and commercial premises between 100-350 m from the site, on all sides. The construction will take place over an 18 month period. The dust emission class for the construction is considered to be *small*.

### *Trackout*

5.13 The number of vehicles accessing the site, which may track out dust and dirt is currently unknown, but given the small size of the site it is likely that there will be less than 25 vehicle movements per day. There are a moderate number of properties lying within 20 m of the public highway within 50 m of the site entrance/exit, which may be affected by dust. The dust emission class for trackout is considered to be *small*.

### *Risk and Significance*

5.14 Using the criteria in Appendix A2 the risk categories for the four construction activities, without mitigation, are judged to be as set out in Table 7.

**Table 7: Summary of Risk of Effects Without Mitigation**

| Source | Dust Soiling | Ecological effects | $PM_{10}$ effects |
|---|---|---|---|
| **Demolition** | Medium Risk Site | None | Medium Risk Site |
| **Earthworks** | Medium Risk Site | None | Medium Risk Site |
| **Construction** | Medium Risk Site | None | Medium Risk Site |
| **Trackout** | Medium Risk Site | None | Medium Risk Site |

5.15 The sensitivity of the areas around the site to dust from the four sources is judged to be as shown in Table 8, together with a summary of the factors used to classify the sensitivity of the area.

**Table 8: Sensitivity of the Area**

| Sensitivity of area | Human receptors | Ecological receptors | |
|---|---|---|---|
| | Factors for Classification of Sensitivity | Sensitivity of area | Factors for Classification of Sensitivity |
| **Demolition** | | | |
| **Medium (Dust)**<br>**Low ($PM_{10}$)** | Suburban or edge of town area.<br>Fewer than 10 receptors within 20m.<br>Local $PM_{10}$ concentrations well below the objectives (less than 75%). | **Low** | No designations. |
| **Earthworks** | | | |
| **Medium (Dust)**<br>**Low ($PM_{10}$)** | Suburban or edge of town area.<br>Fewer than 10 receptors within 20m.<br>Local $PM_{10}$ concentrations well below the objectives (less than 75%). | **Low** | No designations. |
| **Construction** | | | |
| **Medium (Dust)**<br>**Low ($PM_{10}$)** | Suburban or edge of town area.<br>Fewer than 10 receptors within 20m.<br>Local $PM_{10}$ concentrations well below the objectives (less than 75%). | **Low** | No designations. |
| **Trackout** | | | |
| **High (Dust)**<br>**Low ($PM_{10}$)** | 10-100 dwellings within 20m of roads likely to receive trackout.<br>Suburban or edge of town area.<br>Local $PM_{10}$ concentrations well below the objectives (less than 75%). | **Low** | No designations. |

5.16 On this basis the significance of dust effects without mitigation will be as set out in Table 9, using the criteria in Table A2.5.

**Table 9: Summary Significance Table Without Mitigation**

| Source | Dust soiling effects | Ecological effects | $PM_{10}$ effects |
|---|---|---|---|
| **Demolition** | Slight adverse | None | Negligible |
| **Earthworks** | Slight adverse | None | Negligible |
| **Construction** | Slight adverse | None | Negligible |
| **Trackout** | Moderate adverse | None | Negligible |
| **Overall significance** | **Slight Adverse** | | |

# 6 Mitigation

## Road Traffic Impacts

6.1 The assessment has demonstrated that the scheme would not cause any exceedences of the air quality objectives. Mitigation measures to reduce pollutant emissions from road traffic are principally being delivered in the longer term by the introduction of more stringent emissions standards, largely via European legislation. It is not considered appropriate to propose further mitigation measures for this scheme. The Council's Air Quality Action Plan will also be helping to deliver improved air quality.

## Construction Impacts

6.2 Measures to mitigate dust emissions will be required during the construction phase of the development in order to reduce impacts upon nearby residential properties.

6.3 The site has been identified as a *Medium* Risk site as set out in Table 7. The GLA Best Practice Guidance (GLA, 2006) describes best practice measures that should be employed, as appropriate, to reduce the impact of a *medium* risk site. However, more comprehensive guidance has been published by IAQM on mitigation measures to control dust and air emissions (Institute of Air Quality Management, 2012a), and on monitoring during demolition and construction (Institute of Air Quality Management, 2012b). This reflects best practice experience and has been used, together with the professional experience of the consultant and the findings of the dust impact assessment, to draw up a set of measures that should be incorporated into the specification for the works. These measures are described in Appendix A6. Mitigation should be straightforward, as most of the necessary measures are routinely employed as 'good practice' on construction sites.

6.4 It is understood that a Construction Management Scheme will be secured for the proposed development by way of a planning obligation. The mitigation measures should be written into a dust management plan (DMP) which should be integrated into this scheme

6.5 Where mitigation measures rely on water, it is expected that only sufficient water will be applied to damp down the material. There should not be any excess to potentially contaminate local watercourses.

# 7 Residual Impacts

## Road Traffic Impacts

7.1 The residual impacts will be the same as those identified in Section 5, which concluded that the scheme will not introduce any new exposure to exceedences of the air quality objectives.

## Construction Impacts

7.2 Table 10 provides an overall summary table of the residual effects of dust and $PM_{10}$ during construction with mitigation in place.

**Table 10: Summary Significance Table With Mitigation**

| Source | Dust soiling effects | Ecological effects | $PM_{10}$ effects |
|---|---|---|---|
| **Demolition** | Negligible | None | Negligible |
| **Earthworks** | Negligible | None | Negligible |
| **Construction** | Negligible | None | Negligible |
| **Trackout** | Negligible | None | Negligible |
| **Overall significance** | **Negligible** | | |

7.3 With mitigation in place, there is a *negligible* risk of dust impacts during the construction phase.

# 8 Summary and Conclusions

8.1 The air quality impacts associated with the construction and operation of the proposed re-development of land at Swain's Lane in the LB of Camden have been assessed. Existing conditions within the study area show poor air quality close to main routes. An AQMA has been declared for across the whole borough for exceedences of the nitrogen dioxide and $PM_{10}$ objectives.

8.2 The scale of the development is such that it will not significantly increase traffic on local roads. However, the impacts of traffic from local roads on the air quality for future residents have been assessed at eighteen locations within the new development. Concentrations have been predicted for 2012, but in reality the residential units will not be occupied until at the earliest 2015 and therefore predicting concentrations in 2012 will represent a worst case scenario as the modelling will have overestimated the traffic emissions.

8.3 The impacts of local traffic on the air quality for residents living in the proposed development have been shown to be acceptable at the worst-case locations assessed, with concentrations being below the air quality objectives. The overall operational air quality impacts of the development are therefore judged to be *insignificant*.

8.4 The construction works have the potential to create dust. During construction it will therefore be necessary to apply a package of mitigation measures to minimise dust emission. With these measures in place, any impacts are considered to be *negligible*. The overall impacts during construction are judged to be *insignificant*.

8.5 The proposed development is consistent with the NPPF. Furthermore, the scheme does not conflict with the requirements of policies related to air quality outlined in the Local Plan, Core Strategy and Development Policies DPD.

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# 10 Glossary

**AADT** Annual Average Daily Traffic

**ADMS-Roads** Atmospheric Dispersion Modelling System

**AQMA** Air Quality Management Area

**AURN** Automatic Urban and Rural Network

**Defra** Department for Environment, Food and Rural Affairs

**DfT** Department for Transport

**EFT** Emissions Factor Toolkit

**Exceedence** A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure

**HDV** Heavy Duty Vehicles (> 3.5 tonnes)

**LDV** Light Duty Vehicles (<3.5 tonnes)

**LEZ** Low Emission Zone

**$\mu g/m^3$** Microgrammes per cubic metre

**NO** Nitric oxide

**$NO_2$** Nitrogen dioxide

**NOx** Nitrogen oxides (taken to be $NO_2$ + NO)

**Objectives** A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides

**PHV** Private Hire Vehicle

**$PM_{10}$** Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter

**$PM_{2.5}$** Small airborne particles less than 2.5 micrometres in aerodynamic diameter

**Standards** A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal

**TEA** Triethanolamine – used to absorb nitrogen dioxide

# 11 Appendices

# A1 Extracts from the London Plan and Mayor's Air Quality Strategy, and Description of the Low Emission Zone (LEZ)

## London Plan

A1.1 The London Plan sets out the following points in relation to planning decisions:

*"Development proposals should:*

*a) minimise increased exposure to existing poor air quality and make provision to address local problems of air quality (particularly within AQMAs or where development is likely to be used by large numbers of those particularly vulnerable to poor air quality, such as children or older people) such by design solutions, buffer zones or steps to promote greater use of sustainable transport modes through travel plans (see Policy 6.3);*

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

*c) be at least "air quality neutral" and not lead to further deterioration of existing poor air quality (such as areas designated as Air Quality Management Areas (AQMAs));*

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

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

## The Mayor's Air Quality Strategy

A1.2 The Mayor's Air Quality Strategy commits to the continuation of measures identified in the 2002 MAQS, and sets out a series of additional measures, including:

*Policy 1 – Encouraging smarter choices and sustainable travel;*

*Measures to reduce emissions from idling vehicles focusing on buses, taxis, coaches, taxis, PHVs and delivery vehicles;*

*Using spatial planning powers to support a shift to public transport;*

*Supporting car free developments.*

*Policy 2 – Promoting technological change and cleaner vehicles:*

*Supporting the uptake of cleaner vehicles.*

*Policy 4 – Reducing emissions from public transport:*

*Introducing age limits for taxis and PHVs.*

*Policy 5 – Schemes that control emissions to air:*

*Implementing Phases 3 and 4 of the LEZ from January 2012*

*Introducing a NOx emissions standard (Euro IV) into the LEZ for Heavy Goods Vehicles (HGVs), buses and coaches, from 2015.*

*Policy 7 – Using the planning process to improve air quality:*

*Minimising increased exposure to poor air quality, particularly within AQMAs or where a development is likely to be used by a large number of people who are particularly vulnerable to air quality;*

*Ensuring air quality benefits are realised through planning conditions and section 106 agreements and Community Infrastructure Levy.*

*Policy 8 – Creating opportunities between low to zero carbon energy supply for London and air quality impacts:*

*Applying emissions limits for biomass boilers across London;*

*Requiring an emissions assessment to be included at the planning application stage.*

### *Low Emission Zone (LEZ)*

A1.3 A key measure to improve air quality in Greater London is the Low Emission Zone (LEZ). This entails charges for vehicles entering Greater London not meeting certain emissions criteria, and affects older, diesel-engined lorries, buses, coaches, large vans, minibuses and other specialist vehicles derived from lorries and vans. The LEZ was introduced on 4th February 2008, and was phased in through to January 2012. From January 2012 a standard of Euro IV was implemented for lorries and other specialist diesel vehicles over 3.5 tonnes, and buses and coaches over 5 tonnes. Cars and lighter Light Goods Vehicles (LGVs) are excluded. The third phase of the LEZ, which applies to larger vans, minibuses and other specialist diesel vehicles, was also implemented in January 2012. As set out in the 2010 MAQS, a NOx emissions standard (Euro IV) will be included into the LEZ for HGVs, buses and coaches, from 2015.

# A2 Construction Dust Assessment Criteria

## Assessment Procedure

A2.1 The criteria developed by IAQM divide the activities on construction sites into four types to reflect their different potential impacts. These are:

- demolition;
- earthworks;
- construction; and
- trackout.

A2.2 The assessment procedure is split into four steps summarised below:

### *STEP 1: Screen the Need for a Detailed Assessment*

A2.3 An assessment is required where there are sensitive receptors within 350 m of the boundary of the site and/or within 100 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

A2.4 Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is *negligible*.

### *STEP 2: Assess the Risk of Dust Effects Arising*

A2.5 The risk of dust effects is determined by:

- the scale and nature of the works, which determines the risk of dust arising; and
- the proximity of sensitive receptors.

A2.6 The risk categories assigned to the site are different for each of the four potential sources of dust (demolition, earthworks, construction and trackout).

### *Demolition*

A2.7 The potential dust emission classes for demolition are as follows:

**Large**: Total building volume >50,000m$^3$, potentially dusty construction material (e.g. concrete),on site crushing and screening, demolition activities >20m above ground level;

**Medium**: Total building volume 20,000m$^3$ – 50,000m$^3$, potentially dusty construction material, demolition activities 10-20m above ground level; and

**Small**: Total building volume <20,000m$^3$, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months.

A2.8 The potential dust emission class determined above should be used in the matrix in Table A2.1 to determine the **demolition risk category** with no mitigation applied based on the distance to the nearest receptors.

**Table A2.1: Risk Category from Demolition Activities**

| Distance to Nearest Receptor (m)[a] | | Dust Emission Class | | |
|---|---|---|---|---|
| **Dust Soiling and $PM_{10}$** | **Ecological** | **Large** | **Medium** | **Small** |
| **<20** | **-** | High Risk Site | High Risk SIte | Medium Risk Site |
| **20 – 100** | **<20** | High Risk Site | Medium Risk Site | Low Risk Site |
| **100 – 200** | **20 – 40** | Medium Risk Site | Low Risk Site | Low Risk Site |
| **200 – 350** | **40-100** | Medium Risk Site | Low Risk Site | Negligible |

a These distances are from the dust emission source. Where this is not known then the distance should be from the site boundary. The risk is based on the distance to the nearest receptor.

## *Earthworks and Construction*

A2.9 The potential dust emission classes for earthworks are as follows:

**Large:** Total site area >10,000m$^2$, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry to due small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8m in height, total material moved >100,000tonne;

**Medium:** Total site area 2,500m$^2$ – 10,000m$^2$, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4m – 8m in height, total material moved 20,000tonne – 100,000tonne; and

**Small:** Total site area <2,500m$^2$, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4m in height, total material moved <10,000tonne, earthworks during wetter months.

A2.10 The potential dust emission classes for construction are as follows:

**Large:** Total building volume >100,000m$^3$, piling, on site concrete batching; sandblasting

**Medium:** Total building volume 25,000m$^3$ – 100,000m$^3$, potentially dusty construction material (e.g. concrete), piling, on site concrete batching; and

**Small:** Total building volume <25,000m$^3$, construction material with low potential for dust release (e.g. metal cladding or timber).

A2.11 These potential dust emission classes should then be used in the matrix in Table A2.2 to determine the **earthworks risk category and the construction risk category** with no mitigation applied.

**Table A2.2: Risk Category from Earthworks and Construction Activities**

| Distance to Nearest Receptor (m)[a] | | Dust Emission Class | | |
|---|---|---|---|---|
| **Dust Soiling and $PM_{10}$** | **Ecological** | **Large** | **Medium** | **Small** |
| **<20** | **-** | High Risk Site | High Risk Site | Medium Risk Site |
| **20 – 50** | **-** | High Risk Site | Medium Risk Site | Low Risk Site |
| **50 – 100** | **<20** | Medium Risk Site | Medium Risk Site | Low Risk Site |
| **100 – 200** | **20 – 40** | Medium Risk Site | Low Risk Site | Negligible |
| **200 – 350** | **40-100** | Low Risk Site | Low Risk Site | Negligible |

[a] These distances are from the dust emission source. Where this is not known then the distance should be from the site boundary. The risk is based on the distance to the nearest receptor.

### *Trackout*

A2.12 The potential dust emission classes for trackout are as follows:

**Large:** >100 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;

**Medium:** 25-100 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100m; and

**Small** / **Medium:** <25 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50m.

A2.13 These potential dust emission classes should be used in Table A2.3 to determine the **risk category for trackout** with no mitigation applied.

**Table A2.3: Risk Category from Trackout**

| Distance to Nearest Receptor (m)[a] | | Dust Emission Class | | |
|---|---|---|---|---|
| **Dust Soiling and $PM_{10}$** | **Ecological** | ***Large*** | **Medium** | **Small** |
| **<20** | **-** | High Risk Site | Medium Risk Site | Medium Risk Site |
| **20 – 50** | **<20m** | Medium Risk Site | Medium Risk Site | Low Risk Site |
| **50-100** | **20-100** | Low Risk Site | Low Risk Site | Negligible |

[a] For trackout the distance is from the roads used by construction traffic.

A2.14 There is an extra dimension to the assessment of trackout, as the distance over which it might occur depends on the site. As general guidance, significant trackout may occur up to 500 m from *large* sites, 200 m from *medium* sites and 50 m from *small* sites, as measured from the site exit. These distances assume no site-specific mitigation.

A2.15 The 'distance to receptor' in Table A2.3 relates to the distance from the road where mud may be deposited. Therefore in determining the risk from trackout, both distances need to be taken into account.

### *STEP 3: Identify the Need for Site-specific Mitigation*

A2.16 Having determined the risk categories for each of the four activities it is possible to determine the site-specific measures to be adopted. These measures will be related to whether the site is a *low*, *medium* or *high* risk site.

### *STEP 4: Define Effects and their Significance*

A2.17 The significance is determined using professional judgement, taking account of the factors that define the sensitivity of the surrounding area and the overall pattern of potential risks set out within the risk effects summary table. The sensitivity of the area is defined as *very high*, *high*, *medium* and *low* based on the criteria in Table A2.4

**Table A2.4: Examples of Factors Defining Sensitivity of an Area**

| Sensitivity of area | Examples | |
|---|---|---|
| | **Human receptors** | **Ecological receptors**[a] |
| **Very high** | • Very densely populated area.<br>• More than 100 dwellings within 20m.<br>• Local $PM_{10}$ concentrations exceed the objective.<br>• Contaminated buildings present.<br>• Very sensitive receptors (e.g. oncology units).<br>• Works continuing in one area of the site for more than one year. | European Designated site. |
| **High** | • Densely populated area.<br>• 10-100 dwellings within 20m of site.<br>• Local $PM_{10}$ concentrations close to the objective (e.g. annual mean 36-40 µg/m$^3$).<br>• Commercially sensitive horticultural land within 20m. | Nationally Designated site. |
| **Medium** | • Suburban or edge of town area.<br>• Less than 10 receptors within 20m.<br>• Local $PM_{10}$ concentrations below the objective (e.g. annual mean 30-36 µg/m$^3$). | Locally designated site. |
| **Low** | • Rural area; industrial area<br>• No receptors within 20m<br>• Local $PM_{10}$ concentrations well below the objectives (less than 75%)<br>• Wooded area between site and receptors | No designations. |

[a] Only if there are habitats that might be sensitive to dust

A2.18 The sensitivity of the area surrounding the construction / demolition site is combined with the risk of the site giving rise to dust effects to define the significance of the effects for each of the four activities (demolition, earthworks, construction and trackout) using Table A2.5 for the baseline without mitigation and Table A2.6 when mitigation is applied.

**Table A2.5: Significance of Effects for Each Activity Without Mitigation.**

| Sensitivity of surrounding area | Risk of site giving rise to dust effects | | |
|---|---|---|---|
| | **High** | **Medium** | **Low** |
| **Very High** | Substantial adverse | Moderate adverse | Moderate adverse |
| **High** | Moderate adverse | Moderate adverse | Slight adverse |
| **Medium** | Moderate adverse | Slight adverse | Negligible |
| **Low** | Slight Adverse | Negligible | Negligible |

**Table A2.6: Significance of Effects for Each Activity With Mitigation.**

| Sensitivity of surrounding area | Risk of site giving rise to dust effects | | |
|---|---|---|---|
| | High | Medium | Low |
| Very High | Slight adverse | Slight adverse | Negligible |
| High | Slight adverse | Negligible | Negligible |
| Medium | Negligible | Negligible | Negligible |
| Low | Negligible | Negligible | Negligible |

A2.19 The final step is to determine the overall significance of the effects arising from the construction phase of a proposed development. This is based on professional judgement but takes into account of the significance of the effects for each of the four activities.

# A3 Assessment of Significance

A3.1 There is no official guidance in the UK on how to assess the significance of air quality impacts of existing sources on a new development. The approach developed by the Institute of Air Quality Management[3] (Institute of Air Quality Management, 2009), and incorporated in Environmental Protection UK's guidance document on planning and air quality (Environmental Protection UK, 2010), has therefore been used. The guidance is that the assessment of significance should be based on professional judgement, with the overall air quality impact of the scheme described as either, *insignificant*, *minor*, *moderate* or *major*. In drawing this conclusion, the factors set out in Table A3.1 should be taken into account. A summary of the professional experience of the staff contributing to this assessment is provided in Appendix A4.

**Table A3.1: Factors Taken into Account in Determining Air Quality Significance**

| Factors |
|---|
| The number of people exposed to levels above the objective or limit value, where new exposure is being introduced. |
| Uncertainty, including the extent to which worst-case assumptions have been made |
| The extent to which an objective or limit value is exceeded, e.g. an annual mean $NO_2$ of 41 $\mu g/m^3$ should attract less significance than an annual mean of 51 $\mu g/m^3$ |

[3] The IAQM is the professional body for air quality practitioners in the UK.

# A4 Professional Experience

## Penny Wilson, BSc (Hons) CSci MIEnvSc MIAQM

Ms Wilson is a Principal Consultant with AQC, with more than ten years' relevant experience in the field of air quality. She has been responsible for air quality assessments of a wide range of development projects, covering retail, housing, roads, ports, railways and airports. She has also prepared air quality review and assessment reports and air quality action plans for local authorities and appraised local authority assessments on behalf of the UK governments. Ms Wilson has analysed and interpreted air quality data from the national air quality network and new local authority monitoring, as well as from monitoring of dust. She has also arranged monitoring programmes for PM10, sulphur dioxide and nitrogen dioxide. Ms Wilson has provided expert witness services for planning appeals. She is a Member of the Institute of Air Quality Management.

## Laurence Caird, MEarthSci CSci MIEnvSc MIAQM

Mr Caird is a Principal Consultant with AQC, with seven years' experience in the field of air quality including the completion of air quality assessments for local authorities, new commercial and residential developments, road schemes, airports and industrial processes in the UK. He has experience in ambient air quality monitoring for numerous pollutants using a wide range of techniques and is also competent in the monitoring and assessment of nuisance odours and construction dust. Mr Caird has worked with a variety of clients to provide expert air quality services and advice, including local authorities, planners, developers and process operators. He is a Member of the Institute of Air Quality Management.

## Caroline Odbert, BA (Hons) MSc MIEnvSc MIAQM

Ms Odbert is a Senior Consultant with AQC with over four years' relevant experience. She is involved in the preparation of air quality assessments for a range of development projects. She has been responsible for a wide range of air quality projects covering impact assessments for new residential and commercial developments, local air quality management, ambient air quality monitoring of nitrogen dioxide and sulphur dioxide and the assessment of nuisance odours. She has extensive modeling experience for road traffic and has worked with a variety of clients to provide expert air quality services and advice, including local authorities, planners, developers and process operators. She is a Member of the Institute of Air Quality Management.

Full CVs are available at www.aqconsultants.co.uk

# A5 Modelling Methodology

## Background Concentrations

A5.1 The background concentrations across the study area have been defined using the national pollution maps published by Defra (2013b). These cover the whole country on a 1x1 km grid and are published for each year from 2010 until 2025. The maps include the influence of emissions from a range of different sources; one of which is road traffic. There are some concerns that Defra may have over-predicted the rate at which road traffic emissions of nitrogen oxides will fall in the future. The maps currently in use were verified against measurements made during 2010 at a large number of automatic monitoring stations and so there can be reasonable confidence that the maps are representative of conditions during 2010. Similarly, there is reasonable confidence that the reductions which Defra predicts from other sectors (e.g. rail) will be achieved.

A5.2 In order to calculate background nitrogen dioxide and nitrogen oxides concentrations in 2012, it is assumed that there was no reduction in the road traffic component of backgrounds between 2010[4] and 2012. This has been done using the source-specific background nitrogen oxides maps provided by Defra (2013b). For each grid square, the road traffic component has been held constant at 2010 levels, while 2012 values have been taken for the other components. Nitrogen dioxide concentrations have then been calculated using the background nitrogen dioxide calculator which Defra (2013b) publishes to accompany the maps. The result is a set of 'adjusted 2012 background' concentrations.

A5.3 As an additional step, the background maps have been calibrated against national measurements made as part of the AURN during 2012. The published background maps were calibrated against 2010 monitoring data. 2010 was identified as a 'high pollution' year, as a result the background maps may over predict the local background concentrations. Therefore a comparison between the 2012 annual mean nitrogen dioxide concentration at all background monitoring sites within the AURN and the background mapped concentrations has been carried out (see Figure A5.1). Based on the 62 sites with more than 75% data capture for 2012, the maps over-predict the background concentrations by 1.9%, on average. This has been allowed for in production of the calibrated 'adjusted' 2012 background concentrations.

4 This approach assumes that has been no reduction in emissions per vehicle but also that traffic volumes have remained constant. This is not the same as the assumption made for dispersion modelling, in which emissions per vehicle are held constant while traffic volumes are assumed to change year on year. Overall, this discrepancy is unlikely to influence the overall conclusions of the assessment.

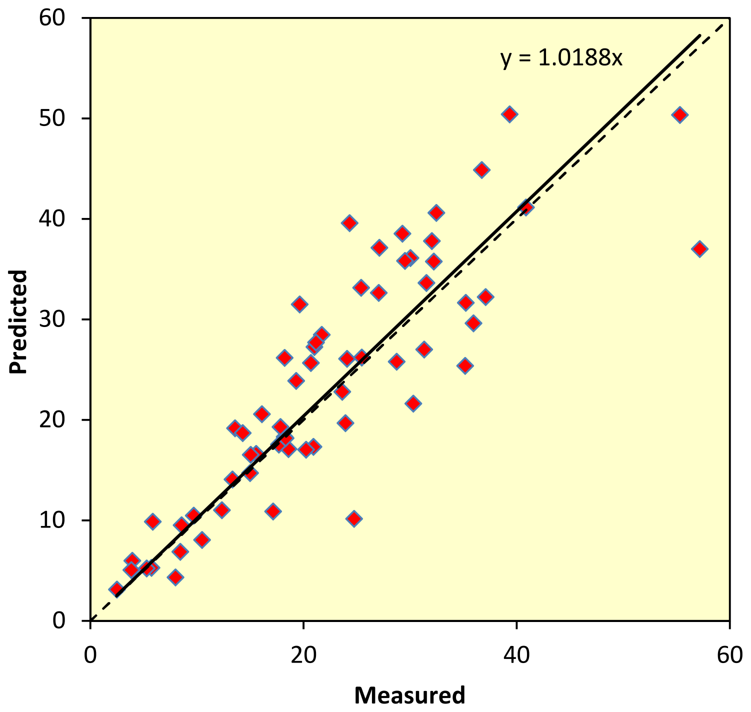


**Figure A5.1: Predicted Mapped versus Measured Concentrations at AURN Background Sites in 2012**

A5.4 For $PM_{10}$ and $PM_{2.5}$, there is no strong evidence that Defra's predictions are unrealistic and so the year-specific mapped concentrations have been used in this assessment.

## Model Inputs

### *Roads*

A5.5 Predictions have been carried out using the ADMS-Roads dispersion model (v3.1). The model requires the user to provide various input data, including emissions from each section of road, and the road characteristic (including road width and street canyon height, where applicable). Vehicle emissions have been calculated based on vehicle flow, composition and speed using the Emission Factor Toolkit (Version 5.2c) published by Defra (2013b).

A5.6 The model has been run using the most recent full year of meteorological data (2012) from the monitoring station located at Heathrow Airport, which is considered suitable for this area.

A5.7 AADT flows, speeds, and vehicle fleet composition data for Swain's Lane, Highgate West Hill and Highgate Road have been provided by Vectos. These were derived from weekday counts, which may over-predict annual average flows. The traffic data used in this assessment are summarised in Table A5.1.

**Table A5.1: Summary of Traffic Data used in the Assessment (AADT)**

| Road Link | 2012 | |
|---|---|---|
| | AADT | %HDV |
| **Swain's Lane** | 3,106 | 3.8 |
| **Highgate West Hill** | 8,456 | 4.4 |
| **Highgate Road** | 11,835 | 6.8 |

11.1 Diurnal flow profiles for the traffic data have been derived from the national diurnal profiles published by DfT (DfT, 2011).

## Model Verification

A5.8 In order to ensure that ADMS-Roads accurately predicts local concentrations, it is necessary to verify the model against local measurements. The verification methodology is described below.

A5.9 The 2012 background concentration for the diffusion tube site on Chetwynd Road has been derived from the national maps, and is calculated using the same approach as described for the 2012 data (Paragraph A5.2): the road traffic component of background nitrogen oxides is held constant at 2010, while 2012 data are taken for the other components. Nitrogen dioxide is then calculated using Defra's background nitrogen dioxide calculator. The nitrogen dioxide background concentration for the diffusion tube location is presented in Table A5.2.

**Table A5.2: Background Concentrations used in the Verification for 2012**

| | Grid square | $NO_2$ |
|---|---|---|
| **2012** | 528500, 185500 | 33.3 |

A5.10 AADT flows, and the proportions of HDVs, for the roads adjacent to the monitoring site, have been taken from the London Atmospheric Emissions Inventory (LAEI) (GLA, 2013). Traffic speeds were based on those presented in the LAEI. Traffic data used in the model verification are presented in Table A5.3.

**Table A5.3: AADT Traffic Data used in the Model Verification[a]**

| Road Link | 2012 |
|---|---|
| **Highgate Road (South of Chetwynd Road)** | 21,803 |
| **Chetwynd Road** | 11,921 |
| **Gordon House Road** | 11,536 |

[a] This is just a summary of the data entered into the model, which were input as hourly average flows of motorcycles, cars, buses, Light Goods Vehicles and Heavy Goods Vehicles, as well as diurnal flow profiles for these vehicles.

A5.11 Most nitrogen dioxide ($NO_2$) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides ($NOx = NO + NO_2$). The model has been run to predict the annual mean NOx concentrations during 2012 at the Chetwynd Road diffusion tube monitoring site. Concentrations have been modelled at 2.5 m, the height of the monitor.

A5.12 The model output of road-NOx (i.e. the component of total NOx coming from road traffic) has been compared with the 'measured' road-NOx. Measured road-NOx was calculated from the measured $NO_2$ concentration and the predicted background $NO_2$ concentration using the NOx from $NO_2$ calculator available on the Defra LAQM Support website (Defra, 2013b).

A5.13 An adjustment factor was determined as the ratio of the 'measured' road contribution and the model derived road contribution. This factor was then applied to the modelled road-NOx concentration for each receptor to provide adjusted modelled road-NOx concentrations. The total nitrogen dioxide concentrations were then determined by combining the adjusted modelled road-NOx concentrations with the predicted background $NO_2$ concentration within the NOx from $NO_2$ calculator (Defra, 2013b).

A5.14 The data used to calculate the adjustment factor are provided below:

- Measured $NO_2$ : 43.7 µg/m$^3$
- Background $NO_2$ : 33.3 µg/m$^3$
- 'Measured' road-NOx (from NOx to $NO_2$ calculator): 24.2 µg/m$^3$
- Modelled road-NOx = 12.4 µg/m$^3$
- Road-NOx adjustment factor: 24.2/12.4 = **1.95**

A5.15 The factor implies that the unadjusted model is under-predicting the road-NOx contribution. This is a common experience with this and most other models.

### *$PM_{10}$ and $PM_{2.5}$*

A5.16 There are no nearby $PM_{10}$ or $PM_{2.5}$ monitors. It has therefore not been possible to verify the model for $PM_{10}$ or $PM_{2.5}$. The model outputs of road-$PM_{10}$ and road-$PM_{2.5}$ have therefore been adjusted by applying the primary adjustment factor calculated for road $NO_x$.

## Model Post-processing

### *Nitrogen oxides and nitrogen dioxide*

A5.17 The model predicts road-NOx concentrations at each receptor location. These concentrations have then been adjusted using the primary adjustment factor, which, along with the background

$NO_2$, is processed through the NOx from $NO_2$ calculator available on the Defra LAQM Support website (Defra, 2012). The traffic mix within the calculator was set to "All London traffic", which is considered suitable for the study area. The calculator predicts the component of $NO_2$ based on the adjusted road-NOx and the background $NO_2$. This is then adjusted by the secondary adjustment factor to provide the final predicted concentrations.

### *$PM_{10}$ and $PM_{2.5}$*

A5.18 The number of exceedences of 50 µg/m$^3$ as a 24-hour mean $PM_{10}$ concentration has been calculated from the adjusted-modelled total annual mean concentration following the relationship advised by (Defra, 2009):

$$A = -18.5 + 0.00145\, B^3 + 206/B$$

where A is the number of exceedences of 50 µg/m$^3$ as a 24-hour mean $PM_{10}$ concentration and B is the annual mean PM10 concentration. The relationship is only applied to annual mean concentrations greater than 16.5 µg/m$^3$, below this concentration, the number of 24-hour exceedences is assumed to be zero.

# A6 Construction Mitigation

A6.1 The following is a set of measures that should be incorporated into the specification for the works:

### Communications

- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environmental manager/engineer or the site manager.

### Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken. Make the complaints log available to the local authority when asked; and
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site, and the action taken to resolve the situation in the log book.

### Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. Use intelligent screening where possible – e.g. locating site offices between potentially dusty activities and the receptors;
- Erect solid screens or barriers around the site boundary;
- Avoid site runoff of water or mud; and
- Keep site fencing, barriers and scaffolding clean.

### Operating vehicle/machinery and sustainable travel

- Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone.

### Operations

- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible;
- Use enclosed chutes, conveyors and covered skips, where practicable; and
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

## Waste Management

- Only use registered waste carriers to take waste off-site; and
- Avoid bonfires and burning of waste materials.

## Measures Specific to Demolition

- Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high water volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground; and
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.

## Measures Specific to Construction

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.

## Measures Specific to Trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as soon as practicable any material tracked out of the site. This may require the sweeper being continuously in use;
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as practicable; and
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site).

**1-11A Swain's Lane and 109-110 Highgate West Hill**

**Client:** The Earl of Listowel