APPENDIX 9.1

AIR QUALITY ASSESSMENT

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Air Quality Appendix 9.1

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1 Legislation, Planning Policy and Guidance

1.1 The legislation, policy and guidance which has been used within the air quality assessment of the Pentavia Retail Park is set out below.

Legislative

The Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC[i]:

1.2 This Directive defines objectives for ambient air quality designed to avoid, prevent or reduce harmful effects on human health and the environment as a whole. To this end, it sets out measures for the assessment of ambient air quality in Member States as well as for obtaining information on ambient air quality in order to help combat air pollution and nuisance. The Directive aims at increasing cooperation between the Member States in reducing air pollution

The Air Quality Standards Regulations 2010[ii]*:*

1.3 The air quality limit values set out in EU Directive (2008/50/EC, 2008) are transposed in English law by the Air Quality Standards Regulations (2010). This imposes duties on the Secretary of State relating to achieving the limit values.

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland[iii]*.*

1.4 Part IV of the Environment Act 1995 requires local authorities to review and assess the air quality within their boundaries. As a result, the Air Quality Strategy (AQS) was adopted in 1997, with national health-based standards and objectives set out for the then, key eight air pollutants of benzene, 1-3 butadiene, carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter and sulphur dioxide.

1.5 The purpose of the AQS was to identify areas where air quality was unlikely to meet the objectives prescribed in the regulations. The strategy was reviewed in 2000 and the amended AQS for England, Scotland, Wales and Northern Ireland (2000) was published. This was followed by an Addendum in February 2003 and in July 2007 an updated AQS was published.

1.6 The AQS sets standards and objectives for pollutants to protect human health, vegetation and ecosystems. The pollutant objectives are the future dates by

which each standard is to be achieved, taking into account economic considerations, practical and technical feasibility.

1.7 The AQS also sets out a framework for Local Authorities to reduce adverse health effects from air pollution and ensures that international commitments are met (the Local Air Quality Management system).

1.8 Air quality objectives and limit values that currently apply in the United Kingdom can be divided into four groups:

- United Kingdom air quality objectives set down in regulations for the purpose of Local Air Quality Management (LAQM);
- United Kingdom national air quality objectives not included in regulations;
- European Union (EU) Limit Values transcribed into United Kingdom legislation; and
- Guidelines: e.g. World Health Organization (WHO) guidelines.

1.9 The main air quality pollutants of concern with regards to new developments such as the one proposed at the Application Site are the traffic related pollutants of Nitrogen Dioxide (NO_2) and Particulate Matter of size 10 and 2.5 microns (PM_{10} and $PM_{2.5}$).

1.10 The relevant air quality standards and objectives are presented in **Table 1.1** below.

Pollutant	Air Quality Objectives		Date to be Achieved by
	Concentration	Measured As	
Nitrogen Dioxide (NO_2)	200 µg m^{-3}	1-hour mean not to be exceeded more than 18 times per year	31/12/2005
	40 µg m^{-3}	Annual mean	31/12/2005
Particles (PM_{10})	50 µg m^{-3}	24-hour mean not to be exceeded more than 35 times per year	31/12/2004
	40 µg m^{-3}	Annual mean	31/12/2004
Particles ($PM_{2.5}$)	25 µg m^{-3}	Annual mean (target)	2020
Particles ($PM_{2.5}$) (UK – Urban Areas)	Target of 15% reduction in concentrations at urban background	Annual Mean	Between 2010 and 2020

Table 1.1: Air Quality Objectives (England)

1.11 The LLAQM Technical Guidance (2016[iv]) has been prepared by the Greater London Authority (GLA) to support London boroughs in carrying out their duties under the Environment Act 1995 and connected regulations. It supersedes the previous LAQM.TG(09), which supported all Local Authorities to fulfil their duties as part of the LAQM system and has now been updated by Defra (national technical guidance LAQM.TG(16)).

1.12 This guidance applies only to London's 32 boroughs (and the City of London), whilst LAQM.TG(16) applies to all other UK local authorities. It is the statutory process by which local authorities monitor, assess and take action to improve local air quality. If when following a detailed assessment, a Local Authority considers that one or more of the air quality objectives is not being met, an Air Quality Management Area (AQMA) must be declared.

1.13 In response to the issuing of an AQMA, an Air Quality Action Plan (AQAP) is required to be submitted within 12 - 18 months by the Local Authority setting out the measures intended to reach the exceeded air quality objectives. London boroughs should update their existing AQAP every 5 years as a minimum, to reflect current policy and to improve their effectiveness.

1.14 The GLA has followed a similar approach to England and Scotland, adopting a new streamlined approach which places greater emphasis on action planning to bring forward improvements in air quality and to include local measures as part of EU reporting requirements. It also sees the introduction of an air quality Annual Status Report (ASR) to reduce the burden of the cycle of Updating and Screening Assessments, Progress Reports, Detailed Assessments, and Further Assessments.

National Planning Policy

National Planning Policy Framework[v]

1.15 The National Planning Policy Framework (NPPF) was adopted in July 2018, replacing the previously adopted 2012 NPPF. This consolidates a series of proposals that have been made in various consultation documents published over the few years.

1.16 In respect of air quality, Section 9 – Promoting Sustainable Transport it states that:

"Transport issues should be considered from the earliest stages of plan-making and development proposals, so that:

…d) the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains…;

…Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making."

1.17 Section 15 – Conserving and Enhancing the Natural Environment, under ground conditions and pollution, paragraph 181 adds:

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan. "

1.18 Paragraph 183 concludes:

"The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular

development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities."

Planning Practice Guidance[vi]

1.19 Planning Policy Guidance for air quality details the circumstances when air quality would be relevant to a planning application. Considerations could include whether a development would:

- *'Generate or increase traffic volumes or congestion, changing vehicle speeds;*
- *Introduce new sources of air pollution;*
- *Expose people to existing sources of air pollution;*
- *Give rise to unacceptable impacts during construction for sensitive receptors; and*
- *Affect biodiversity by deposition or concentration of pollutants.'*

1.20 The PPG provides guidance for the completion of air quality assessments, stating the importance of an assessment to be location specific, and being:

'*proportionate to the nature and scale of development proposed and the level of concern about air quality.'*

1.21 The mitigation measures necessary for a development are stated to be:

'location specific, depend on the proposed development and should be proportionate to the likely impact.'

1.22 The PPG states:

"Whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife)".

Regional Planning Policy

Draft Replacement London Plan[vii]

1.23 On 13th August 2018 the Mayor published a version of the draft replacement London plan that included his suggested changes. When adopted, this plan will replace all previous versions.

1.24 The Plan sets out policies and supporting text (also known as reasoned justification). These take account of:

i) the legal requirements related to the development of the Plan (including those discussed above) and the various issues that European and national legislation requires to be considered
ii) other requirements of planning law and Government planning policy and guidance (without seeking to repeat these)
iii) the integrated impact and habitats regulations assessment
iv) the evidence that underpins the Plan (without seeking to repeat it).

- In Chapter 9 – Sustainable Infrastructure, Policy SI1: Improving Air Quality states the following:

A. *"London's air quality should be significantly improved and exposure to poor air quality, especially for vulnerable people, should be reduced:*

1. *development proposals should not:*

   a. *lead to further deterioration of existing poor air quality*
   b. *create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits*
   c. *reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality*
   d. *create unacceptable risk of high levels of exposure to poor air quality.*

2. *Development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality. Particular care should be taken with developments that are in Air Quality Focus Areas or that are likely to be*

used by large numbers of people particularly vulnerable to poor air quality, such as children or older people.

3. *Masterplans and development briefs for a large-scale development proposals subject to an Environmental Impact Assessment should propose methods of achieving an Air Quality Positive approach through the new development.*

   3a. *Major development proposals must be at least air quality neutral and be submitted with an Air Quality Assessment.*

4. *Development proposals must demonstrate how they plan to comply with the Non-Road Mobile Machinery Low Emission Zone and reduce emissions from the demolition and construction of buildings following best practice guidance.*

5. *Development proposals should ensure that where emissions need to be reduced, this is done on-site. Where it can be demonstrated that on-site provision is impractical or inappropriate, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated.*

Guidance is currently in 'The control of dust and emissions for construction and demolition SPG"

1.25 Policy SI1 explains that:

"The aim of this policy is to ensure that new developments are designed and built, as far as is possible, to improve local air quality and reduce the extent to which the public are exposed to poor air quality. This means that new developments, as a minimum, must not cause new exceedances of legal air quality standards, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits. Where limit values are already met, or are predicted to be met at the time of completion, new developments must endeavour to maintain the best ambient air quality compatible with sustainable development principles.

For larger-scale development areas such as Opportunity Areas, or those large enough to already require an Environmental Impact Assessment, there should be an aim to be Air Quality Positive by implementing measures across the area that will actively reduce air pollution. This could be achieved, for

example, by the provision of low or zero-emission heating and energy, or improvements to public transport, walking and cycling infrastructure, and designing out features such as street canyons that prevent effective dispersion of pollutants. Data from the use of smart infrastructure such as sensors could contribute to beneficial design solutions.

For major developments, a preliminary AQA should be carried out before designing the development to inform the design process. The aim of a preliminary assessment is to assess:

- The most significant sources of pollution in the area
- Constraints imposed on the site by poor air quality
- Appropriate land uses for the site
- Appropriate design measures that could be implemented to ensure that development reduces exposure and improves air quality.

Further assessments should then be carried out as the design evolves to ensure that impacts from emissions are prevented or minimised as far as possible, and to fully quantify the expected effect of any proposed mitigation measures, including the cumulative effect where other nearby developments are also underway or likely to come forward.

Assessment of the impacts of a scheme on local air pollution should include fixed plant, such as boiler and emergency generators, as well as expected transport-related sources. Impact assessments should always include all relevant pollutants. Industrial, waste and other working sites may need to include on-site vehicles and mobile machinery as well as fixed machinery and transport sources.

It may not always be possible in practice for developments to achieve Air Quality Neutral standards or to acceptably minimise impacts using on-site measures alone. If a development can demonstrate that it has exploited all relevant on-site measures it may be possible to make the development acceptable through additional mitigation or offsetting payments.

Where there have been significant improvements to air quality resulting in an area no longer exceeding air quality limits, development should not take advantage of this investment and worsen the local air quality back to a poor level.

Further guidance will be published on Air Quality Neutral and Air Quality Positive standards as well as guidance on how to reduce construction and demolition impacts."

The Adopted London Plan[viii]:

1.26 The adopted Plan sets out policies and supporting text (also known as reasoned justification). These take account of:

- the legal requirements related to the development of the Plan (including those discussed above) and the various issues that European and national legislation requires to be considered
- other requirements of planning law and Government planning policy and guidance (without seeking to repeat these)
- the integrated impact and habitats regulations assessment
- the evidence that underpins the Plan (without seeking to repeat it).

1.27 The policies of relevance for the Pentavia Site are:

- Policy 5.1 Climate change mitigation;
  "The Mayor seeks to achieve an overall reduction in London's carbon dioxide emissions of 60 per cent (below 1990 levels) by 2025. It is expected that the GLA Group, London boroughs and other organisations will contribute to meeting the strategic reduction target..."

- Policy 5.2 Minimising carbon dioxide emissions;
  "A. Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:
  1. Be lean: use less energy
  2. Be clean: supply energy efficiently
  3. Be green: use renewable energy..."

- Policy 5.3 Sustainable design and construction;
  "The highest standards of sustainable design and construction should be achieved in London to improve the environmental performance of new developments."

- Policy 6.3 Assessing the effects of development on transport capacity;

  This policy specifically seeks the submission of travel plans, construction logistic plans and delivery and servicing management plans from developers. Noting that these plans and assessments seek to help minimise emissions into the air.

- Policy 7.14 Improving Air Quality and under 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 Air Quality Management Areas (AQMAs) and 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 as by design solutions, buffer zones or steps to promote greater use of sustainable transport modes through travel plans.*

  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 from 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 be made to reduce emissions from a development, this is usually made on-site. Where it can be demonstrated that on-site 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…."*

London Environment Strategy[ix]

1.28 Changes made by the Localism Act 2011 brought in a requirement for the original six separate environmental strategies to be brought together into a single London Environment Strategy ("the strategy") under section 351A of the Greater London Authority Act 1999. This included The Mayer's Air Quality Strategy – Cleaning the Air, 2010.

1.29 The Strategy has been developed in conjunction with the Mayor's London Plan and the first priority of this Strategy is to achieve European Union limit values, which will be the most effective means to reduce the impact of air pollution on Londoners.

1.30 Chapter 3 – Transport Measures, proposes to reduce vehicle emissions through people making smarter choices about which mode they use to travel and, for all vehicles, using them as efficiently as possible, through policy 1, Encouraging smarter choices and sustainable travel behaviour:

"The Mayor, working with boroughs and stakeholders, will support Londoners and those working in and visiting the capital in making behavioural changes to the way they travel to reduce emissions from transport and promote more efficient use of vehicles by individual and organisations."

1.31 In addition, this Chapter proposes to improve air quality through a new generation of cleaner, greener private vehicles operating in London with a long-term aspiration of zero tailpipe emissions, through policy 2, Promoting technological change and cleaner vehicles:

"The Mayor, through TfL, working with central Government and boroughs and encouraging others will promote the transfer to and the uptake and use of low emission vehicles for both private and freight transport."

1.32 In Chapter 4 – Non-transport Measures, Policy 7, Reducing emissions from construction and demolition sites, states:

"The Mayor, working with London boroughs, the GLA group and the construction industry to encourage implementation of the Best Practice Guidance for construction and demolition sites across London."*

**Now known as the London Councils Transport and Environment Committee*

1.33 In addition,

- Policy 4.1.1 states *"Make sure that London and its communities, particularly the most disadvantaged and those in priority locations, are empowered to reduce their exposure to poor air quality*"…and provides a particular focus on reducing unnecessary private car use and other activities that contribute to pollution;
- Policy 4.2.1 refers to reducing emissions and switching to more sustainable travel. It states: "Reduce emissions from London's road transport network by phasing out fossil fuelled vehicles, prioritising action on diesel, and enabling Londoners to switch to more sustainable forms of transport". The Mayor will promote and prioritise more sustainable travel in London, including walking, cycling and public transport;
- Policy 4.2.3 notes that the Mayor will work with Government, TfL, the London boroughs, the construction industry and other users of Non-Road Mobile Machinery (NRMM), to prevent or reduce NRMM emissions. The Mayor has issued guidance to create an NRMM Low Emission Zone through planning conditions with minimum emission standards;
- Policy 4.2.4 states "*The Mayor will work with the government, the London boroughs and other partners to accelerate the achievement of legal limits in Greater London and improve air quality*". The Mayor will use the London Local Air Quality Management (LLAQM) framework to assist boroughs and require them to exercise their statutory duties to improve air quality in accordance with that framework.

1.34 Where pollution exceeds legal standards, the London boroughs must declare an Air Quality Management Area and put in place an action plan detailing how they will tackle the problem. The levers under the control of the London boroughs include:

- emissions based parking charges;
- reducing pollution from new developments through the planning system (especially those that are not referred to the Mayor);
- improving public realm for walking and cycling;
- rolling-out targeted measures at pollution hotspots;
- integrating air quality into their public health duties;
- supporting new infrastructure for fuelling zero emission vehicles; and
- taking enforcement action against idling vehicles.

1.35 Policy 4.3.1 and 4.3.2 refer to meeting World Health Organization (WHO) air quality guidelines, establishing new targets for pollutants and zero emission transport. They state:

"The Mayor will establish new targets for $PM_{2.5}$ and other pollutants where needed. The Mayor will seek to meet these targets as soon as possible, working with government and other partners"

"The Mayor will encourage the take up of ultra low and zero emission technologies to make sure London's entire transport system is zero emission by 2050 to further reduce levels of pollution and achieve WHO air quality guidelines"

1.36 The Mayor aims to meet the World Health Organization's guidelines for $PM_{2.5}$ by 2030. The Mayor, through TfL and the boroughs, and working with Government, will seek to implement zero emission zones in town centres from 2020 and aim to deliver a zero emission zone in central London from 2025, as well as broader congestion reduction measures to facilitate the implementation of larger zero emission zones in inner London by 2040 and London-wide by 2050 at the latest.

1.37 Policy 4.3.3 states: "Phase out the use of fossil fuels to heat, cool and maintain London's buildings, homes and urban spaces, and reduce the impact of building emissions on air quality". The London Plan includes policies so that all new large scale developments in London are 'Air Quality Positive", and maintain Air Quality Neutral requirements for all other developments. London's growth and redevelopment should contribute to delivering improvements in air quality now and into the future.

1.38 The final policy in the chapter for air quality relates to indoor air pollutants. It states: "Work to reduce exposure to indoor air pollutants in the home, schools, workplace and other enclosed spaces". The Mayor will work with partners to develop protocols and tools for planners and the building design industry to improve indoor air quality in existing buildings, as well as guides for Londoners, schools and businesses to help them reduce levels of indoor pollution.

1.39 Chapter 6: Climate change mitigation and energy has the aim: *"London will be a zero carbon city by 2050, with energy efficient buildings, clean transport and clean energy".*

1.40 Policy 6.1.4 states: "Ensure that new developments are zero carbon". All new developments in London are currently expected to achieve at least a 35 per cent onsite reduction in greenhouse gas emissions above and beyond national government's standards. Where the target cannot be met onsite, developers are able to offset emissions through other carbon reduction measures offsite in agreement with the borough, or make payments to offset the shortfall into a borough's offsetting fund.

1.41 Policy 6.2.1 refers to delivering more decentralised energy in London. Implementation of large scale decentralised and low carbon energy projects will be undertaken in a coordinated way so they also contribute towards improving air quality as well as reducing carbon emissions. This will include meeting any relevant air quality standards and emission requirements set out in the London Plan. To facilitate implementation, the Mayor will provide support to boroughs and the private sector through the Decentralised Energy Enabling Project (DEEP).

1.42 Policy 8 aims to implement a planning process that ensures that no new development has a negative impact on air quality in London and states:

"The Mayor will ensure that new developments in London shall as a minimum be 'air quality neutral' through the adoption of best practice in the management and mitigation of emissions."

The Sustainable Design and Construction SPG[x]

1.43 This document provides guidance on how boroughs can take forward the approaches set out in the London Plan, including carbon-off-setting, and the application of 'air quality neutral' assessments.

1.44 It also refers to the Mayor's strategic target to:

"contribute to the achievement of EU limit values for air pollution"

1.45 Additional air quality specific priorities which cross reference with the requirements of the London Plan Policies (LPP) include:

- Developers are to design their schemes so that they are at least 'air quality neutral' (LPP 7.4);
- Developments should be designed to minimise and mitigate against increased exposure to poor air quality (LPP 3.2, 5.3, and 7.14);

- Developers should select plant that meets the standards for emissions from combined heat and power and biomass plants set out in Appendix 7 (LPP 7.14); and
- Developers and contractors should follow the guidance set out in the emerging The Control of Dust and Emissions during Construction and Demolition SPG when constructing their development (LPP 5.3 and 7.14).

1.46 The principals of the 2013 draft Control of Dust and Emissions during Demolition and Construction (and subsequent 2014 final issue) SPG are embedded within the 2014 IAQM document 'Guidance on the assessment of dust from demolition and construction and this has been applied within this assessment.

Local Planning Policy

The London Borough of Barnet (LBB) Local Plan, the Core Strategy[xi]*;*

1.47 The Core Strategy notes within Section 18.11 'Air and noise pollution' that the impact on air quality will be taken into account when assessing development proposals and that where development could do harm to air quality, an Air Quality Assessment will be required.

1.48 Specifically, Policy CS13: 'Ensuring the efficient use of natural resources' notes that: *"We will improve air and noise quality by requiring Air Quality Assessments and Noise Impact Assessments from development in line with Barnet's SPD on Sustainable Design and Construction."*

The LBB's Sustainable Design and Construction Supplementary Planning Document (SPD)[xii]*:*

1.49 The 2013 Sustainable Design and Construction Supplementary Planning Guide (SPG) contains specific requirements in relation to air quality in Barnet. It is required within Section 2.13 that:

"A. Location – Ensure that development type suits development site."

1.50 This requires that in areas of poor air quality, where there is no other potential use for a site, then the design will be required to prevent exposure to air pollutants both within buildings and in accessible outdoor areas proximate to buildings.

"B. Siting and design – Ensure that where there is a localised and proximate source of air pollution, buildings are designed and sited to reduce exposure to air pollutants."

1.51 It is noted here that buildings themselves can be used as barriers between sources of air pollution and those areas where people will linger in the outside environment. It is also noted that buildings should be actively ventilated allowing air to be drawn from the less polluted side of the building (where a balance needs to be achieved between air quality and energy consumption required for active ventilation). Consideration is also required to be given to ensuring that buildings façades, which face directly onto a pollution source, are sealed.

Guidance

Guidance published by the Department for Environment Food and Rural Affairs (Defra):

- UK-Air Local Air Quality Management Tools[xiii]:
  The Local Air Quality Management Tools contain information pertaining to monitoring networks across the UK and provides tools, which aid in the estimation of pollutant concentrations with reference to the year of study.
- AQM Background Maps[xiv]:
  1 x 1 km grid background maps provide modelled background pollutant concentrations for NO_x, NO_2, PM10 and $PM_{2.5}$

Guidance published by the GLA:

- London Local Air Quality Management (LLAQM) Technical Guidance, TG (16)[xv]: Published by GLA in 2016 in order to support London Boroughs in carrying out their duties under the Environmental Act 1995 and connected regulations.
- The Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance[xvi]:
  Guidance on the assessment of dust and emissions during construction and demolition, which is referenced in the London Plan but currently superseded by EPUK and IAQM guidance:

- Air Quality Neutral (AQN) Planning Support Update: GLA 80371 (Air Quality Consultants and Environ, 2014)[xvii]:
  This report has been commissioned by the GLA to provide support to the development of the Mayor's policy related to "air quality neutral" developments.
- GLA Sustainable Design and Construction SPG:
  Provision of sustainable design advice to architects and developers.

Guidance published by Environmental Protection UK (EPUK) and the Institute of Air Quality Managers (IAQM):

- Development Control: Planning for Air Quality[xviii]:
  This guidance has been produced to help ensure that air quality is properly accounted for in local development control processes.
- Land-Use Planning & Development Control: Planning for Air Quality (2017)[xix]:
  Provides advice and guidance from the collected industry body how an air quality assessment should be undertaken.
- Guidance on the Assessment of Dust from Demolition and Construction[xx]:
  Most current guidance on the assessment of dust from demolition and construction and which supersedes any previously issued by the GLA.

Information released by Ricardo Energy and Environment:

- National Atmospheric Emissions Inventory[xxi]:
  A website run by Ricardo AEA Technology where emission data can be obtained which relates the vehicle fleet composition for the year of study.

Guidance published by the London Councils:

- Air Quality and Planning Guidance[xxii]:
  This guidance is aimed at local authorities, developers and their consultants, and provides technical advice on how to deal with planning applications that could have an impact on air quality.

2 Air Quality Neutral/Positive Assessment

2.1 The London Plan and the Mayor's Air Quality Strategy require that developments are to be at least 'air quality neutral'. The Mayor of London's Sustainable Design and Construction (SDC) Supplementary Planning Guidance (SPG) advises that, to enable the implementation of this aspiration, 'benchmarks' have been produced for buildings' operation and transport across London, based on the latest technology (including its effectiveness and viability). The Greater London Authority (GLA) have therefore commissioned the 'Air Quality Neutral Planning Support Update'[1] ('AQN Planning Support Update') to support the assessment of air quality neutrality in London based developments and this has been applied here.

2.2 Benchmarks may be set based upon the acceptable theoretical emission rates associated with various site uses proposed. The 'total' emissions associated with the development are then calculated. Where the total emissions are below the benchmark, the development is considered to be air quality neutral. Where total emissions exceed the benchmark, mitigation measures and then 'offsetting' may be required.

Offsetting

2.3 The GLA update report states that in circumstances where the benchmark is exceeded and mitigation is not possible, offsetting measures may be enforced via a Section 106 agreement which may provide a charge for each kilogram of pollutant emitted over the benchmark. Community Infrastructure Levey (CIL) may also be applied although there are restrictions on this application.

Transport Emissions

2.4 The detail of the assessment process is set out within the GLA AQN Planning Support Update, however the process is summarised below.

2.5 In summary, transport emissions are assessed by multiplying the number of residential units and the gross floor areas (GFA) by use class for the Proposed Development by the emission factors provided, in order to obtain the Transport Emissions Benchmarks for NO_x and PM_{10}.

[1] Moorcroft, S. Holman, C. Odbert, C & Marner, B. (2014) Air Quality Neutral Planning Support Update: GLA 80371. Air Quality Consultants Ltd in association with ENVIRON UK Ltd, London

2.6 Transport Emission Benchmark (TEB) factors are available within the SDC SPD and also within the GLAs Air Quality Neutral Planning Support update for the Retail (A1), Office (B1a) and Residential (C3, C4) for CAZ, Inner and Outer London as per **Table 2.1.**

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

Table 2.1: Transport Emission Benchmarks Factors

2.7 The revised Development includes the provision of:

- 844 residential dwellings;
- 723 m^2 of retail and restaurant space; and
- 294 m^2 of 'community uses'

2.8 The community use on the site has been allocated as a D1 use class for the purposes of this assessment. In the absence of a D1 bench mark factor for transport emissions, the community use has been classified as an office use for the purpose of the AQN/P assessment.

2.9 Due to the location of the Proposed Development, the third column representing 'Outer London' has been used as requested by the GLA.

2.10 Benchmarked transport emissions are established by multiplying the number of residential units and the GFA for the Proposed Development by the TEB factors provided in **Table 2.1.** These are presented in **Table 2.2.**

Land Use	GFAm²/No. of Dwellings	NO_X Transport Emissions Benchmark	NOx Benchmarked Emissions (kg/annum)
C3	844	1553	1311
Retail	723	249	180
Community Use	294	68.5	20
Total Benchmarked NOx Emissions			**1511**
Land Use	**GFAm²/No. of Dwellings**	**PM_{10} Transport Emissions Benchmarks**	**PM_{10}Benchmarked Emissions (kg/annum)**
C3	844	267	225
Retail	723	42.9	31
Community Use	294	11.8	3
Total Benchmarked PM_{10} Emissions			**260**

Table 2.2: Calculation of Benchmarked Transport Emissions

2.11 The Total Transport Emissions of NO_x and PM_{10} are then calculated for the Proposed Development. A summary of these calculations and the supporting data provided within the GLA AQN Planning Support Update is set out below.

2.12 The average (arithmetic mean) journey lengths for residential, office and retail developments derived from the London Travel Demand Surveys (LTDS) are set out in **Table 2.3**.

Land Use	Distance (Km)		
	CAZ	Inner	Outer
Retail (A1)	9.3	5.9	5.4
Office (B1)*	3.0	7.7	10.8
Residential (C3)*	4.3	3.7	11.4
*Based on the LTDS destination Note that these distances are based on a straight line between the origin and destination of a trip, not actual trip lengths			

Table 2.3: Average Distance Travelled by Car per Trip

2.13 Due to the location of the proposed Development, the third column representing 'Outer' London' has been used as requested by the GLA.

2.14 The predicted average distance travelled per year is presented in **Table 2.4** below.

Land Use	GFAm²/No. of Dwellings	Number of vehicle trips per year*	Average distance travelled per trip (km/trip)**	Distance Travelled (km/year)
C3	844	410990	11.4	4685286
Retail	723	263895	5.4	1425033
Community Use	294	107310	10.8	1158948
*based on Transport Statement predicted 12hr traffic generation times 365 days **based on the London Travel Demand Survey for Outer London as shown in the supporting guidance				

Table 2.4: Calculation of Total Average Distance Travelled per Year

2.15 The Total Transport Emissions have been calculated by multiplying the total distance travelled, by the relevant emission factors for NO_x and PM_{10} as set out in **Table 2.5**

Pollutants			
	CAZ	Inner	Outer
NO_x	0.4224	0.37	0.353
PM_{10}	0.0733	0.665	0.0606

Table 2.5: Transport Emission Factors

2.16 The Total Transport Emissions are set out in **Table 2.6**

Land Use	Total distance travelled per year (km)	NOx Transport Emission factor (g/Vehicle-km)	Total NO_x Transport (kg/annum)
C3	4685286	0.353	1654
Retail	1425033	0.353	503
Community Use	1158948	0.353	409
Land Use	**Total distance travelled per year (km)**	**PM_{10} Transport Emission factor (g/Vehicle-km)**	**Total PM_{10} Transport (kg/annum)**
C3	4685286	0.0606	284
Retail	1425033	0.0606	86
Community Use	1158948	0.0606	70
*based on emission factors provided in Table 10 of GL A80371 air quality neutral planning support			

Table 2.6: Calculation of Total Transport Emissions

2.17 The Total Transport Emissions have then been compared with the Benchmarked Emissions in order to assess whether the proposed Development results in any additional NO_x or PM_{10} emissions and the results are presented in **Table 2.7** below.

Transport Emissions	NO_x kg/Annum
Benchmarked Transport Emissions	1511
Total Transport Emissions	2566
Difference	**+1055**
Transport Emissions	**PM_{10} kg/Annum**
Benchmarked Transport Emissions	260
Total Transport Emissions	441
Difference	**+181**

Table 2.7: Comparison Between Benchmarked Transport Emissions and the Total Transport Emissions

2.18 **Table 2.7** demonstrates that the predicted Total Transport Emissions associated with the Pentavia Development are expected to be higher than the Benchmarked emissions.

2.19 As noted, the GLA AQN Planning Support Update states that in circumstances where the benchmark is exceeded, mitigation measures to reduce emissions may be applied on site or offsite.

2.20 Is it also noted that the SDC SPG states that:

"Developments should be designed to encourage and facilitate walking and cycling and the use of public transport. This will enable air pollutants deriving from a particular development to be minimised. To further support this policy, boroughs should also ensure developments do not exceed local car parking standards."

2.21 In relation to this, the Pentavia Site offers a number of encouragements to model shift or 'Active Travel' as supported by Transport for London (TfL), to encourage residents and site users away from car use. These are set out in detail within the Framework Travel Plan submitted with the application and are summarised below.

Travel Plan

2.22 The Framework Travel Plan (FTP) focusses on maximising the potential for sustainable modes of travel. Once the development proceeds through to occupation, the FTP will be used to develop a Full Travel Plan for the site.

Full Travel Plan

2.23 The site will be managed by an appointed management company who will have a presence on site. They will appoint a Travel Plan Coordinator (TPC) who will manage the day to day running of the Travel Plan.

Welcome Pack

2.24 Occupiers will receive a welcome pack at the start of the occupation of their unit, which will include details of:

- A summarised version of the Travel Plan document, that sets out the purpose and benefits of the Plan;
- Timetables and route maps for public transport;

- A description of distance, time, and routes for travelling from the site to key local destinations on foot, bicycle and public transport;
- Contact numbers and web details for the TfL Journey Planner and National Rail Enquiries;
- Zipcar or similar car club free 1 year membership, information and preliminary driving credit;
- Cycling and walking maps for the local area;
- Details of any site specific measures implemented over time; and
- Confirmation of restrictions to on-site and on-street parking (with the exception of occupants of disabled accessible units, a number of which will be able to park on-site).

Incentivisation of Pedestrians and Cyclists

2.25 As well as information within the welcome packs, travel information points will be installed at key access points within the site detailing, bus, cycling and walking routes and bus and rail timetables. Travel board will also be provided to all non-residential units including staff rooms etc.

2.26 As noted above, walking and cycle access improvements to the site will be made, in addition cycle parking locations will be provided for both long and short stay use. Racks will be positioned in safe and accessible locations across the site. These will be reviewed and maintained by the TPC.

Parking Strategy

2.27 The proposals include for a parking provision for residents, retail and leisure. These include standard and disabled parking bays with a portion of electrical charging points and passive electrical provision. Both long stay and short stay bays are provided. The details of the car parking provision are provided within the Framework Travel Plan. However, it should be noted that retail/leisure parking spaces will be provided at the south end of the scheme as Pay and Display in order to ensure that long stay parking is discouraged and that there is a turn-over of parking spaces.

2.28 A Car Parking Managing Strategy will also be provided to ensure that the car parking on site is efficiently used and car ownership and car driving is discouraged.

Delivery and Servicing Plan

2.29 The FTP notes that a Delivery and Servicing Plan (DSP) has been produced to support the planning application in order to manage refuse, delivery and service vehicle arrangements and overall accessibility. The DSP sets out a range of management strategies and measures to ensure the site can be readily serviced in an efficient and safe manner, without inconveniencing others.

2.30 Therefore, it is considered that the above constitute the implementation of 'Active Travel' measures, as requested by the GLA and supported by TfL to encourage model shift away from the car and provides a significant levels of mitigation measures as required by Air Quality Neutral/Positive.

Building Emissions

2.31 The Pentavia site is proposed to be serviced by a low carbon, energy efficient communal heating network which will serve all domestic and non-domestic areas. To this end, a single energy centre on site will be comprised of a communal gas-fired cogeneration scheme with three back-up natural gas fired boilers for space heating and domestic hot water.

Cogeneration Plan

2.32 Cogeneration Plant are often chosen for their ability to reduce Carbon Dioxide emissions (CO_2), but can often result in an increase in NO_x. Therefore, the emission standards applied within the SDC SPG have been developed based on the latest technology, viability and the implication for carbon dioxide emissions of any abatement measures to reduce the NO_x and PM_{10} emissions from the plant. The emission standards which apply are taken from Appendix 7 of the SPD and are set out in **Table 2.8** below.

Combustion Appliance	Pollutant/Parameter	Emission Standard at Reference O_2 (mg Nm^{-3})	Equivalent Concentration at 0% 0_2 (mg Nm^{-3})	Likely Technique Required to Meet Emission Standard
Spark ignition engine (natural gas/biogas)	NO_x	95	125	SCR (lean burn engines)

Table 2.8: Emissions Standards for Solid Biomass and Cogeneration Plan in the Thermal Range 50kWth to less than 20MWth for development in Band B[2]

2.33 The specific plant proposed for the Energy Centre has not yet been confirmed however, the project engineers Chapman BDSP have provided the likely parameters of the plant to be specified and have confirmed that the plant will not exceed an end of pipe NOx emissions at 5% 02 of more than 50mg/Nm^3 placing it well within the required emission standards.

Boilers

2.34 The SPG requires that where individual and/or communal gas boilers are installed in commercial and domestic buildings they should achieve a NOx rating of <40 mg kWh.

2.35 Three condensing gas boilers are proposed for the Energy Centre. Building service engineers have advised that the boilers will be specified from a range with a maximum NO_x emission of 37mg/kWh.

Building Emission Calculations

2.36 As with transport emissions, a Benchmark is obtained for the theoretical building emissions associated with the site. This is then compared to the Total Building Emissions and an assessment of Air Quality Neutrality is made.

2.37 On-site emissions are calculated from the GFA m^2 of the development and the site emissions associated with the building use (kg/annum) calculated from the energy use kWh/annum and the site specific emission factors.

2.38 It is noted in the GLA AQN Planning Support Update that PM_{10} emissions need only be considered for oil and solid fuel use, which is not the case at this site and so PM10 emissions have not been considered here.

2.39 The calculation of the Building Emission Benchmark Factors are set out in **Table 2.9** below:

[2] Where Band B relates to areas where baseline annual mean NO2 and PM10 is between 5% below or above the national objective. (SDC SPG Appendix 7)

Land Use Class	NO_x (g/m^2)
Class A1	22.6
Class A3 – A5	27.2
Class A2 and Class B1	30.8
Class B2 – B7	36.6
Class B8	23.6
Class C1	70.9
Class C2[3]	68.5
Class C3[6]	26.2
D1 (a)	43.0
D1 (b)	75.0
Class D1 (c-h)	31.0
Class D2 (a-d)	90.3
Class D2 (e)	284

Table 2.9: Building Emission Benchmark Factors

2.40 For the Pentavia Site the GFA have been provided and these are multiplied by the appropriate factors in **Table 2.9** to provide the Total Benchmarked Building NO_x Emissions in **Table 2.10**.

Land Use Class	GFA (m^2)	BEB Factors (g/m^2)	NO_x (kg/annum)
A1 - retail	401	22.6	9.1
A3/A4 - restaurant	322	27.2	8.8
D1 (b) - creche	294	75.0	22.1
C3 - dwelling houses	76306	26.2	1999.2
C3 - ancillary	878	26.2	23.0
B8 - Plant /refuse/bike store	3549	23.6	83.8
B2 - Energy Centre	264	36.6	9.7
B8 - car park	10262	23.6	242.2
Total Benchmarked Building NOx Emissions			**2398**

Table 2.10: Benchmarked Building NO_x Emissions.

2.41 The total likely building emissions provided by the engineers are provided in **Table 2.11**.

[3] Benchmarks have been calibrated for London (SOURCE: GLA PLANNIG SUPPORT UPDATE)

Energy Centre	g/s	kg/annum
Cogeneration Plant	0.03	946.08
Boiler (x 3)	0.05	1545.3
Total Building Emissions		**2523**

Table 2.11: Total Building Emissions

2.42 A comparison of the Benchmarked Building Emissions against the Total Building Emissions is provided in **Table 2.12** .

Building Emissions	NO_x kg/Annum
Benchmarked Building Emissions	2398
Total Building Emissions	2523
Difference	**125**

Table 2.12: Comparison Between Benchmarked Building Emissions and the Total Building Emissions

2.43 The assessment of building emissions therefore demonstrates that on the worst-case assumption that the co-generation plant will have a NO_x emission of 50mg/Nm^3, the buildings emissions will not reach neutrality. However, it is understood that a Selective Catalytic Reduction System (SCR) which removes NO_x from the plant exhaust will be utilised and this will significantly further reduce the Cogneration Plant NO_x emissions. Where an SCR system is applied, the Energy Centre will become air quality positive.

3 Construction Dust Risk Assessment

3.1 The construction dust assessment has been completed in accordance with 2014 IAQM guidance and follows the procedures as outlined within the ES chapter.

Screen the Need for a Detailed Assessment

3.2 The following screening criterion has been applied to the assessment: An assessment will normally be required where there is:

- a 'human receptor' within:
  - 350m of the boundary of the Site; or
  - 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the Site entrance(s).
- an 'ecological receptor' within:
  - 50m of the boundary of the Site; or
  - 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the Site entrance(s).

3.3 There are a number of human receptors within 350m of the Site boundary but no ecological receptors within 50m of the Site. However, a dust assessment is still required due to the proposed Development location meeting some of the above criteria.

Assess the Risk of Dust Effects

3.4 The construction activities associated with the proposed Development have been separated into four stages:

- Demolition/Site Clearance
- Earthworks;
- Construction; and
- Trackout.

3.5 The assessment of the risk of dust effects has been completed in two stages:

- Determine the potential dust emission magnitude; and
- Determine the sensitivity of the area to dust effects.

3.6 The potential dust emission magnitude for all four of the construction stages have been determined to be either Small, Medium or Large according to the criteria presented in **Table 3.1** below.

Construction Activity	Dust Emission Magnitude Scale		
	Small	Medium	Large
Demolition/ Site Clearance	Total building volume <20,000m^3, construction material with low potential for dust release, demolition activities <10m above ground, works during wetter months.	Total building volume 20,000-50,000m^3, potentially dusty construction material, demolition activities 10-20m above ground level.	Total building volume >50,000m^3, potentially dusty material, on-site crushing and screening, activities >20m above ground level.
Earthworks	Total site area <2,500m^2, soil type with large grain size, <5 heavy earth moving vehicles active at one time, bunds <4m high, total material moved <20,000t, works during wetter months.	Total site area 2,500-10,000m^2, moderately dusty soil type, 5-10 heavy earth moving vehicles active at one time, bunds 4-8m high, total material moved 20,000-100,000t.	Total site area >10,000m^2, potentially dusty soil type, >10 heavy earth moving vehicles active at one time, bunds >8m high, total material moved >100,000t.
Construction	Total building volume <25,000m^3, construction material with low potential for dust release.	Total building volume 25,000-100,000m^3, potentially dusty construction material, on site concrete batching.	Total building volume >100,000m^3, on site concrete batching, sandblasting.
Trackout	<10 HDV* outwards movements in any one day, surface material with low potential for dust release, unpaved road length <50m.	10-50 HDV outward movements in any one day, moderately dusty surface material, unpaved road length 50-100m.	>50 HDV outward movements in any one day, potentially dusty surface material, unpaved road length >100m.
* HDV – Heavy Duty Vehicle (>3.5t), Note – In each case, not all the criteria need to be met, and that other criteria may be used if justified.			

Table 3.1: Dust Emission Magnitude Criteria

3.7 The completed assessment of Dust Emission Magnitude is shown in **Table 3.2** below.

Construction Activity	Dust Emission Magnitude	Justification
Demolition/ Site Clearance	medium	Total building volume 20,000-50,000m^3, potentially dusty construction material, demolition activities 10-20m above ground level
Earthworks	large	Total site area >10,000m^2, potentially dusty soil type, >10 heavy earth moving vehicles active at one time, bunds >8m high, total material moved >100,000t.
Construction	medium	Total building volume >100,000m^3, on site concrete batching, sandblasting.
Trackout	medium	10-50 HDV outward movements in any one day, moderately dusty surface material, unpaved road length 50-100m.

Table 3.2: Dust Emission Magnitude Assessment

3.8 Due to the scale of the proposed Development the magnitude of dust emissions has been assessed as medium to large overall.

3.9 The sensitivity of the area has been assessed in relation to a number of factors such as; the specific sensitivities of receptors in the area, the proximity and number of those receptors and in the case of PM_{10}, the local background concentration and by following the significance criteria in T**ables 3.3, 3.4** and **3.5** below. Included in this is a judgement of the risk to driver safety from unmitigated wind-blown dust.

Receptor Sensitivity	Number of Receptors	Distance from the source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 3.3: Sensitivity of the Area to Dust Soiling Effects of People, Property and Driver Safety

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from the source (m)				
			<20	<50	<100	<200	<350
High	>32 µg m^{-3}	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg m^{-3}	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg m^{-3}	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg m^{-3}	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table 3.4: Sensitivity of the Area to Human Health Effects

Receptor Sensitivity	Distance from the source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Table 3.5: Sensitivity of the Area to Ecological Effects

3.10 In addition to **Tables 3.3, 3.4** and **3.5** , Site specific factors have been taken into account when defining the sensitivity of the area:

- any history of dust generating activities in the area;
- the likelihood of concurrent dust generating activity on nearby Sites;
- any pre-existing screening between the source and the receptors; and
- the duration of the potential impact, as a receptor may become more sensitive over time.

3.11 The completed pre-mitigation impact risk assessment incorporating the sensitivity of the area and the dust emissions magnitude for the four construction activities is shown in **Table 3.6** below.

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	High
Human Health	Low	Low	Low	Low
Ecological	Negligible	Negligible	Negligible	Negligible

Table 3.6: Summary of Dust Risk (pre-mitigation)

3.12 The risk of dust soiling has been considered high due to the risk of drivers located in close proximity to the proposed Site. The human health risk was considered Low due to the low PM_{10} background concentrations in the local area (15.2µgm^3). There are no ecological Sites within 50m of the proposed Site, therefore ecological sensitivity has been assessed as negligible.

3.13 Additionally, the dust emissions magnitude, based on the scale of the Development, is considered to be small.

Site-specific mitigation

3.14 From the identification of the risk of effects with no mitigation applied in T**able 3.6**, it is possible to determine the specific mitigation measures that can be applied in relation to the level of risk associated with the construction activity. These are expected to form part of the design and management measures set out within the ES Chapter.

Demolition:

- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust);
- Wherever reasonably practicable, retain walls and windows while the rest of the building is demolished to provide a screen against dust;
- Bag and remove any biological debris or damp down such material before demolition; and
- 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 required.

Earthworks:

- Avoid scabbling (roughening of concrete surfaces) if possible;
- Avoid carrying out any earthworks during dry weather if reasonably practicable having regard to programme and contracting arrangements

for the relevant works or provide and ensure appropriate use of water to control dust.

- Re-vegetate any earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.

Construction:

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out unless required for a particular process;
- Mix large quantities of cement, grouts and other similar materials in enclosed areas remote from Site boundaries and potential receptors;
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery; and
- For small supplies of fine powder ensure bags are sealed after use and are stored appropriately to prevent dust.

Trackout:

- Ensure any vehicles arriving and leaving Site are securely covered to prevent escape of materials during transport;
- Routinely clean public roads and any access routes using wet sweeping methods; and
- Avoid dry sweeping.

General Mitigation Measures:

- Ensure regular cleaning of hardstanding surfaces using wet sweeping methods;
- Display the head or regional office contact information, and the name and contact details of person(s) accountable for air quality on the boundary;
- Develop and implement a stakeholder communications plan that includes community engagement before work commences on Site;
- Log all air quality complaints, identify the cause(s), take appropriate measures to reduce emissions in a timely manner, and record all measures taken. Make the complaints log available to the Local Authority when requested;

- Carry out regular on-site and off-site inspections to monitor dust soiling effects, with cleaning to be provided if necessary. Increase the frequency of inspections when activities with a high potential to produce dust are being carried out;
- Erect barriers around the site, any dusty activities and stockpiles (the last of which should be covered);
- Screen areas of the building, where dust producing activities are taking place, with debris screens or sheeting;
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;
- Remove materials that have a potential to produce dust as soon as possible, unless they are being re-used. If they are to be re-used, on site covers should be used;
- Ensure all vehicles switch off engines when stationary, so that there are no idling vehicles;
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine sprays on such equipment wherever possible;
- Avoid bonfires and the burning of waste materials; and
- Special provisions will apply for any materials containing asbestos. The safety method statement should outline the control measures necessary to minimise the risks to an acceptable level and all statutory notices will be placed with the Health and Safety Executive (HSE).

Dust Monitoring

3.15 The dust monitoring requirements are typically split into three categories as follows:

- **Negligible/Low risk** category sites- should not normally be necessary to undertake any quantitative air quality monitoring, although in some circumstances it may be applicable to undertake occasional surveys in the vicinity of the site boundary at least once on each working day.
- **Medium risk** category sites- should normally be adequate to undertake surveys of dust flux over the site boundary, and/or dust deposition/soiling

rates around the site at nearby receptors, although this may have resource implications, and an approach based on continuous particulate matter monitoring may be preferred.

- **High risk** category sites- should normally be necessary to supplement the monitoring for medium risk sites with monitoring of ambient PM concentrations. It is recommended that priority be assigned to the measurement of PM10, as emissions of dust from construction sites are predominantly in the coarser fractions.

3.16 The proposed development site has been classified as having a high risk of unmitigated dust soiling during all stages of construction.

3.17 Therefore, adequate dust monitoring should be undertaken during the relevant stages of construction to ensure that:

- The construction activities do not give rise to any exceedances of the air quality objectives for PM_{10} or $PM_{2.5}$;
- The agreed mitigation measures to control dust emissions are being applied and are effective; and
- Any high levels of dust is attributed to specific activities on site to ensure that appropriate corrective measures take place.

Construction Traffic and Plant

3.18 As previously stated, there is potential for air pollutant impacts to arise from construction plant and vehicles associated with the scheme. The following BAT should be implemented during the construction phase.

- All vehicles should switch off engines when stationary, no idling vehicles;
- On-road vehicles to comply with the requirements of the Low Emission Zone and the London Non-Road Mobile Machinery (NRMM) standards, where applicable;
- All NRMM to use ultra low sulphur diesel (ULSD) where available;
- Minimise the movement of construction traffic around the site;
- Maximising efficiency (this may include alternative modes of transport, maximising vehicle utilisation by ensuring full loading and efficient routing);
- Vehicles should be well maintained and kept in a high standard of working order;

- Avoid the use of diesel or petrol powered generators by using mains electricity or battery powered equipment where possible; and
- Locate plant away from boundaries close to residential areas.

Determine Significant Effects

3.19 Prior to the implementation of any mitigation measures the highest significance of adverse effects was high risk for dust soiling and low risk for human health, with dust emissions magnitude considered to be small.

3.20 The mitigation measures listed above have been chosen due to their suitability to the Site and to reduce the risk of adverse effects from the four stages of construction.

3.21 The implementation of Site specific mitigation measures (secured by planning condition), which are designed to mitigate potential dust impact, will ensure that potential significant adverse dust effects will not occur and the residual effect will normally be 'not significant'.

Conclusions of Construction Dust Assessment

3.22 The completion of the construction dust assessment has shown that the residual effect of the proposed Development in the context of construction dust emissions will be 'negligible to minor'. This conclusion has been made based on the small dust emissions magnitude related to the scale of development and the assumption that the suggested mitigation measures will be implemented (secured by planning condition) and is relevant for all sensitive receptors within 350m of the Site.

3.23 It should be noted that even with a rigorous management plan in place, it is not possible to guarantee that all mitigation measures will be effective at all times. If there is an interruption in the water supply used for dust suppression or adverse weather conditions are experienced that exacerbate dust emissions, the receptors may experience occasional, short term dust annoyance.

3.24 However, the likely scale of this would not normally be considered sufficient to change the conclusion of this assessment. It is therefore important to consider all mitigation measures and provide a frequent review and assessment procedure at each stage, to ensure that mitigation measures continue to provide the maximum attenuation level possible.

4 Dispersion Modelling of Energy Centre

4.1 A dispersion modelling exercise has been undertaken for the Energy Centre (EC) in order to identify whether it is possible to detect any emissions associated with its plume dispersion either in the local area, or further afield. It is proposed that the energy centre will comprise of one Low NOx emission Cogeneration Plan and two low NOx boilers. The specific plant proposed for the Energy Centre has not yet been confirmed, however, the project engineers Chapman BDSP have agreed that the plant specified will not exceed end of pipe NO_x emissions at 5% of more than 50mg/Nm^3 placing it well within the required emission standards.

4.2 As noted within the ES, emission rates associated with both the Cogeneration plant and the boilers will be within the guideline values set within the SDC SPG. This study assesses the emission of NO_x only.

Modelling Tool

4.3 The modelling tool which has been used is the dispersion model ADMS-Roads Extra 4.1, which has been developed by the Cambridge Environmental Research Consultants and can be used to model point source emissions. ADMS-Roads Extra is particularly suitable for modelling situations where the point source is in close proximity to significant building mass and where there is a potential that the emission plume may be grounded prematurely by the adjacent buildings i.e. subject to the 'building downwash' effect.

4.4 The parameters and assumptions used within the modelling process are set out in the following section.

Receptor Locations

4.5 Pollutant dispersion modelling has been undertaken specifically for NO_x/NO_2 for the following receptors/environments:

Central amenity areas/playspaces at ground level

4.6 These areas have been taken to represent those locations where residents may be expected to spend leisure time for extended periods. Detection of EC emissions has been examined at heights of 1.5m from ground level. The location of the receptors examined is set out in **Figure 4.1**

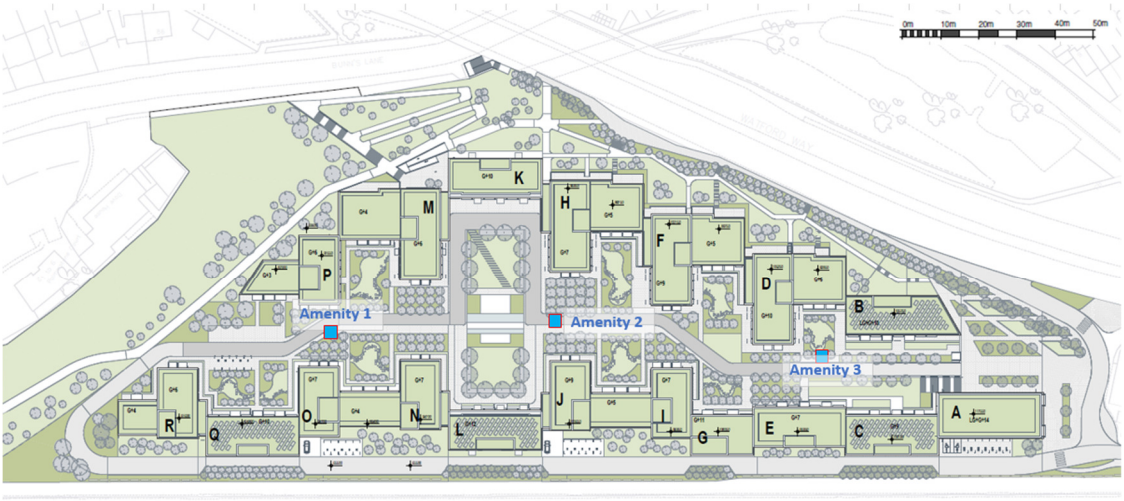

Figure 4.1: Assessment Locations: Central Amenity Areas /Playspaces

Inner facades at successive storey heights

4.7 Balconies within the central courtyard areas are also considered as 'amenity space'. Therefore, detection of EC emissions has also been undertaken for each inner façade at successive storey heights. Three vertical axis have been examined and these are illustrated in **Figure 4.2**.

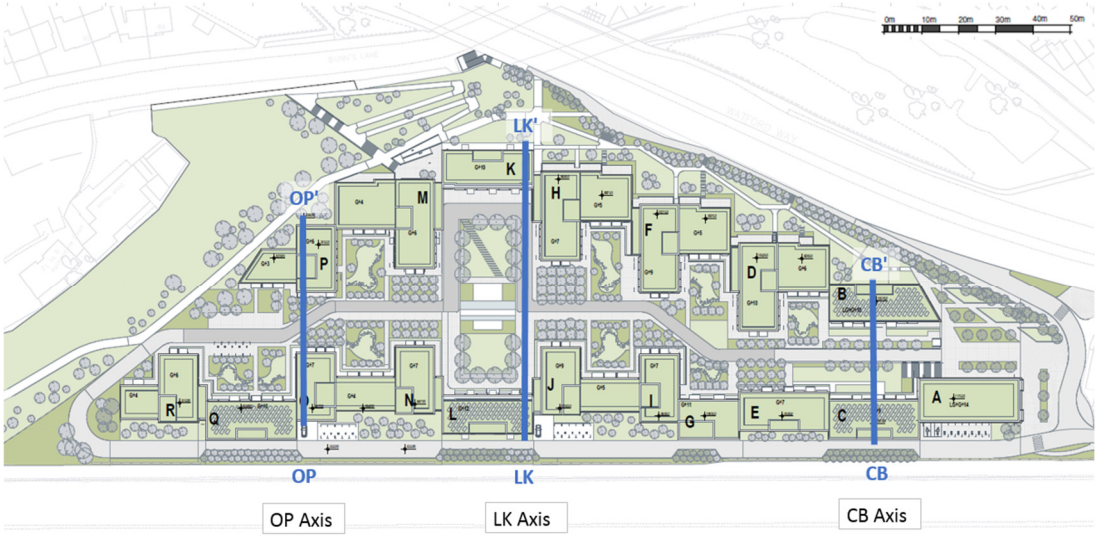

Figure 4.2: Assessment Locations: Inner Facades at Successive Storey Heights

Wider local area (up to 6km^2).

4.8 Point source emissions are understood to form buoyant 'plumes' which, dependent upon the rate and temperature of emission, diameter and height of stack, can travel significant distances before dispersing. In some cases, local topography and meteorology can cause a plume to 'ground' i.e. reach ground level, before becoming sufficiently dispersed. Therefore, an assessment has also been applied across a grid of 6km2 in order to examine the likelihood of this occurrence. The area examined is illustrated in **Figure 4.3.**

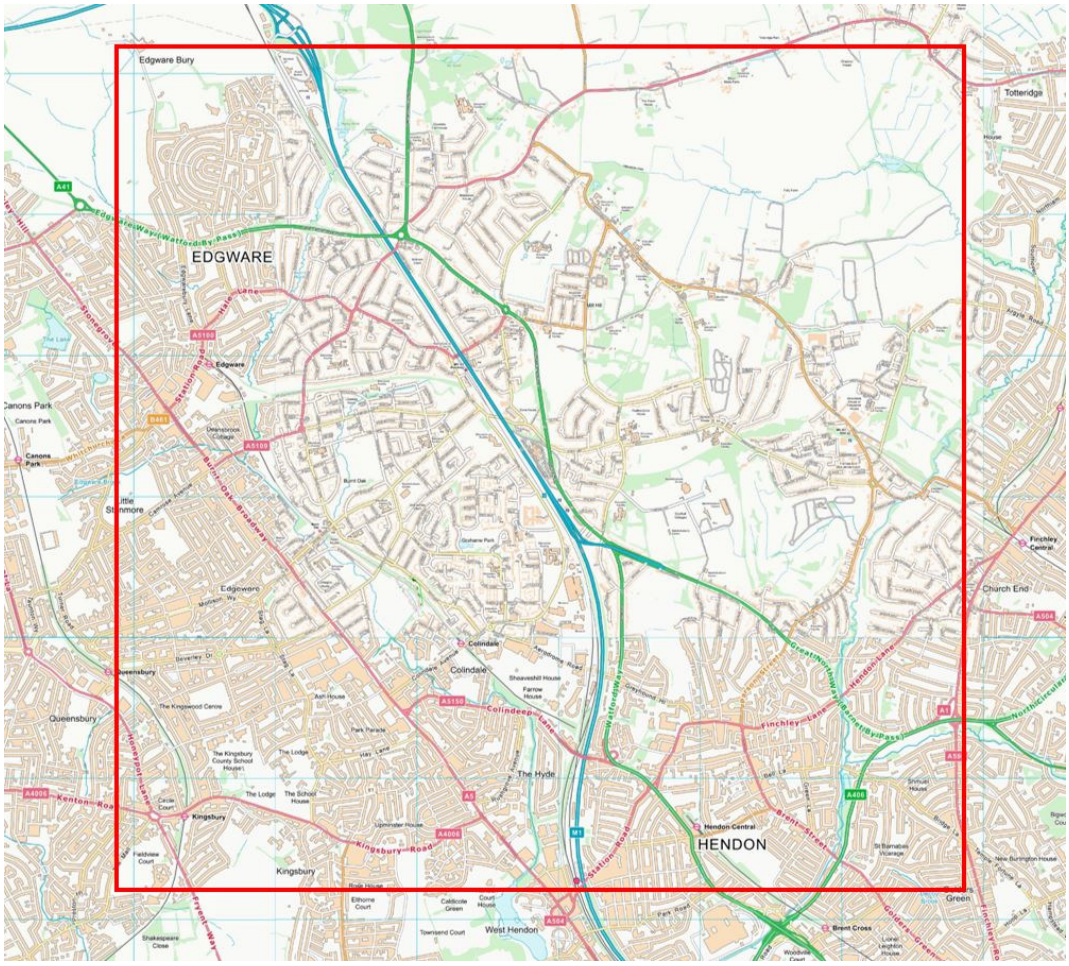

Figure 4.3: Assessment Locations: Wider Local Area

Model Uncertainty.

4.9 It is noted within the IAQM Air Quality Planning Guidance[4] that model verification of point source emissions is not practicable therefore a number of sensitivity tests have been conducted on the input data. These have included examination of the effects of:

- Adjustment of stack heights;
- Adjustment of emission rates;
- Adjustment of flue location;

[4] Environmental Protection UK & Institute of Air Quality Management (EPUK & IAQM) (2015) Land-Use Planning & Development Control: Planning for Air Quality, EPUK & IAQM, London

- Adjustment of receptor locations and grid spacings; and
- Adjustment of ground heights

4.10 All of the above tests have provided confidence that the model is responding as expected.

Assessment of Effects

4.11 Section 1 provides the national health based air quality standards and objectives as set out within the Air Quality Strategy and which are used in the assessment of effects. The EPUK & IAQM Air Quality Planning Guidance notes that, with regards to point source emissions, the impacts resulting from short term, peak concentrations of those pollutants that can affect health through inhalation are of most concern. It notes that the Environment Agency uses a threshold criterion of 10% of the short term Air Quality Action Level as a screening criterion for the maximum short term impact. It concludes that this is a reasonable value to take and adopts it as a basis for defining an impact that is sufficiently small in magnitude to be regarded as having an insignificant effect.

4.12 The short-term Air Quality Action Level for NO_2 is 200 µg/m^3. This has been modelled as the 99.79th percentile of the short term annual mean. In accordance with the guidance issued by EPUK, IAQM and the Environment Agency, any short-term concentrations associated with the emissions from the EC which are of 20 µg/m^3 or less, will be considered insignificant.

Results

4.13 The findings of the exercise to detect emissions from the EC within the three identified environments is set out below.

Central Amenity Areas /Playspaces

Receptor Location	Modelled Short -term NO_2 Concentrations (99.79th percentile)at 1.5m (µg m^{-3})
Amenity Area 1	1.33
Amenity Area 2	1.78
Amenity Areas 3	6.61

Table 4.1: Assessment Locations: Central Amenity Areas/Playspaces

4.14 This demonstrates that short term NO_2 concentrations detected at the three amenity areas, as a result of the EC, are is less than 20 µg/m^3 and so the effect of the EC on levels of NO_2 within the amenity space is considered to be insignificant.

Inner facades at successive storey heights

4.15 **Figures 4.4, 4.5** and **4.6** illustrate the change in NO_2 concentration with height at façade

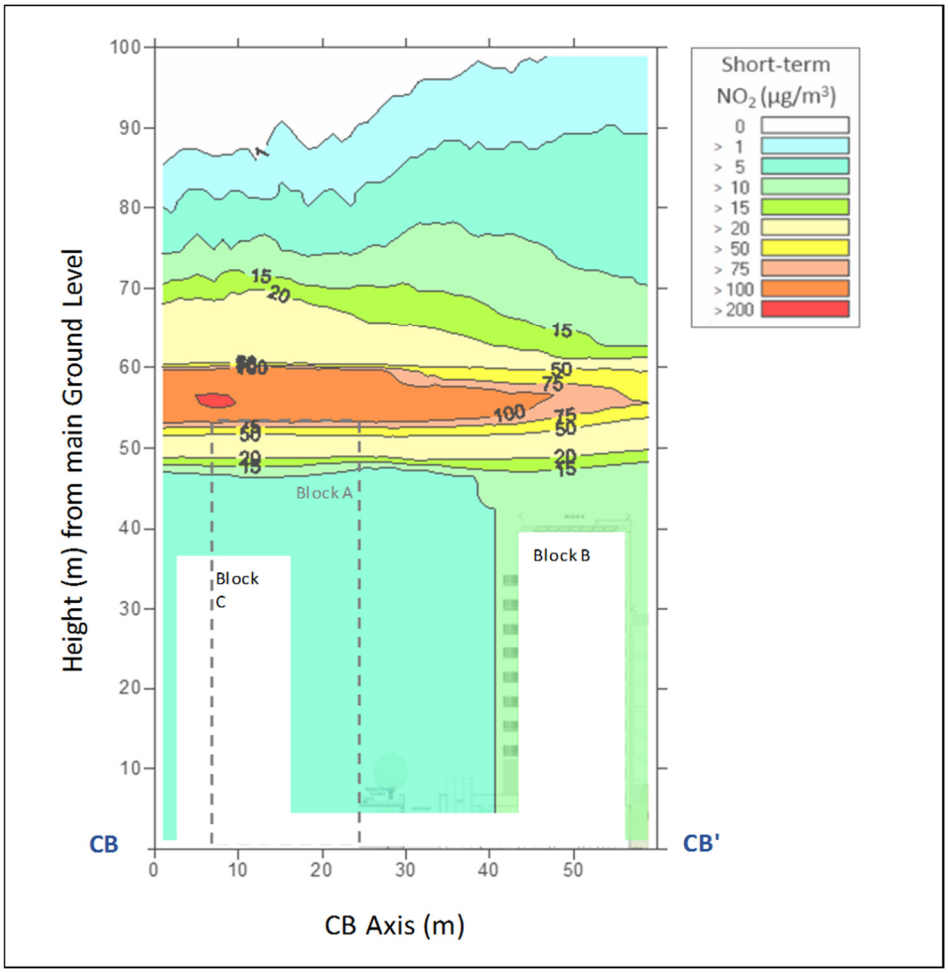

Figure 4.4: Assessment Locations: Inner Facades C B Axis

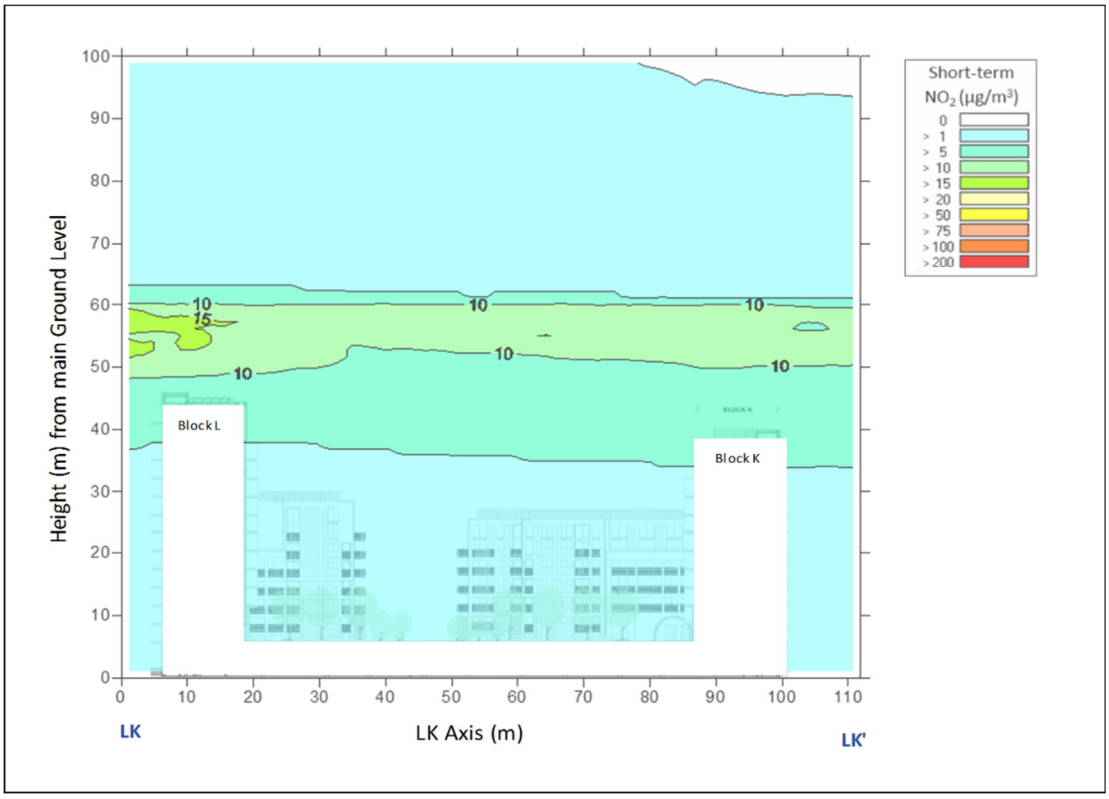

Figure 4.5: Assessment Locations: Inner Facades LK Axis

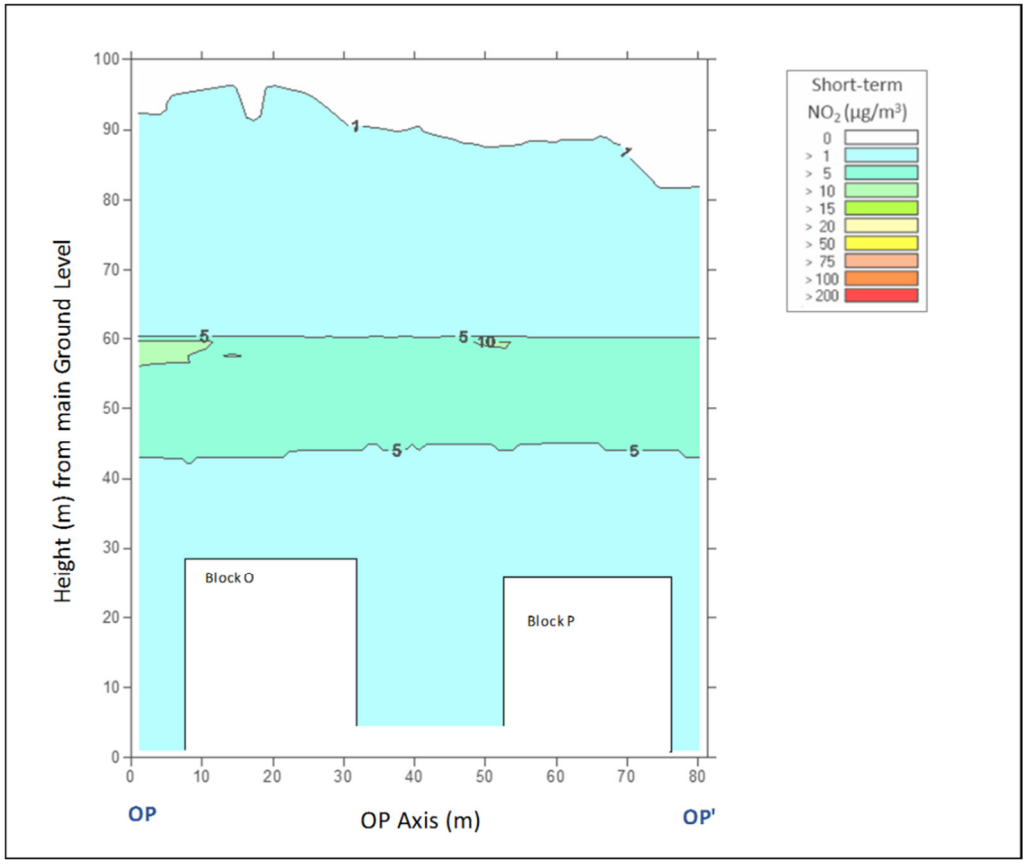

Figure 4.6: Assessment Locations: Inner Facades OP Axis

4.16 **Figure 4.6** illustrates the axis closest to the stack. Therefore, of the three axis examined, this is where the highest levels of short term NO_2 associated with the Energy Centre are demonstrated within the modelling and where the effect of building downwash can most be clearly seen. However, all three images illustrate that short term NO2 concentrations at the balcony levels of the inner facades, as a result of the EC are less than 20 µg/m3 and so, in accordance with EPUK, IAQM and Environment Agency guidance, the effect of the EC on levels of NO2 at the balcony areas is considered to be insignificant. Wider local area (6km2)

Wider local area (up to 6km^2).

4.17 **Figure 4.7** below illustrates the NO_2 plume associated with the EC over a 6km^2 area.

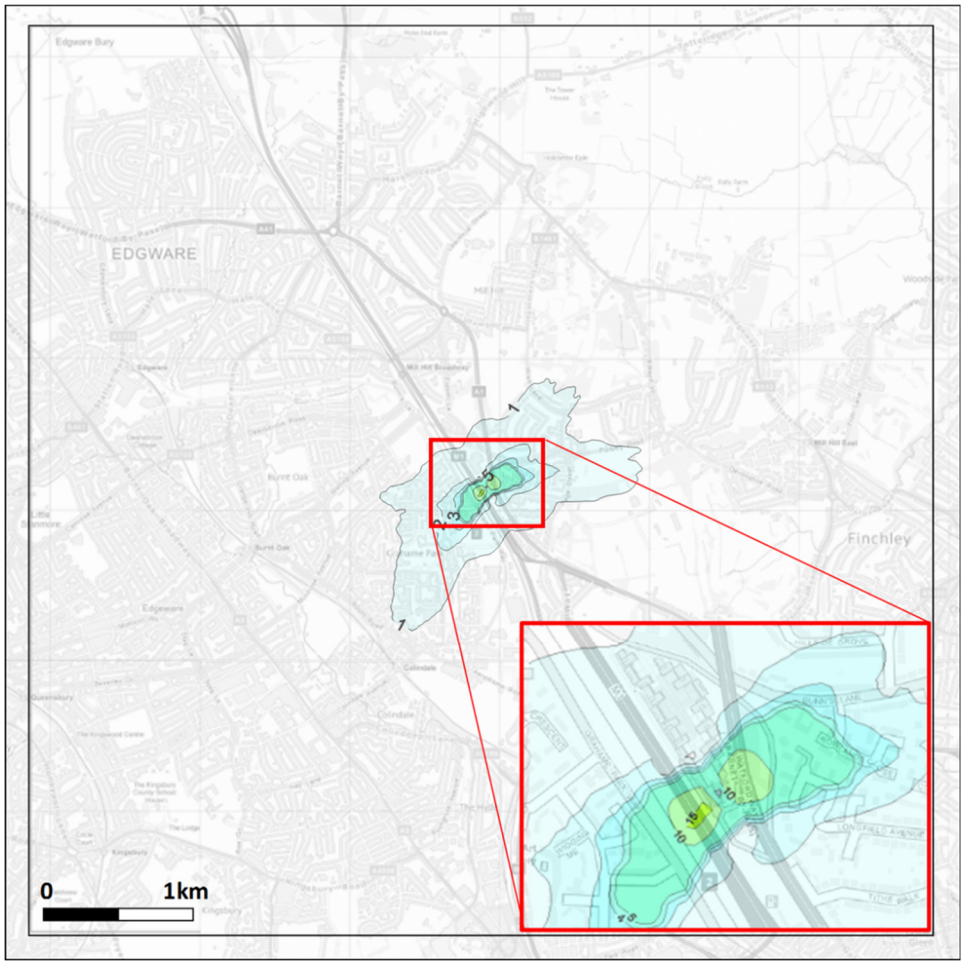

Figure 4.7: Estimated Energy Centre NO_2 Concentrations over 6km^2

4.18 This image illustrates that the short term NO_2 concentrations at ground level across a 6km^2 as a result of the EC, are less than 20 µg/m^3 and so are considered to be insignificant.

5 Dispersion Modelling Protocol and Assumptions

5.1 The modelling tools which has been used in the dispersion modelling processes is the ADMS Roads Extra 4.1 model, for modelling roadside emissions and point source emissions. This has been developed by the Cambridge Environmental Research Consultants.

5.2 The ADMS model has used the following input data for the road sources:

- Hourly Average Traffic Speeds - derived from London Atmospheric Emissions Inventory (LAEI) and local knowledge;
- 2016 Baseline surveyed traffic data provided by Velocity Transport Planning;
- 2021 Assessment year traffic data (including committed) with and without the Development, provided by Velocity Transport Planning;
- 2026 Assessment year traffic data (including committed) with and without the Development, provided by Velocity Transport Planning;
- 2016 Surveyed data for the M1 obtained from the Department for Transport website; applying a growth factor for 2021 and 2026 provided by Velocity Transport Planning;
- 2016 data for the A1 Watford Way provided by Velocity Transport Planning;
- Latest relevant Emission Factor Toolkit (v8.0);
- Geo-referenced mapping data; and
- Hourly Sequential ADMS format MET data for the closest suitable site of Heathrow, for the year 2016.

5.3 All traffic data used within the modelling process is set out within Annex A to this Appendix.

5.4 The ADMS model uses the following input data for the industrial sources

Cogeneration Plant

- NOx Emission rate – 0.03g/s;
- Specific heat capacity of whole release - 1012ºC/kg;
- Molecular mass of whole release - 28.966g;
- Density of whole release – 1.225 kg.m^3;
- Stack Heights – 53.5m;

- Flue diameter 0.3m;
- Vertical velocity of release – 10.62m/s;
- Temperature of release - 120°C; and
- Stack coordinates – 521900, 191160;

Boilers

- Combined NOx Emission rate – 0.05g/s;
- Specific heat capacity of whole release - 1012°C/kg;
- Molecular mass of whole release - 28.966g;
- Density of whole release – 1.225 kg.m^3;
- Stack Heights – 53.5m;
- Combined Flue diameter 0.866m;
- Vertical velocity of release – 3.65m/s;
- Temperature of release - 69°C; and
- Stack coordinates – 521900, 191160;

Building

- For the purpose of modelling the effect of point source emission on adjacent buildings only Building A, has been included in the modelling process[5]. This is the largest building and the one within which the point source stacks are located. is the taller and where the stacks are located, has been included.
- Shape: rectangular
- Coordinates: 521906.3, 191157.06
- Height 52.35m
- Length/diameter: 14.06m
- Width: 34.33m
- Angle: 57.32m

5.5 Both the baseline and the effect of the proposed building facades upon existing road traffic emissions has been assessed within the ADMS model by modelling the M1 and A1 Watford Way as two converging canyon environments. Whilst the road corridors are not classic canyons, they can be described in this way for the purposed of modelling, albeit with one very low

[5] Concluded on discussion with CERC.

canyon wall and one very high one. In the Development scenario, this will replicate the pollutant dispersion behaviour adjacent to the Development façade and the pollutants which overtop it into the amenity space.

5.6 ADMS Road Extra only allows the use of buildings for modelling industrial sources. Therefore, to represent the barrier effect of the building, the M1 and A1 have been split on several roads of the same length of the buildings, each of them have a canyon with the height of the building that adjoins.

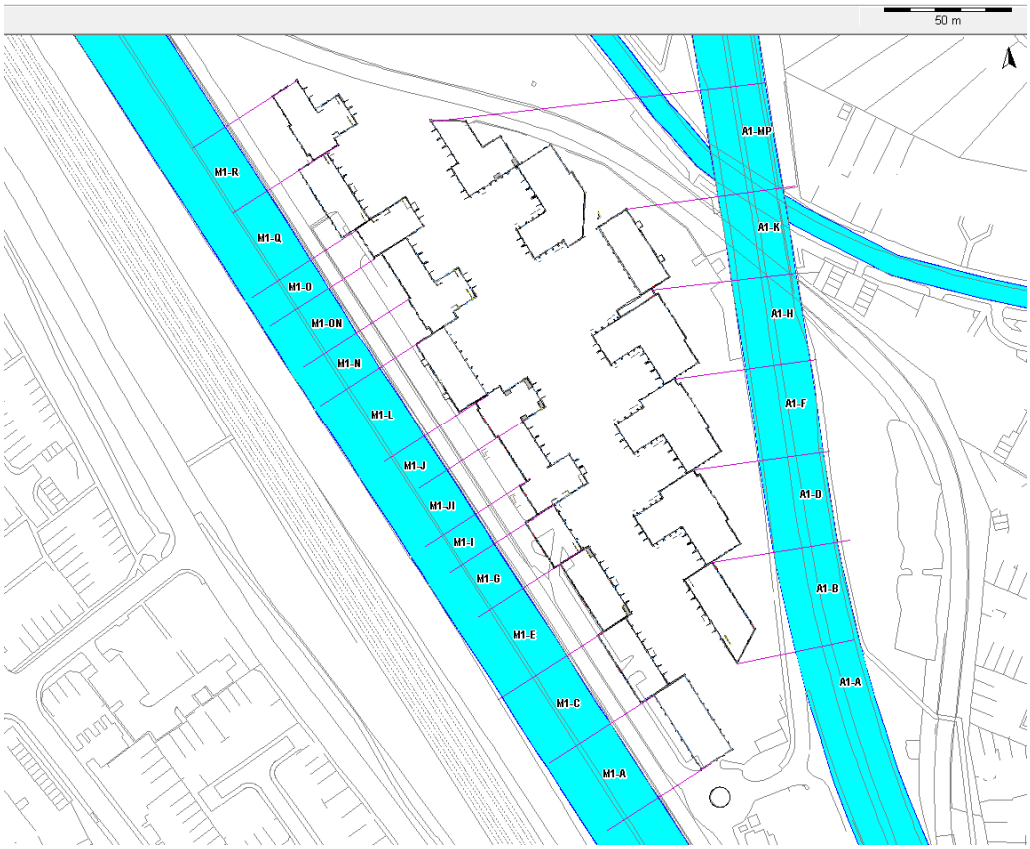

Figure 5.1: Advanced Canyon Modelling Process

5.7 Canyons have been calculated using the Advance Canyon option with network road activated in order to allow the travelling of the pollutants between consecutive canyons. Height of the buildings to develop the canyons has been calculated from the ground floor level of the amenity area.

5.8 **Table 5.1** below summarise the parameters included on the advance canyon file

AdvancedCanyonVersion1																		
Name	X1	Y1	X2	Y2	width_L	avgHeight_L	minHeight_L	maxHeight_L	canyonLength_L	endLength_L	buildLength_L	width_R	avgHeight_R	minHeight_R	maxHeight_R	canyonLength_R	endLength_R	buildLength_R
A1.N	521922	191407	521919	191427	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A1-A	521959	191187	521962	191175	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49.2	48.0	32.5	48.0	31.6	0.0	31.6
A1-B	521950	191226	521953	191213	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.3	35.7	35.7	35.7	39.1	0.0	39.1
A1-D	521945	191261	521948	191244	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.7	30.3	20.1	35.7	35.6	0.0	35.6
A1-F	521939	191298	521942	191278	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.3	26.8	20.1	32.5	37.3	0.0	37.3
A1-H	521934	191332	521936	191315	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.0	23.6	20.1	26.4	34.6	0.0	34.6
A1-K	521929	191365	521931	191349	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.5	34.8	15.8	34.8	33.8	0.0	33.8
A1-MP	521922	191407	521925	191386	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.2	18.9	15.8	34.8	31.4	11.2	31.4
A1-South	521969	191153	521974	191137	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M1.North	521709	191383	521690	191413	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.6	15.8	15.8	15.8	0.1	0.0	0.1
M1.South	521879	191119	521889	191104	35.6	48.0	48.0	48.0	0.4	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M1-A	521861	191148	521867	191139	35.4	48.0	32.5	48.0	34.3	0.0	34.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M1-C	521844	191175	521850	191164	29.6	32.5	26.4	32.5	31.6	0.0	31.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M1-E	521826	191202	521833	191191	32.2	26.7	26.4	38.8	31.7	0.0	31.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M1-G	521815	191219	521821	191210	30.2	38.7	26.4	38.8	20.8	0.0	20.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M1-I	521808	191230	521811	191225	35.3	27.1	20.1	38.8	13.7	0.0	13.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M1-J	521787	191261	521792	191255	38.0	32.5	20.1	41.8	16.4	0.0	16.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M1-JI	521796	191248	521801	191240	39.0	20.5	20.1	34.0	20.6	0.0	20.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M1-L	521770	191288	521777	191278	32.1	40.9	15.8	41.8	31.9	0.0	31.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M1-N	521761	191302	521765	191296	38.3	24.3	15.8	41.8	16.6	0.0	16.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M1-O	521743	191331	521746	191326	36.5	24.5	15.8	34.4	13.5	0.0	13.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M1-ON	521750	191320	521755	191311	39.7	16.7	15.8	25.1	20.6	0.0	20.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M1-Q	521725	191358	521734	191345	30.0	33.9	15.8	34.4	31.9	0.0	31.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 5.1: Advanced Canyon File Parameters

5.9 These calculations have been undertaken specifically for NO_2 for the following environments:

- Courtyard amenity areas at ground level;
- Courtyard amenity areas at successive storey heights;
- Block facades facing the M1/A1 Watford Way at ground level; and
- Block facades facing the M1/A1 Watford Way at successive storey heights.

9.1.1 The road related NO_2 levels associated with the proposed scheme layout have been assessed using emission factors for the year 2016. It is assumed that future road emissions will be an improvement on current conditions however this is not a known parameter. Therefore, application of current road traffic emission rates provides a worst-case assessment. It is noted here that only NO_2 concentrations have been presented in terms of site suitability as these are the main pollutants of concern and for which validation data is available. The relative increases and decreases of NO_2 around the site will be indicative of likely similar findings for PM_{10} and $PM_{2.5}$ albeit these will be at a lower level.

Background

Roadside Dispersion Modelling

5.10 Two sets of corresponding urban background data for NO_2 available from sites LB Barnet monitoring sites ABN2 and PNB3 indicate a worst case 2016 background NO_2 value of 28µg/m^3. This has been used for the roadside dispersion modelling exercises within this study. ABN2 also collects data for PM_{10} and this has also been used. However, no monitored values are available for $PM_{2.5}$. Therefore, estimates of these values have been obtained from the Defra background mapping tool which provides a modelled indication of pollutant background concentrations within the closest appropriate 1 x 1km grid squares to the Site (X:521500, Y:191500 : X:522500, Y:191500).

5.11 The NO_2, PM_{10}, and $PM_{2.5}$ background concentrations used within the roadside dispersion modelling process are provided in **Table 5.2**

Pollutant	2016 Background Concentrations (µg/m^3)	Data Source
NO_2	28.0	Local LB Barnet Monitored Data
PM_{10}	18.0	Local LB Barnet Monitored Data
$PM_{2.5}$	13.8	Defra Background Mapping Tool

Table 5.2: Background Pollutant Concentrations for Roadside Dispersion Modelling

Point Source Dispersion Modelling

5.12 Point source emissions from the cogeneration plant and boilers have been assessed against short-term Air Quality Action Level for NO_2 of 200µg/m^3, modelled as the 99.79th percentile of the short-term annual mean. In accordance with the guidance issued by EPUK, IAQM and the Environment Agency, any short-term concentrations associated with the emissions from the Energy Centre which are of 20 µg/m^3 or less will be considered insignificant.

5.13 As a result, these contributions are not required to be compared with background values for the area. However, background values are required in order to enable the conversion of model derived NO_x to NO_2 values for examination of the short term NO_2 levels. This conversion has been achieved based upon the comparison NO_x and NO_2 background values for the 1 x 1 km grid square for the whole of LB Barnet using the following linear regressionf:

$$Y = 0.5555x + 3.854$$ [6]

NO_x to NO^2 Conversion

5.14 Where point source NO_x emissions require conversion to NO_2, the above relationship has been used. However, where road side emission or combined road side and point source NO_x emissions require conversion to NO_2, this has been achieved using the methodology set out in LLAQM(TG16).

Meteorological Data

5.15 The meteorological data required for the ADMS model must be from a representative location to the Site and include a full year of sequential readings. The MET office has advised that the closest suitable site with the most representative data is located at Heathrow. This data has been obtained for the ADMS model and the wind rose data for this location is set out in **Figure 5.2** below.

[6] Where NO_x contributions are greater than 3.854 µg/m^3 this relationship is assumed. Where NO_x contributions are less than 3.854 µg/m^3 the same value is assumed NO_2

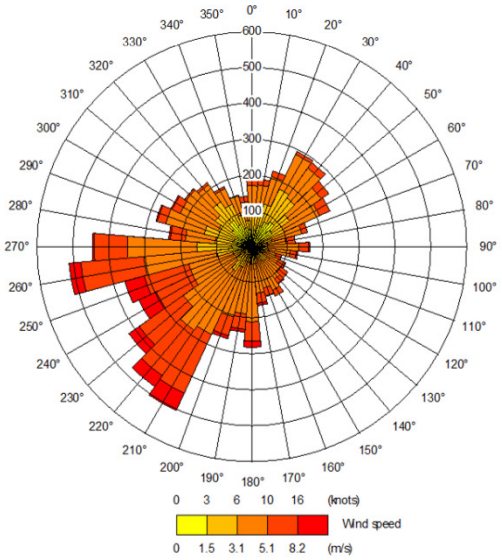

Figure 5.2: Heathrow Windrose Image.

Model Uncertainty.

5.16 This assessment focuses on modelling annual mean concentrations. This is because it is inherently more difficult to make satisfactory predictions for short-term behaviour of pollutants than it is to model an annual mean value.

5.17 It should also be noted that the modelling process is dependant in the first instance upon traffic data. Where this data is subject to change, this may affect the results of the modelling process.

5.18 Model uncertainty can result from:

- Model formulations;
- Data uncertainty – due to errors in input data emission estimates and background estimates and meteorology; and
- Variability – randomness of measures used.

5.19 Model uncertainty as a result of data uncertainty has been reduced where possible by close verification of the input data.

5.20 A number of sensitivity tests have been conducted on the input data in order to obtain results which most closely reflect the Site monitored data and these include:

- Adjustment of road traffic speed;
- Adjustment of surface roughness;
- Adjustment of ground heights; and

- Assessment of the building facades as both barriers functions and as canyons in the model.

Model Validation

5.21 A validation exercise was undertaken on the model and the result are set out in **Table 5.3** below.

Calibration Point	Annualised Monitored Site Data (2016)	Modelled Site Data (2016)	% difference
Real Time Monitor	33.9	37.4	9.7
DT 1: Northern Façade	34.2	36.6	6.7
DT 2: M1 - 1	52.0	44.2	16.3
DT3: M1 - 2	43.8	36.8	4.4
DT4: SE Façade	30.4	40.3	19.0
DT5: Eastern Façade	36.8	37.4	9.2
DT6: A1 – 1	52.4	45.2	14.9
DT7: A1 – 2	61.3	52.7	15.1
DT8: A1 – 3	63.0	56.0	11.7
DT9: Southern Facade	31.0	45.8	18.6
Average Site value (not including motorway adjacent)	33.3	37.7	12.5
Average motorway adjacent value.	54.4	48.8	11.1

Table 5.3: Model Validation

5.22 As noted above, a number of sensitivity tests were carried out on the model in order to replicate as closely as possible, the real-world site specific conditions of meteorology, topography and traffic related emissions. However, given the complex topography of the Site in relation to adjacent roads and the pollution microclimates created within the Site, due to building facades and adjacent car parks it is clear that a close validation of the model results was not possible.

5.23 In some cases, a closer validation is possible by the application of the LAQM Technical Guidance (16) methodology, however this document is superseded by LLAQM for the London Boroughs which does not contain a validation methodology. In addition, it is considered that this process would not materially improve model performance, due to the complexities of the Site.

5.24 Therefore, in this case, where any model results are presented it will be noted that these may range in accuracy from +12.5 to -11.1% depending on location. Typically, locations adjacent to the road under estimate by 11.1% on average whilst locations within the centre of the site over estimate by 12.5% on average.

Model Assumptions

5.25 In addition to the input data set out above, the following assumptions have been made:

- Receptor locations have generally chosen at worst case facade locations close to the kerbside.
- All receptors modelled at 1.5m above ground level plus a further 3.1 for each storey.
- Roads typically 10-30m wide.
- Road speeds have been modelled as set out on Annex A
- Diurnal Profile for the local road network based on typical UK profiles
- Surface roughness: Site 0.5 Met Site 0.2.

[i] European Parliament and the Council of the European Union. (2008) *Directive 2008/50/EC of the European Parliament and of the Council. European Parliament and the Council of the European Union. Brussels*.

[ii] Her Majesty's Stationery Office. (2010). *The Air Quality Standards Regulations 2010.* HSMO, London.

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[xii] London Borough of Barnet (2016). *London Borough of Barnet Sustainable Design and Construction Supplementary Planning Document*. LBB, Whetstone.
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[xv] Greater London Authority. (2016) *London Local Air Quality Management (LLAQM) Technical Guidance.* GLA, London.
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[xx] IAQM, (2014). Guidance on the Assessment of Dust from Demolition and Construction. EPUK and IAQM, London.
[xxi] Ricardo Energy and Environment, (August 2014). Available online at: http://naei.defra.gov.uk
[xxii] London Councils. (2007). *Air Quality and Planning Guidance. The London Air Pollution Planning and the Local Environment (APPLE) working group. APPLE, London*

ANNEX A – TRAFFIC DATA

INDICATIVE LINK PLAN

TRAFFIC DATA

	All Scenarios		Scenario 1		Scenario 4		Scenario 5		Scenario 6		Scenario 7	
	Speed (km/h)		Baseline Year 2016		Future Year +Committed Development 2021		Future Year +Committed Development 2026		Future Year +Committed Development + New Development 2021		Future Year +Committed Development + New Development 2026	
ADDT	Light Vehicles	HGVs	Total Vehicles	% HGVS	Total Vehicles	% HGVS	Total Vehicles	% HGVS	Total Vehicles	% HGVS	Total Vehicles	% HGVS
Link 1	30	30	17655	6.0%	18527	6.0%	19440	6.0%	18581	6.0%	19494	6.0%
Link 2	29	29	9842	7.5%	10347	7.5%	10878	7.5%	10469	7.4%	11000	7.4%
Link 3	20	20	11813	6.7%	12371	6.7%	12954	6.7%	12476	6.6%	13059	6.6%
Link 4	20	20	13885	8.5%	14547	8.5%	15239	8.5%	14600	8.5%	15292	8.5%
Link 5	35	35	36182	5.3%	37861	5.3%	39618	5.3%	38305	5.2%	40062	5.2%
Link 6	38	38	8986	3.0%	9403	3.0%	9839	3.0%	9536	2.9%	9972	3.0%
Link 7	52	52	59274	5.5%	62024	5.5%	64902	5.5%	62967	5.4%	65845	5.4%
Link 8	28	28	3638	6.3%	3817	6.3%	4004	6.3%	3850	6.3%	4037	6.2%
Link 9	29	29	14245	0.5%	14924	0.5%	15634	0.5%	14952	0.5%	15662	0.5%
Link 10	28	28	4723	26.0%	4960	25.9%	5208	25.8%	4993	25.8%	5241	25.7%
Link 11	44	44	10042	3.0%	10517	3.0%	11012	3.0%	10537	3.0%	11032	3.0%
Link 12	41	41	4694	1.2%	4955	1.2%	5228	1.2%	5024	1.2%	5297	1.2%
Link 13	30	30	16166	1.7%	16970	1.7%	17809	1.7%	17024	1.7%	17863	1.6%
Link 14	43	43	14774	1.8%	15604	1.8%	16475	1.8%	15757	1.8%	16628	1.8%
Link 15	50	50	37526	5.0%	39268	5.0%	41090	5.0%	40439	4.8%	42261	4.8%
Link 16	29	29	605	14.3%	633	14.3%	662	14.3%	633	14.3%	662	14.3%
Link 17	40	40	44916	5.9%	47024	5.9%	49231	5.9%	47257	5.9%	49464	5.9%
Link 18	60	60	20400	3.2%	21371	3.2%	22388	3.2%	21604	3.2%	22621	3.2%
A1	40	40	59274	5.5%	62024	5.5%	64902	5.5%	62967	5.4%	65845	5.4%
M1	112	97	66360	8.0%	69432	8.0%	72672	8.0%	69432	8.0%	72672	8.0%