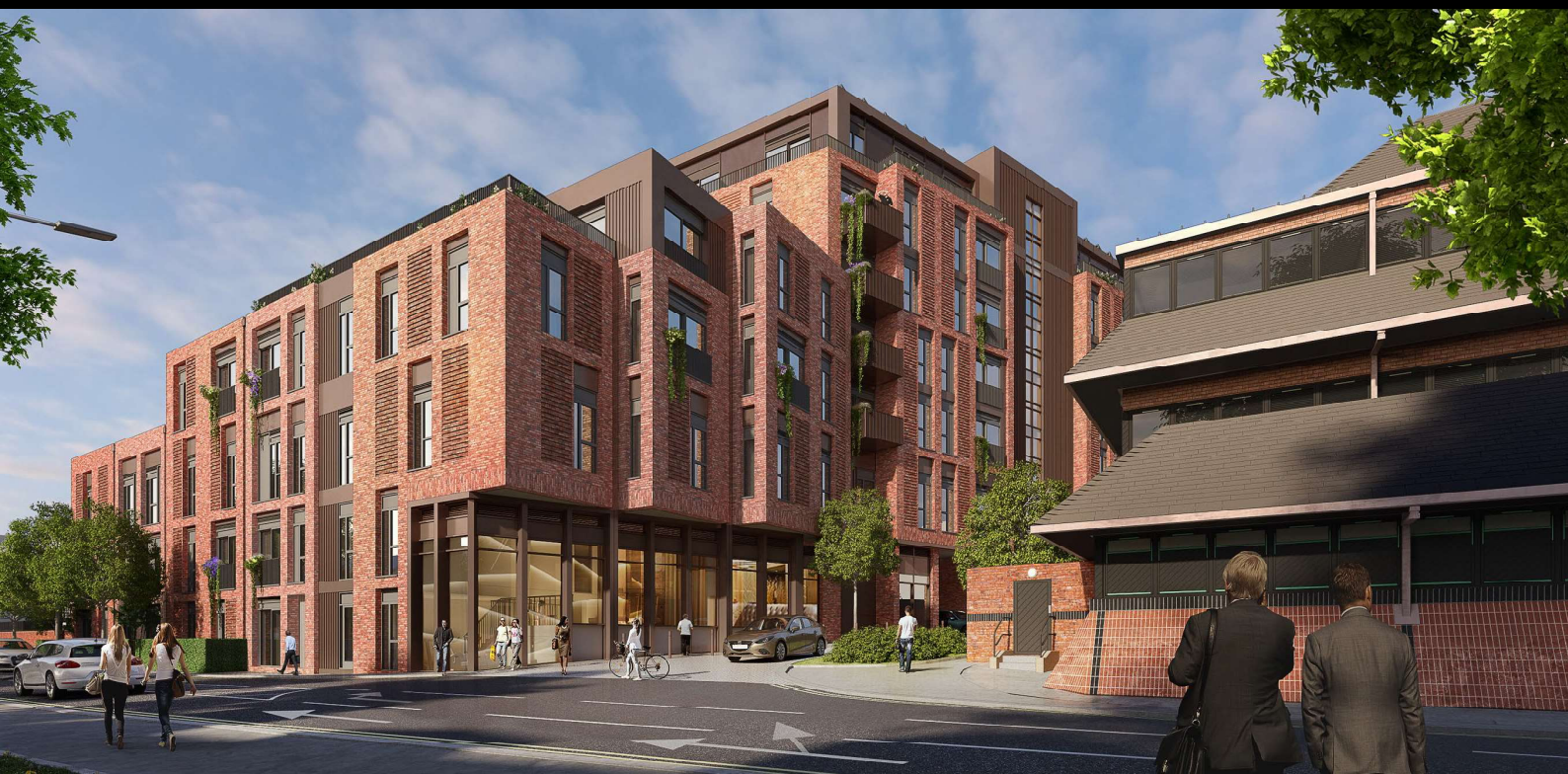
GUILD LIVING @ UXBRIDGE.

Air Quality Assessment

SEPTEMBER 2020

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Air Quality CONSULTANTS

Air Quality Assessment:
Guild Living Care Home, Uxbridge, Hillingdon

September 2020



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Document Control

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Executive Summary

This air quality impact assessment has been prepared by Air Quality Consultants Ltd to accompany an application for full planning permission submitted by the Applicant, Senior Living Urban (Uxbridge) Limited (Guild Living), to the London Borough of Hillingdon (LBH). The proposal is for a comprehensive redevelopment of the site comprising demolition of existing buildings to provide residential care accommodation (C2), café and nursery (E), car parking, landscaping, and associated works.

The proposed development will lead to a net decrease in traffic flows on the local road network, and road traffic impacts at existing receptors have been screened out as either not significant or beneficial.

An assessment of the emissions from the emergency generator has demonstrated that the impacts of these emissions at existing receptors will be negligible.

The suitability of the site for the proposed uses was considered through the prediction of future air quality conditions at the site, taking account of existing road sources and emissions from the proposed emergency diesel generator. Future air quality conditions were shown to be acceptable throughout the site, with pollutant concentrations predicted to be below the air quality objectives.

During the construction works, a range of best practice mitigation measures will be implemented to reduce dust emissions and the overall effect will be 'not significant'; appropriate measures have been set out in this report, to be included in the Dust Management Plan for the works.

Overall, the construction and operational air quality effects of the proposed development are judged to be 'not significant'.

The proposed development has also been shown to meet the London Plan's requirement that new developments are at least 'air quality neutral'.

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1 Introduction

1.1 This air quality impact assessment has been prepared by Air Quality Consultants Ltd to accompany an application for full planning permission being submitted by Guild Living, to LBH. The proposal is for a for a comprehensive redevelopment of the site comprising demolition of existing buildings to provide residential care accommodation (C2), café and nursery (E), car parking, landscaping and associated works. It lies within an Air Quality Management Area (AQMA) declared by LBH for exceedances of the annual mean nitrogen dioxide (NO_2) objective.

1.2 The proposed development will lead to changes in vehicle flows on local roads, which may impact on air quality at existing residential properties. The new residents and users of the proposed development will be subject to the impacts of road traffic emissions from the adjacent road network. The main air pollutants of concern related to road traffic emissions are nitrogen dioxide (NO_2) and fine particulate matter (PM_{10} and $PM_{2.5}$).

1.3 The proposals for the development also include the provision of a diesel emergency generator (hereafter referred to as the 'emergency plant'). The emergency plant is designed for critical use only (i.e. during power failure to the building) the emissions from the its operation during maintenance and testing could impact upon air quality at existing and proposed receptors. The main air pollutants of concern related to the generator are nitrogen dioxide and fine particulate matter (PM_{10}).

1.4 The Greater London Authority's (GLA's) London Plan (GLA, 2016) requires new developments to be air quality neutral. The air quality neutrality of the proposed development has, therefore, been assessed following the methodology provided in the Greater London Authority's (GLA's) Supplementary Planning Guidance (SPG) on Sustainable Design and Construction (GLA, 2014a).

1.5 The GLA has also released Supplementary Planning Guidance on the Control of Dust and Emissions from Construction and Demolition (GLA, 2014b). The SPG outlines a risk assessment approach for construction dust assessment and helps determine the mitigation measures that will need to be applied. A construction dust assessment has been undertaken and the appropriate mitigation has been set out.

1.6 This report describes existing local air quality conditions (base year 2018), and the predicted air quality in the future (opening year of 2024). The assessment of traffic and emergency plant-related impacts focuses on 2024, which is the anticipated year of first occupation of any of the residential units. The assessment of construction dust impacts focuses on the anticipated duration of the works at pre-application stage.

1.7 This report has been prepared taking into account all relevant local and national guidance and regulations, and follows a methodology agreed with LBH.

2 Policy Context and Assessment Criteria

2.1 The United Kingdom formally left the European Union (EU) on 31 January 2020; until the end of 2020 there will be a transition period while the UK and EU negotiate additional arrangements. During this period EU rules and regulations will continue to apply to the UK. All European legislation referred to in this report is written into UK law and will remain in place beyond 2020, unless amended, although there is uncertainty at this point in time as to who will enforce the requirements of some of this legislation.

Air Quality Strategy

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

The Environmental Permitting (England and Wales) (Amendment) Regulations 2018

2.3 The Medium Combustion Plant Directive (MCPD) (The European Parliament and the Council of the European Union, 2015) regulates pollutant emissions from combustion plant with a rated input between 1 and 50 megawatts (MW_{th}) and was transposed into UK law in January 2018 through an amendment to the Environmental Permitting Regulations (2018). The legislation sets emission limits to be applied from December 2018 for new plant and from 2025 or 2030 for existing plant (depending on the rated input). In addition to addressing emissions from plant with a rated input of 1 to 50 MW_{th}, as required by the MCPD, the amendment also introduces emission limits on generator plant, regardless of their rated input. Generators whose sole purpose is maintaining power supply at a site during an on-site emergency, that are operated for the purpose of testing/maintenance for no more than 50 hours per year, will be exempt from the emission limits, but will be required to apply for an exemption with the regulating authority.

2.4 The emergency plant will be tested for fewer than 50 hours per year and is exempt from requiring a permit.

Clean Air Act 1993 & Environmental Protection Act

2.5 Small combustion plant of less than 20 MW net rated thermal input are controlled under the Clean Air Act 1993 (1993). This requires the local authority to approve the chimney height. Plant which are smaller than 366 kW have no such requirement. The local authority's approval will, therefore, be required for the plant to be installed in the proposed development.

2.6 Measures to ensure adequate dispersion of emissions from discharging stacks and vents are included in Technical Guidance Note D1 (Dispersion) (1993), issued in support of the Environmental Protection Act (1990).

Clean Air Strategy 2019

2.7 The Clean Air Strategy (Defra, 2019) sets out a wide range of actions by which the UK Government will seek to reduce pollutant emissions and improve air quality. Actions are targeted at four main sources of emissions: Transport, Domestic, Farming and Industry. At this stage, there is no straightforward way to take account of the expected future benefits to air quality within this assessment.

Reducing Emissions from Road Transport: Road to Zero Strategy

2.8 The Office for Low Emission Vehicles (OLEV) and Department for Transport (DfT) published a Policy Paper (DfT, 2018) in July 2018 outlining how the government will support the transition to zero tailpipe emission road transport and reduce tailpipe emissions from conventional vehicles during the transition. This paper affirms the Government's pledge to end the sale of new conventional petrol and diesel cars and vans by 2040, and states that the Government expects the majority of new cars and vans sold to be 100% zero tailpipe emission and all new cars and vans to have significant zero tailpipe emission capability by this year, and that by 2050 almost every car and van should have zero tailpipe emissions. It states that the Government wants to see at least 50%, and as many as 70%, of new car sales, and up to 40% of new van sales, being ultra-low emission by 2030.

2.9 The paper sets out a number of measures by which Government will support this transition, but is clear that Government expects this transition to be industry and consumer led. The Government has since announced *"plans to bring forward an end to the sale of new petrol and diesel cars and vans to 2035, or earlier if a faster transition is feasible, subject to consultation, as well as including hybrids for the first time"*. If these ambitions are realised then road traffic-related NOx emissions can be expected to reduce significantly over the coming decades, likely beyond the scale of reductions forecast in the tools utilised in carrying out this air quality assessment.

Planning Policy

National Policies

2.10 The National Planning Policy Framework (NPPF) (2019a) sets out planning policy for England. It states that the purpose of the planning system is to contribute to the achievement of sustainable development, and that the planning system has three overarching objectives, one of which is an environmental objective:

"to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy".

2.11 To prevent unacceptable risks from air pollution, the NPPF states that:

"Planning policies and decisions should contribute to and enhance the natural and local environment by…preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air quality".

and

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development".

2.12 More specifically on air quality, the NPPF makes clear that:

"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".

2.13 The NPPF is supported by Planning Practice Guidance (PPG) (Ministry of Housing, Communities & Local Government, 2019b), which includes guiding principles on how planning can take account of the impacts of new development on air quality. The PPG states that:

"Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with Limit Values. It is important that the potential impact of new development on air quality is taken into account where the national assessment indicates that relevant limits have been exceeded or are near the limit, or where the need for emissions reductions has been identified".

2.14 Regarding plan-making, the PPG states:

"It is important to take into account air quality management areas, Clean Air Zones and other areas including sensitive habitats or designated sites of importance for biodiversity where there could be specific requirements or limitations on new development because of air quality".

2.15 The role of the local authorities through the LAQM regime is covered, with the PPG stating that a local authority Air Quality Action Plan "*identifies measures that will be introduced in pursuit of the objectives and can have implications for planning*". In addition, the PPG makes clear that *"…dust can also be a planning concern, for example, because of the effect on local amenity"*.

2.16 Regarding the need for an air quality assessment, the PPG states that:

"Whether 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 have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity".

2.17 The PPG sets out the information that may be required in an air quality assessment, making clear that:

"Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific".

2.18 The PPG also provides guidance on options for mitigating air quality impacts, as well as examples of the types of measures to be considered. It makes clear that:

"Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact. It is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented".

London-Specific Policies

2.19 The key London-specific policies are summarised below, with more detail provided, where required, in Appendix A1.

The London Plan

2.20 The London Plan (GLA, 2016) sets out the spatial development strategy for London consolidated with alterations made to the original plan since 2011. It brings together all relevant strategies, including those relating to air quality.

2.21 Policy 7.14, 'Improving Air Quality', addresses the spatial implications of the Mayor's Air Quality Strategy and how development and land use can help achieve its objectives. It recognises that Boroughs should have policies in place to reduce pollutant concentrations, having regard to the Mayor's Air Quality Strategy.

2.22 Policy 7.14B(c), requires that development proposals should be "*at least 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as designated Air Quality Management Areas (AQMAs))*". Further details of the London Plan in relation to planning decisions are provided in Appendix A1.

2.23 The 'Intend to Publish' version of the new London Plan was published in December 2019 (GLA, 2019a), incorporating consolidated changes to previous versions suggested by the Mayor of London, as well as addressing the Inspectors' recommendations following the 2019 Examination in Public. Despite not yet being adopted, the 'Intend to Publish' London Plan is a material consideration in planning decisions and is afforded considerable weight. Policy SI1 on 'Improving Air Quality' states that:

"Development plans, through relevant strategic, site specific and area-based policies should seek opportunities to identify and deliver further improvements to air quality and should not reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality".

2.24 It goes on to detail that development proposals should not:

- *"lead to further deterioration of existing poor air quality*
- *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*
- *create unacceptable risk of high levels of exposure to poor air quality".*

London Environment Strategy

2.25 The London Environment Strategy was published in May 2018 (GLA, 2018a). The strategy considers air quality in Chapter 4; the Mayor's main objective is to create a *"zero emission London by 2050".* Policy 4.2.1 aims to *"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".* An implementation plan for the strategy has also been published

which sets out what the Mayor will do between 2018 and 2023 to help achieve the ambitions in the strategy.

Mayor's Transport Strategy

2.26 The Mayor's Transport Strategy (GLA, 2018b) sets out the Mayor's policies and proposals to reshape transport in London over the next two decades. The Strategy focuses on reducing car dependency and increasing active sustainable travel, with the aim of improving air quality and creating healthier streets. It notes that development proposals should *"be designed so that walking and cycling are the most appealing choices for getting around locally".*

GLA SPG: Sustainable Design and Construction

2.27 The GLA's SPG on Sustainable Design and Construction (GLA, 2014a) provides details on delivering some of the priorities in the London Plan. Section 4.3 covers Air Pollution. It defines when developers will be required to submit an air quality assessment, explains how location and transport measures can minimise emissions to air, and provides emission standards for gas-fired boilers, Combined Heat and Power (CHP) and biomass plant. It also sets out, for the first time, guidance on how Policy 7.14B(c) of the London Plan relating to 'air quality neutral' (see Paragraph 2.22, above) should be implemented.

GLA SPG: The Control of Dust and Emissions During Construction and Demolition

2.28 The GLA's SPG on The Control of Dust and Emissions During Construction and Demolition (GLA, 2014b) outlines a risk assessment based approach to considering the potential for dust generation from a construction site, and sets out what mitigation measures should be implemented to minimise the risk of construction dust impacts, dependent on the outcomes of the risk assessment. This guidance is largely based on the Institute of Air Quality Management's (IAQM's) guidance (IAQM, 2016), and it states that "*the latest version of the IAQM Guidance should be used*".

Air Quality Focus Areas

2.29 The GLA has identified 187 air quality Focus Areas in London. These are locations that not only exceed the EU annual mean limit value for nitrogen dioxide, but also have high levels of human exposure. They do not represent an exhaustive list of London's air quality hotspot locations, but locations where the GLA believes the problem to be most acute. They are also areas where the GLA considers there to be the most potential for air quality improvements and are, therefore, where the GLA and Transport for London (TfL) will focus actions to improve air quality. The southern section of the proposed development is located within the Uxbridge Town Centre air quality Focus Area.

Local Policies

2.30 The Local Plan Part 1: Strategic Policies (LBH, 2012) was adopted by LBH in November 2012, and includes the following three Strategic Objectives (SOs) and five policies that are directly related to air quality:

- Strategic Objectives:
  - SO10: *"Improve and protect air… quality…";*
  - SO11: *"…minimise emissions of… local air quality pollutants from new development and transport"*; and
  - SO23: *"Develop and implement a strategy for Heathrow Opportunity Area, in order to ensure that local people benefit from… environmental improvements including reductions in... poor air quality"*;
- Policies:
  - Policy E2 'Location of Employment Growth' states that *"…The Council will promote development in highly accessible locations that delivers sustainable travel patterns and contributes to the improvement of existing networks to reduce emissions and impacts on air quality…"*;
  - Policy E3 'Strategy for Heathrow Opportunity Area' states that *"The Council will prepare a Local Development Document (LDD) for the Heathrow area…The LDD will also set… measures to improve local air quality"*;
  - Policy BE1 'Built Environment' states that *"The Council will require all new development to improve and maintain the quality of the built environment in order to create successful and sustainable neighbourhoods, where people enjoy living and working and that serve the long-term needs of all residents. All new development should… maximise the opportunities for all new homes to contribute to… reducing emissions of local air quality pollutants…"*;
  - Policy EM1 'Climate Change Adaptation and Mitigation' states that *"The Council will ensure that climate change mitigation is addressed at every stage of the development process by:*
    - *Promoting the use of decentralised energy within large scale development whilst improving local air quality levels…;*
    - *Targeting areas with high carbon emissions for additional reductions through low carbon strategies. These strategies will also have an objective to minimise other pollutants that impact on local air quality.*

- *Targeting areas of poor air quality for additional emissions reductions"*; and

- Policy EM8 'Land, Water, Air and Noise' states that *"All development should not cause deterioration in the local air quality levels and should ensure the protection of both existing and new sensitive receptors.*

  All major development within the Air Quality Management Area (AQMA) should demonstrate air quality neutrality (no worsening of impacts) where appropriate; actively contribute to the promotion of sustainable transport measures such as vehicle charging points and the increased provision for vehicles with cleaner transport fuels; deliver increased planting through soft landscaping and living walls and roofs; and provide a management plan for ensuring air quality impacts can be kept to a minimum.

  The Council seeks to reduce the levels of pollutants referred to in the Government's National Air Quality Strategy and will have regard to the Mayor's Air Quality Strategy. London Boroughs should also take account of the findings of the Air Quality Review and Assessments and Action plans, in particular where Air Quality Management Areas have been designated.

  The Council has a network of Air Quality Monitoring stations but recognises that this can be widened to improve understanding of air quality impacts. The Council may therefore require new major development in an AQMA to fund additional air quality monitoring stations to assist in managing air quality improvements".

2.31 The Council adopted the Local Plan Part 2: Development Management Policies (LBH, 2020) in January 2020, which delivers the detail of the strategic policies set out in the Local Plan Part 1: Strategic Policies. Together the documents form a comprehensive development strategy for the Borough up to 2026. The Local Plan Part 2 includes the following six policies that relate to air quality:

- Policy DMEI 1 'Living Walls and Roofs and on-site Vegetation' states that *"…Major development in Air Quality Management Areas must provide onsite provision of living roofs and/or walls. A suitable offsite contribution may be required where onsite provision is not appropriate"*;

- Policy DMEI 3 'Decentralised Energy' states that *"…The Council will support the development of DENs* [decentralised energy networks] *and energy centres in principle, subject to meeting the wider policy requirements of this plan and in particular on design and air quality"*;

- Policy DMEI 14 'Air Quality' states that:

"A) Development proposals should demonstrate appropriate reductions in emissions to sustain compliance with and contribute towards meeting EU limit values and national air quality objectives for pollutants.

B) Development proposals should, as a minimum:

i) be at least 'air quality neutral';

ii) include sufficient mitigation to ensure there is no unacceptable risk from air pollution to sensitive receptors, both existing and new; and

iii) actively contribute towards the improvement of air quality, especially within the Air Quality Management Area".

- Policy DMT 1 'Managing Transport Impacts' states that *"…In order for developments to be acceptable they are required to… have no significant adverse transport or associated air quality… impacts on the local and wider environment, particularly on the strategic road network…"*;
- Policy DMT 2 'Highways Impacts' states that *"Development proposals must ensure that… they do not contribute to the deterioration of air quality…"*; and
- Policy DMT 7 'Freight' states that *"Development proposals that generate a high number and/or intensity of transport and movements such as those relating to logistics and distribution or freight will be required to demonstrate that… there is no deleterious impact on…local air quality levels…"*

2.32 The LBH also adopted a Supplementary Planning Document (SPD) on Planning Obligations (LBH, 2014) in July 2014, which states that:

"Obligations may be sought to ensure no detrimental impacts on air quality and/or to ensure compliance with the objective of the AQMA. The following circumstances may establish a requirement for planning obligations:

- *As a recommendation of an air quality assessment;*
- *To mitigate the impacts from emissions from new development where these cannot be resolved through other means such as planning conditions, travel plans or statutory licenses;*
- *To mitigate impacts on new development where floor space is to be occupied for significant parts of the day, such as residential, where located in an area of poor air quality; and*
- *To mitigate air quality impacts during the construction phase where these cannot be controlled through conditions or other statutory licenses."*

Air Quality Action Plans

National Air Quality Plan

2.33 Defra has produced an Air Quality Plan to tackle roadside nitrogen dioxide concentrations in the UK (Defra, 2017); a supplement to the 2017 Plan (Defra, 2018a) was published in October 2018 and sets out the steps Government is taking in relation to a further 33 local authorities where shorter-term exceedances of the limit value were identified. Alongside a package of national measures, the 2017 Plan and the 2018 Supplement require those identified English Local Authorities (or the GLA in the case of London Authorities) to produce local action plans and/or feasibility studies. These plans and feasibility studies must have regard to measures to achieve the statutory limit values within the shortest possible time, which may include the implementation of a CAZ. There is currently no straightforward way to take account of the effects of the 2017 Plan or 2018 Supplement in the modelling undertaken for this assessment; however, consideration has been given to whether there is currently, or is likely to be in the future, a limit value exceedance in the vicinity of the proposed development. This assessment has principally been carried out in relation to the air quality objectives, rather than the EU limit values that are the focus of the Air Quality Plan.

Local Air Quality Action Plan

2.34 The LBH has declared an AQMA for nitrogen dioxide that covers the section of the Borough located below the Chiltern-Marylebone railway line. The Council has since developed an Air Quality Action Plan (LBH, 2019a). This plan identifies the Council's objectives to:

"a) improve the areas of poorer air quality as soon as possible;

b) to continue to improve air quality across the borough and reduce public exposure to air pollution, especially for vulnerable groups within our communities such as the young, the old and those already suffering with associated respiratory illnesses".

2.35 With these objectives in mind, LBH will prioritise the following actions:

- *"Lead by example;*
- *Prioritise reducing public exposure and improving air quality around schools;*
- *Prioritise the implementation of improvement strategies in the AQ Focus Areas;*
- *Ensure the integration of the Healthy Streets approach in relevant council work programmes;*
- *Ensure the planning system supports the achievement of air quality improvements in relation to new developments;*
- *Raise awareness via targeted campaigns;*

- *Promote the use of greener walking and cycling routes to help the delivery of the Council's transport objective of an increased mode share for walking and cycling; and*
- *Work with external stakeholders."*

Assessment Criteria

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

2.37 The UK-wide objectives for nitrogen dioxide and PM_{10} were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. The $PM_{2.5}$ objective is to be achieved by 2020. Measurements across the UK have shown that the 1-hour nitrogen dioxide objective is unlikely to be exceeded at roadside locations where the annual mean concentration is below 60 µg/m^3 (Defra, 2018b). Measurements have also shown that the 24-hour mean PM_{10} objective could be exceeded at roadside locations where the annual mean concentration is above 32 µg/m^3 (Defra, 2018b). The predicted annual mean PM_{10} concentrations are thus used as a proxy to determine the likelihood of an exceedance of the 24-hour mean PM_{10} objective. Where predicted annual mean concentrations are below 32 µg/m^3 it is unlikely that the 24-hour mean objective will be exceeded.

2.38 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. Defra explains where these objectives will apply in its Local Air Quality Management Technical Guidance (Defra, 2018b). The annual mean objectives for nitrogen dioxide and PM_{10} are considered to apply at the façades of residential properties, schools, hospitals etc.; they do not apply at hotels. The 24-hour mean objective for PM_{10} is considered to apply at the same locations as the annual mean objective, as well as in gardens of residential properties and at hotels. The 1-hour mean objective for nitrogen dioxide applies wherever members of the public might regularly spend 1-hour or more, including outdoor eating locations and pavements of busy shopping streets.

2.39 EU Directive 2008/50/EC (The European Parliament and the Council of the European Union, 2008) sets limit values for nitrogen dioxide, PM_{10} and $PM_{2.5}$, and is implemented in UK law through the Air Quality Standards Regulations (2010). The limit values for nitrogen dioxide are the same numerical concentrations as the UK objectives, but achievement of these values is a national obligation rather than a local one. In the UK, only monitoring and modelling carried out by UK Central Government

meets the specification required to assess compliance with the limit values. Central Government does not normally recognise local authority monitoring or local modelling studies when determining the likelihood of the limit values being exceeded, unless such studies have been audited and approved by Defra and DfT's Joint Air Quality Unit (JAQU).

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

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

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

[a] A proxy value of 32 µg/m^3 as an annual mean is used in this assessment to assess the likelihood of the 24-hour mean PM_{10} objective being exceeded. Measurements have shown that, above this concentration, exceedances of the 24-hour mean PM_{10} objective are possible (Defra, 2018b).

[b] The $PM_{2.5}$ objective, which is to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

Construction Dust Criteria

2.41 There are no formal assessment criteria for dust. In the absence of formal criteria, the approach developed by the Institute of Air Quality Management (IAQM)[1] (2016) has been used (the GLA's SPG (GLA, 2014b) recommends that the assessment be based on the latest version of the IAQM guidance). Full details of this approach are provided in Appendix A2.

Screening Criteria for Road Traffic Assessments

2.42 Environmental Protection UK (EPUK) and the IAQM recommend a two-stage screening approach (Moorcroft and Barrowcliffe et al, 2017) to determine whether emissions from road traffic generated by a development have the potential for significant air quality impacts. The approach, as described in Appendix A3, first considers the size and parking provision of a development; if the development is residential and is for fewer than ten homes or covers less than 0.5 ha, or is non-residential and will provide less than 1,000 m^2 of floor space or cover a site area of less than 1 ha, and will provide ten or fewer parking spaces, then there is no need to progress to a detailed assessment. The second stage then compares the changes in vehicle flows on local roads that a development will lead to against specified screening criteria. Where these criteria are exceeded, a detailed assessment is required, although the guidance advises that *"the criteria provided are precautionary and should be*

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

treated as indicative", and *"it may be appropriate to amend them on the basis of professional judgement"*.

Screening Criteria for Point Source Assessments

2.43 EPUK and IAQM have developed an approach (Moorcroft and Barrowcliffe et al, 2017) to determine whether emissions from point sources, such as energy plant, have the potential for significant air quality impacts. The first step of the approach, as described in Appendix A3, is to screen the emissions and the emissions parameters to determine whether an assessment is necessary:

"Typically, any combustion plant where the single or combined NOx emission rate is less than 5 mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion.

In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates.

Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable".

2.44 This screening approach requires professional judgement, and the experience of the consultants preparing the assessment is set out in AppendixA4.

2.45 If it is determined that an assessment of the point source emissions is required, then there is a further stage of screening that can be applied to the model outputs. The approach is that any change in concentration smaller than 0.5% of the long-term environmental standard will be *negligible*, regardless of the existing air quality conditions. Any change smaller than 1.5% of the long-term environmental standard will be *negligible* so long as the total concentration is less than 94% of the standard and any change smaller than 5.5% of the long-term environmental standard will be *negligible* so long as the total concentration is less than 75% of the standard. The guidance also explains that:

"Where peak short term concentrations (those averaged over periods of an hour or less) from an elevated source are in the range 11-20% of the relevant Air Quality Assessment Level (AQAL), then their magnitude can be described as small, those in the range 21-50% medium and those above 51% as large. These are the maximum concentrations experienced in any year and the severity of this impact can be described as slight, moderate and substantial respectively, without the need to reference background or baseline concentrations. In most cases, the assessment of impact severity for a proposed development will be governed by the long-term exposure experienced by receptors and it will not be a necessity to define the significance of effects by reference to short-term impacts. The severity of the impact will be substantial when there is a risk that the relevant AQAL for short-

term concentrations is approached through the presence of the new source, taking into account the contribution of other local sources".

2.46 As a first step, the assessment of the emissions from the energy plant within the proposed development has considered the predicted process contributions using the following criteria:

- is the long-term (annual mean) process contribution less than 0.5% of the long-term environmental standard?; and
- is the short-term (24-hour mean or shorter) process contribution less than 10% of the short-term environmental standard?

2.47 Where both of these criteria are met, then the impacts are *negligible* and thus 'not significant'. Where these criteria are breached then a more detailed assessment, considering total concentrations (incorporating local baseline conditions), has been provided.

Descriptors for Air Quality Impacts and Assessment of Significance

Construction Dust Significance

2.48 Guidance from IAQM (2016) is that, with appropriate mitigation in place, the effects of construction dust will be 'not significant'. This is the latest version of the guidance upon which the assessment methodology set out in the GLA guidance (GLA, 2014b) is based (the GLA guidance advises that the latest version of the IAQM guidance should always be used). The assessment thus focuses on determining the appropriate level of mitigation so as to ensure that effects will normally be 'not significant'.

Operational Significance

2.49 There is no official guidance in the UK in relation to development control on how to describe air quality impacts, nor how to assess their significance. The approach developed jointly by EPUK and IAQM (Moorcroft and Barrowcliffe et al, 2017) has therefore been used. This includes defining descriptors of the impacts at individual receptors, which take account of the percentage change in concentrations relative to the relevant air quality objective, rounded to the nearest whole number, and the absolute concentration relative to the objective. The overall significance of the air quality impacts is determined using professional judgement, taking account of the impact descriptors. Full details of the EPUK/IAQM approach are provided in Appendix A3. The approach includes elements of professional judgement, and the experience of the consultants preparing the report is set out in Appendix A4.

3 Assessment Approach

Consultation

3.1 The assessment follows a methodology agreed with LBH via email correspondence between Val Beale (Air Quality Officer at the LB of Hillingdon) and George Chousos (Air Quality Consultants) held on 30 June 2020.

Existing Conditions

3.2 Existing sources of emissions within the study area have been defined using a number of approaches. Industrial and waste management sources that may affect the area have been identified using Defra's Pollutant Release and Transfer Register (Defra, 2020a). Local sources have also been identified through examination of the Council's Air Quality Review and Assessment reports.

3.3 Information on existing air quality has been obtained by collating the results of monitoring carried out by the local authority. Background concentrations have been defined using the 2017-based national pollution maps published by Defra (2020b). These cover the whole of the UK on a 1x1 km grid.

3.4 Whether or not there are any exceedances of the annual mean EU limit value for nitrogen dioxide in the study area has been identified using the maps of roadside concentrations published by Defra (2020c). These maps are used by the UK Government to report exceedances of the limit value to the EU. The national maps of roadside PM_{10} and $PM_{2.5}$ concentrations (Defra, 2020d), which are available for the years 2009 to 2018, show no exceedances of the limit values anywhere in the UK in 2018.

Construction Impacts

3.5 The construction dust assessment considers the potential for impacts within 350 m of the site boundary; or within 50 m of roads used by construction vehicles. The assessment methodology follows the GLA's SPG on the Control of Dust and Emissions During Construction and Demolition (GLA, 2014b), which is based on that provided by IAQM (2016). This follows a sequence of steps. Step 1 is a basic screening stage, to determine whether the more detailed assessment provided in Step 2 is required. Step 2a determines the potential for dust to be raised from on-site works and by vehicles leaving the site. Step 2b defines the sensitivity of the area to any dust that may be raised. Step 2c combines the information from Steps 2a and 2b to determine the risk of dust impacts without appropriate mitigation. Step 3 uses this information to determine the appropriate level of mitigation required to ensure that there should be no significant impacts. Appendix A2 explains the approach in more detail.

Road Traffic Impacts

3.6 The first step in considering the road traffic impacts of the proposed development has been to screen the development and its traffic generation against the criteria set out in the EPUK/IAQM guidance (Moorcroft and Barrowcliffe et al, 2017), as described in Paragraph 2.42 and detailed further in Appendix A3. Where impacts can be screened out there is no need to progress to a more detailed assessment. The proposed development will lead to a net decrease in traffic on local roads, and adverse impacts at existing receptors have thus been screened out, this approach has been agreed with LBH. The dispersion modelling of road traffic emissions has however been required for this project in order to determine future air quality conditions at the site of proposed development and provide context to the assessment of off-site impacts from the proposed emergency diesel generator. The following sections describe the approach to dispersion modelling of the road traffic emissions,

Sensitive Locations

3.7 Concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ have been predicted at 28 locations within the proposed development. Receptors have been identified to represent a range of exposure within the development, including the worst-case locations (these being at the façades closest to the sources). All heights with relevant exposure were modelled, for each selected location.

3.8 The locations of sensitive receptors included within the proposed development are shown in Figure 1.

3.9 Concentrations were also modelled at existing residential properties boarding the Site to determine the off-site impacts of the emergency, as well as at the HD211 and HD212 diffusion tube monitoring sites in order to verify the road traffic model outputs (see Appendix A5 for verification method).

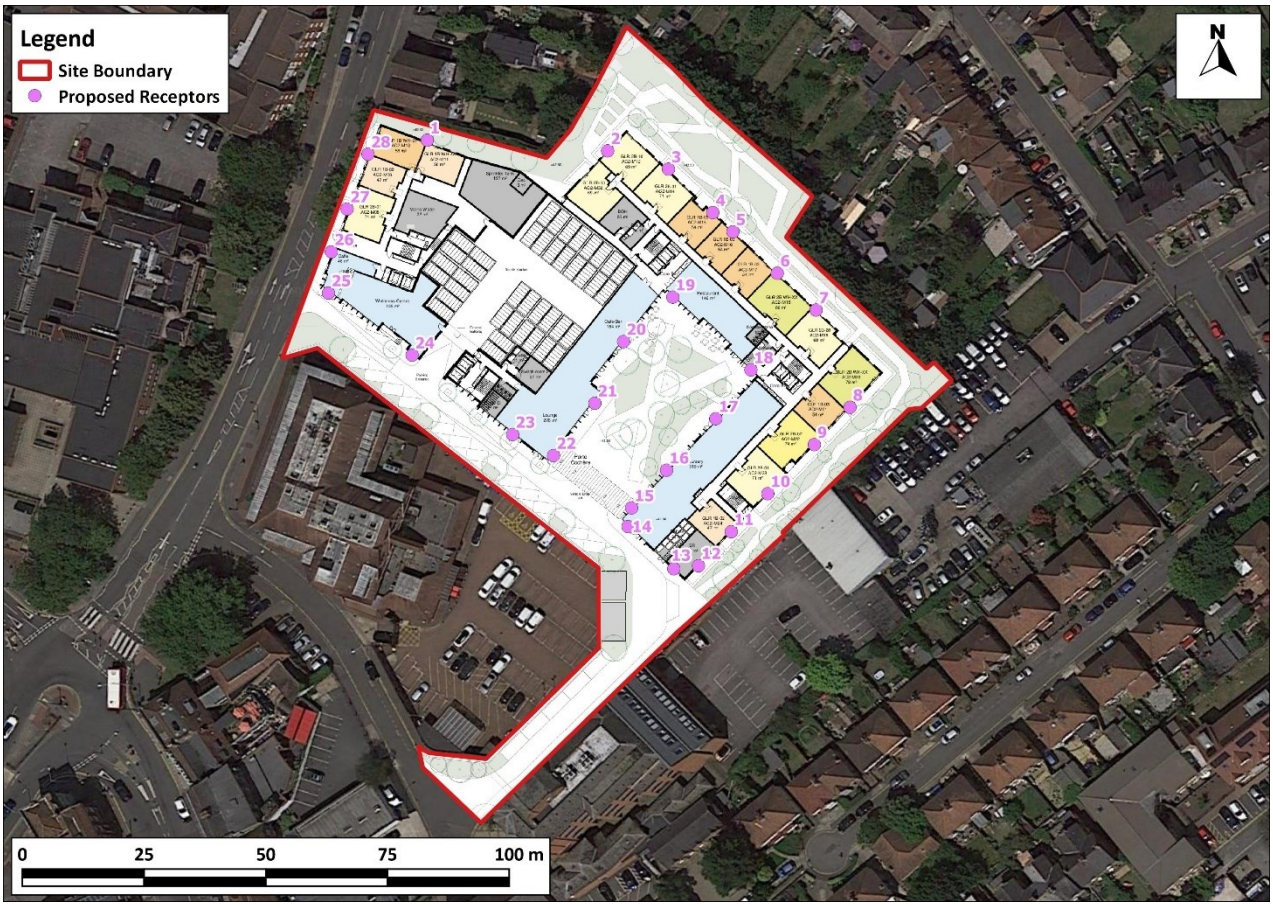


Figure 1: Proposed Receptor Locations and the Application Site Boundary

Imagery ©2020 Google. Contains data from Marchese Partners drawing no. UXB001-MPI-20_000.

Modelling Methodology

3.10 Concentrations have been predicted using the ADMS-Roads dispersion model, with vehicle emissions derived using Defra's Emission Factor Toolkit (EFT) (v9.0) (Defra, 2020b). Details of the model inputs, assumptions and the verification are provided in Appendix A5, together with the method used to derive base and future year background concentrations. Where assumptions have been made, a realistic worst-case approach has been adopted.

Assessment Scenarios

3.11 Nitrogen dioxide, PM_{10} and $PM_{2.5}$ concentrations have been predicted for a base year (2018) and the proposed year of opening (2024).

Traffic Data

3.12 Traffic data for the assessment have been taken from the London Atmospheric Emissions Inventory (LAEI) (GLA, 2019b). Further details of the traffic data used in this assessment are provided in Appendix A5.

Uncertainty

3.13 There are many components that contribute to the uncertainty of modelling predictions. The road traffic emissions dispersion model used in this assessment is dependent upon the traffic data that have been input, which will have inherent uncertainties associated with them. There are then additional uncertainties, as models are required to simplify real-world conditions into a series of algorithms.

3.14 An important stage in the process is model verification, which involves comparing the model output with measured concentrations (see Appendix A5). This can only be done for the road traffic model. Because the model has been verified and adjusted, there can be reasonable confidence in the prediction of base year (2018) concentrations.

3.15 Predicting pollutant concentrations in a future year will always be subject to greater uncertainty. For obvious reasons, the model cannot be verified in the future, and it is necessary to rely on a series of projections provided by DfT and Defra as to what will happen to traffic volumes, background pollutant concentrations and vehicle emissions.

3.16 European type approval ('Euro') standards for vehicle emissions apply to all new vehicles manufactured for sale in Europe. These standards have, over many years, become progressively more stringent and this is one of the factors that has driven reductions in both predicted and measured pollutant concentrations over time.

3.17 Historically, the emissions tests used for type approval were carried out within laboratories and were quite simplistic. They were thus insufficiently representative of emissions when driving in the real world. For a time, this resulted in a discrepancy, whereby nitrogen oxides emissions from new diesel vehicles reduced over time when measured within the laboratory, but did not fall in the real world. This, in turn, led to a discrepancy between models (which predicted improvements in nitrogen dioxide concentrations over time) and measurements (which very often showed no improvements year-on-year).

3.18 Recognition of these discrepancies has led to changes to the type approval process. Vehicles are now tested using a more complex laboratory drive cycle and also through 'Real Driving Emissions' (RDE) testing, which involves driving on real roads while measuring exhaust emissions. For Heavy Duty Vehicles (HDVs), the new testing regime has worked very well and NOx emissions from the latest vehicles (Euro VI[2]) are now very low when compared with those from older models (ICCT, 2017).

3.19 For Light Duty Vehicles (LDVs), while the latest (Euro 6) emission standard has been in place since 2015, the new type-approval testing regime only came into force in 2017. Despite this delay, earlier

[2] Euro VI refers to HDVs while Euro 6 refers to LDVs.

work by AQC (2016) showed that Euro 6 diesel cars manufactured prior to 2017 tend to emit significantly less NOx than previous (Euro 5 and earlier) models.

3.20 AQC has analysed trends in measured NOx concentrations against trends in Defra's EFT model predictions for the period 2013 to 2019 (AQC, 2020). This has demonstrated that, while the EFT typically over-stated the improvements over the period 2013 to 2016, it has tended to under-state the improvements since 2016. Wider consideration of the assumptions built into the EFT suggests that, on balance, the EFT is unlikely to over-state the rate at which NOx emissions decline in the future at an 'average' site in the UK. In practice, the balance of evidence thus suggests that NOx concentrations are most likely to decline more quickly in the future, on average, than predicted by the EFT, especially against a base year of 2016 or later. Using EFT v9.0 for future-year forecasts in this report thus provides a robust assessment, given that the model has been verified against measurements made in 2018.

3.21 The Mayor of London confirmed in June 2018 that changes will be made to the existing LEZ in 2020, and that the Ultra Low Emission Zone (ULEZ) will be expanded in 2021. The changes are described in detail in Appendix A1, and can be expected to significantly reduce NOx emissions in London from 2020 onwards; however, they are not reflected in Defra's latest EFT and thus have not been considered in this assessment. The assessment presented in this report is, therefore, very much worst-case in this regard, and it is expected that background concentrations, baseline concentrations, and the impacts of the proposed development, will be lower than described in Sections 4 and 6 of this report. Appendix A6 discusses uncertainties regarding the future fleet mix in London and the scale of the reduction in NOx emissions that can be expected with the adoption of these changes.

3.22 It is also important to note that the road traffic dispersion model was verified against monitoring data for the year 2018, and that current and future traffic data used in the assessment were sourced and determined from the LAEI database rather than from recent development-specific traffic counts. The reduction in traffic observed as a result of the Covid-19 lockdown measures in the spring and summer of 2020 has therefore no influence on the results presented in this report. The conclusions of this report are thus robust and representative of 'typical' conditions in the area.

Impacts of the Proposed Emergency Plant

3.23 The proposed development will include an emergency plant located on the roof of a single-storey outbuilding located within the southern part of the site. The specifications for this plant, upon which the assessment is based, are set out in Appendices A5 and A7.

Screening

3.24 The first step in considering the emergency plant impacts has been to screen the pollutant emissions against the criteria set out in the EPUK/IAQM guidance (Moorcroft and Barrowcliffe et al, 2017), as

described in Paragraphs 2.43 and 2.44. Where impacts can be screened out there is no need to progress to a more detailed assessment. The following sections describe the approach to dispersion modelling of the plant emissions, which has been required for this project.

Sensitive Locations

3.25 In terms of the potential impacts from the proposed emergency plant, concentrations have been modelled at the specific receptor locations shown in Figure 1, as well as for a grid of receptors covering off-site residential properties bordering the site, the extent of which is shown in Figure 2.



Figure 2: Extent of Modelled Grid of Receptors

Imagery ©2020 Google.

Assessment Scenarios

3.26 Predictions of nitrogen dioxide, PM_{10} and $PM_{2.5}$ concentrations have been carried out assuming that the emergency plant is installed in 2024.

Modelling Methodology

3.27 The impacts of emissions from the proposed emergency plant have been modelled using the ADMS-5 dispersion model. ADMS-5 is a new generation model that incorporates a state-of-the-art

understanding of the dispersion processes within the atmospheric boundary layer. The model input parameters are set out in Appendix A5. The air quality modelling has been carried out based on a number of necessary assumptions, detailed further in Appendices A5 and A7. Where possible a realistic worst-case approach has been adopted.

3.28 Entrainment of the plume into the wake of buildings has been simulated within the model. ADMS-5 takes a relatively simplistic approach to modelling building downwash effects, thus additional uncertainty is introduced when using the buildings module. In order to ensure a worst-case assessment, sensitivity tests have been carried out whereby the model has been run with no buildings and with all nearby buildings that might affect the dispersion of the energy plant emissions. In order to account for the variations in meteorological conditions, and to again provide a conservative assessment, the with and without buildings models were modelled for three meteorological years. The maximum predicted concentration from any of these six scenarios has been used throughout this assessment.

Emissions Data

3.29 The emissions data input into the model for the emergency plant have been provided by Chapman BDSP (the project mechanical and engineering consultants) and determined using the data set out in the technical datasheets for the plant to be installed based upon the fuel consumption, fuel composition, typical operating conditions and combustion chemistry. Further details of the emissions data used in this assessment are provided in Appendix A5.

3.30 For consideration of concentrations in relation to the annual mean objectives, a realistic utilisation of the emergency generator, based on testing regimes, has been assumed: one hour per month off-load (assuming 75% fuel consumption) and bi-annually (two hours) on full load (100% fuel consumption). Modelled annual mean outputs based on continuous operation have been scaled to reflect this anticipated level of utilisation.

3.31 For the assessment of the short-term impacts, it has been assumed that the emergency plant will operate continuously throughout the year to ensure the potential impacts under all meteorological conditions are considered. This has resulted in the prediction of worst-case impacts on short term pollutant concentrations, and the assessment can thus be considered conservative.

Uncertainty

3.32 The point source dispersion model used in the assessment is dependent upon emission rates, flow rates, exhaust temperatures and other parameters for each source, all of which in reality are variable as the plant will operate at different loads at different times. The air quality assessment has assessed the impacts of a diesel generator currently identified by Chapman BDSP to be included within the proposed development. However, it is noted that the final generator to be installed prior to

commencement of the proposed development may differ to those identified at this stage of planning. It is considered the final plant will adhere to or be better than the emissions set out in Appendix A7.

3.33 There are then additional uncertainties, as models are required to simplify real-world conditions into a series of algorithms. These uncertainties cannot be easily quantified, and it is not possible to verify the point-source model outputs. Where parameters have been estimated the approach has been to use reasonable worst-case assumptions (see Appendices A5 and A7). Sensitivity tests have also been applied to address specific uncertainties and to ensure a worst-case assessment.

'Air Quality Neutral'

3.34 The guidance relating to air quality neutral follows a tiered approach, such that all developments are expected to comply with minimum standards for gas and biomass boilers and for CHP plant (GLA, 2014a). Compliance with 'air quality neutral' is then founded on emissions benchmarks that have been derived for both building (energy) use and road transport in different areas of London. Developments that exceed the benchmarks are required to implement on-site or off-site mitigation to offset the excess emissions (GLA, 2014a).

3.35 Appendix A8 sets out the emissions benchmarks. The approach has been to calculate the emissions from the development and to compare them with these benchmarks.

4 Site Description and Baseline Conditions

4.1 The site is located to the east of Harefield Road and north of Warwick Place within Uxbridge Town Centre. It is bound by the rear gardens of the residential properties of Harefield Road and Lancaster Road to the north; Warwick Place and Beasley Court to the south; Penfield Estate to the east; and Harefield Road to the west.

4.2 The site comprises two low density attached retail warehouse buildings (Use Class A1), currently occupied by Wickes (Unit 1) and Halfords (Unit 2). The buildings are set back within the site which includes a large car park situated in front of the buildings. The site benefits from existing landscaping which is generally limited to eastern and northern boundaries. The site is currently raised above Harefield Road which is fronted by a retaining wall to the car park. The site benefits from existing vehicular and pedestrian access from Harefield Road, with a separate access to a loading bay off Warwick Place.

Industrial sources

4.3 A search of the UK Pollutant Release and Transfer Register (Defra, 2020a) has not identified any significant industrial or waste management sources that are likely to affect the proposed development, in terms of air quality.

Air Quality Focus Areas

4.4 A section of the proposed development is located within the Uxbridge Town Centre air quality Focus Area, one of 187 air quality Focus Areas in London, these being locations that not only exceed the EU annual mean limit value for nitrogen dioxide but also locations with high levels of human exposure.

Air Quality Management Areas

4.5 LBH has investigated air quality within its area as part of its responsibilities under the LAQM regime. In September 2003, an AQMA was declared for exceedances of the annual mean nitrogen dioxide objective, which encompasses the entire southern extent of the Borough. The proposed development lies within the AQMA. The declared AQMA is shown in Figure 3, alongside the nearest Air Quality Focus Areas.

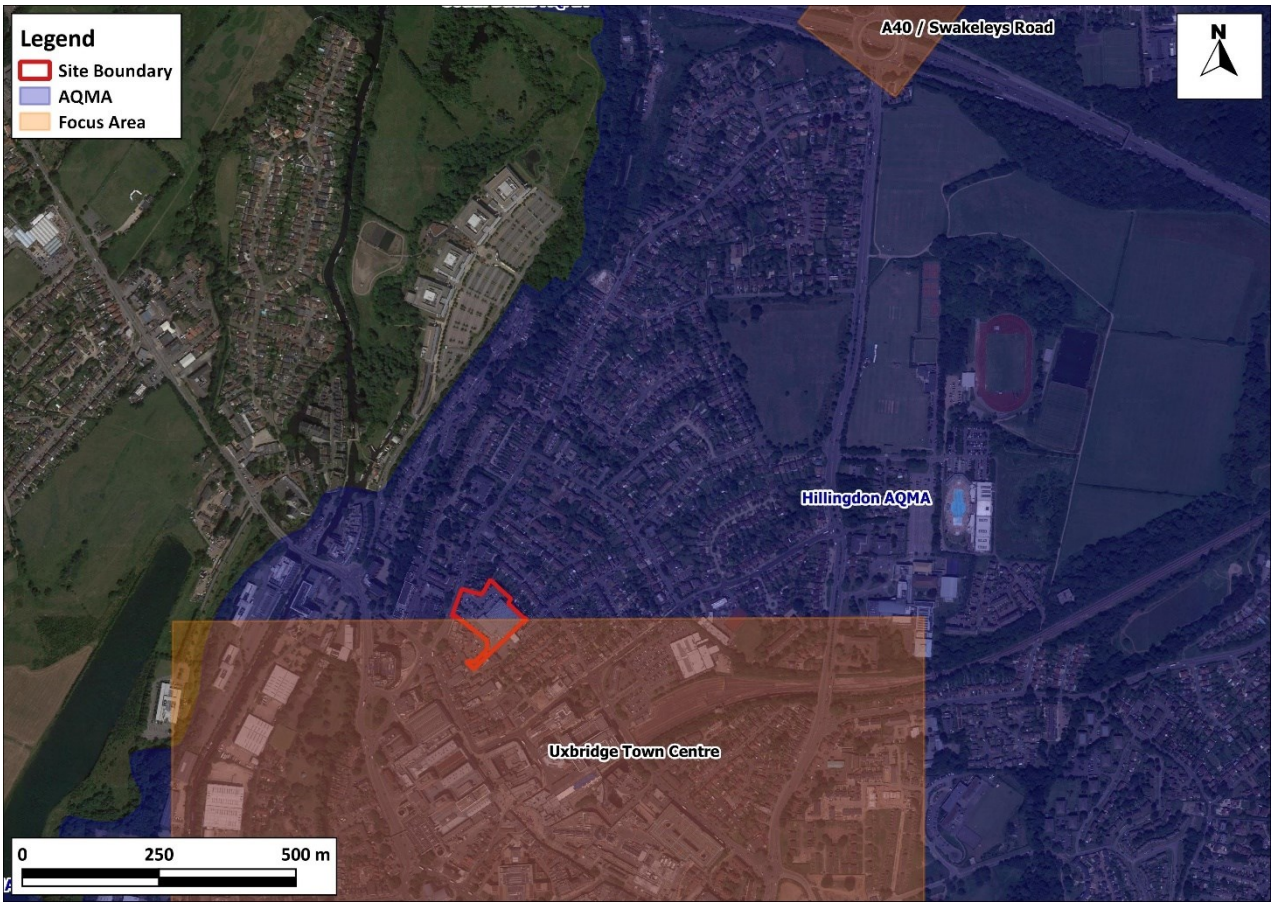


Figure 3: Declared AQMAs and Focus Areas

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Local Air Quality Monitoring

4.6 LBH operates eleven automatic monitoring stations within its area. The nearest to the proposed development site is HI1, situated 5.3 km to the northeast of the proposed development site. The Council also operates a number of nitrogen dioxide monitoring sites using diffusion tubes prepared and analysed by Gradko (using the 50% TEA in acetone method), with three diffusion tube monitoring sites located in close proximity to the proposed development. Results for the years 2013 to 2018 are summarised in Table 2 and the monitoring locations are shown in Figure 4.

Table 2: Summary of Nitrogen Dioxide (NO_2) Monitoring (2013-2018) [a, b]

Site No.	Site Type	Location	2013	2014	2015	2016	2017	2018
Automatic Monitor – Annual Mean (µg/m³)								
HI1	Roadside	South Ruislip	**45.0**	**44.4**	**48.4**	**42.9**	**46.0**	36.0 [c]
Objective			**40**					
Automatic Monitor – No. of Hours > 200 µg/m³								
HI1	Roadside	South Ruislip	0	0	0	2	2	0
Objective			**18**					
Diffusion Tubes - Annual Mean (µg/m³)								
HD43	Roadside	Uxbridge Day Nursery Park Road Uxbridge	**47.6**	**46.3**	**42.8**	**42.8**	**40.1**	**40.7**
HD211	Roadside	198 Harefield Road, Uxbridge Lamppost	35.9	38.8	34.0	34.8	34.2	35.1
HD212	Roadside	59 Hillingdon Road, Uxbridge Lamppost	**42.3**	**45.4**	38.5	35.5	40.0	36.9
Objective			**40**					

[a] Exceedances of the objectives are shown in bold.

[b] Data taken from LBH's Air Quality Annual Status Report 2019 (LBH, 2019b).

[c] Site being checked by the Council to see if the fall in 2018 is a consequence of relocation.

4.7 The annual mean nitrogen dioxide objective was exceeded at the HD43 diffusion tube monitoring site for all the considered years and at the HD212 in 2013 and 2014. At all other diffusion tube sites, the annual mean objective was below the annual mean objective for all years.

4.8 The HI1 automatic monitoring station exceeded the annual mean nitrogen dioxide objective for all years presented, besides 2018. However, the 1-hour mean nitrogen dioxide objective has not been exceeded between 2013 and 2018.



Figure 4: Monitoring Locations and the Application Site Boundary

Imagery ©2020 Google.

4.9 The HI1 roadside automatic monitoring station, located approximately 5.3 km northeast of the proposed development site, is the closest station which measures PM_{10} concentrations. Results for the years 2013 to 2018 are summarised in Table 3.

4.10 There is only one automatic monitoring station that measures $PM_{2.5}$ concentrations in LBH; LHR2, located more than 8 km southeast of the proposed development, at the London Heathrow Airport. It is not deemed to be representative of conditions in the study area and thus no results have been presented.

Table 3: Summary of PM_{10} Automatic Monitoring (2013-2018) [a]

Site No.	Site Type	Location	2013	2014	2015	2016	2017	2018
PM_{10} Annual Mean (µg/m^3)								
HI1	Roadside	South Ruislip	22.6	23.2	24.0	22.0	17.0	17.0
Objective			**40**					
PM_{10} No. Days >50 µg/m^3								
HI1	Roadside	South Ruislip	10	18	3	9	6	0
Objective			**35**					

[a] Data taken from LBH's Air Quality Annual Status Report 2019 (LBH, 2019b)

Exceedances of EU Limit Value

4.11 There are several AURN monitoring sites within the Greater London Urban Area that have measured exceedances of the annual mean nitrogen dioxide limit value. Furthermore, Defra's roadside annual mean nitrogen dioxide concentrations (Defra, 2020d), which are used to report exceedances of the limit value to the EU, identify exceedances of this limit value in 2018 along many roads in London, but not for the roads close to the proposed development. As such, there is considered to be no risk of a limit value exceedance in the vicinity of the proposed development by the time that it is operational.

4.12 Defra's Air Quality Plan requires the GLA to prepare an action plan that will *"deliver compliance in the shortest time possible"*, and the 2015 Plan assumed that a CAZ was required. The GLA has already implemented a LEZ and a ULEZ, thus the authority has effectively already implemented the required CAZ. These have been implemented as part of a package of measures including 12 Low Emission Bus Zones, Low Emission Neighbourhoods, the phasing out of diesel buses and taxis and other measures within the Mayor's Transport Strategy.

Background Concentrations

4.13 Estimated background concentrations at the proposed development have been determined for 2018 (to determine existing air quality concentrations and for the purpose of verification) and the opening year 2024 using Defra's 2017-based background maps (Defra, 2020b). The background concentrations are set out in Table 4 and have been derived as described in Appendix A5. The background concentrations are all well below the objectives.

Table 4: Estimated Annual Mean Background Pollutant Concentrations in 2018 and 2024 (µg/m^3)

Year	NO_2	PM_{10}	$PM_{2.5}$
2018	25.5	16.3	11.4
2024	20.1	15.1	10.4
Objectives	**40**	**40**	**25** [a]

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

5 Construction Phase Impact Assessment

5.1 The construction works will give rise to a risk of dust impacts during demolition, earthworks and construction, as well as from trackout of dust and dirt by vehicles onto the public highway. Step 1 of the assessment procedure is to screen the need for a detailed assessment. There are receptors within the distances set out in the guidance (see Appendix A2), thus a detailed assessment is required. The following section sets out Step 2 of the assessment procedure.

Potential Dust Emission Magnitude

Demolition

5.2 There will be a requirement to demolish the existing commercial units at the site, with an estimated demolition waste volume of around 20,000 to 25,000 m^3. The method of demolition has not yet been decided. Based on the example definitions set out in Table A2.1 in Appendix A2, the dust emission class for demolition is considered to be *medium.*

Earthworks

5.3 The characteristics of the soil at the site have been defined using the British Geological Survey's UK Soil Observatory website (British Geological Survey, 2020), as set out in Table 5. Overall, it is considered that, when dry, this soil has the potential to be moderately dusty.

Table 5: Summary of Soil Characteristics

Category	Record
Soil Layer Thickness	Deep
Soil Parent Material Grain Size	Mixed (Arenaceous [a] – Rudaceous [b])
European Soil Bureau Description	River Terrace Sand/Gravel
Soil Texture	Sand to Sandy Loam [c]

[a] grain size 0.06 – 2.0 mm.

[b] grain size > 2.0 mm.

[c] a loam is composed mostly of sand and silt.

5.4 The site covers some 9,350 m^2 and most of this will be subject to earthworks, involving removal of the foundations of the demolished buildings and breaking up of a paved area. Dust will arise mainly from vehicles travelling over unpaved ground and from the handling of dusty materials (such as dry soil). Based on the example definitions set out in Table A2.1 in Appendix A2, the dust emission class for earthworks is considered to be *medium*.

Construction

5.5 Construction will involve the erection of two buildings ranging between three and eight storeys high with a shared ground level housing the proposed car park, café, wellness centre, nursery and residential apartments. It is estimated that the total building volume will be comprised between 40,000 and 60,000 m^3. Dust will arise from vehicles travelling over unpaved ground, the handling and storage of dusty materials, and from the cutting of concrete. Based on the example definitions set out in Table A2.1 in Appendix A2, the dust emission class for construction is considered to be *medium*.

Trackout

5.6 The number of heavy vehicles accessing the site, which may track out dust and dirt, is currently unknown, but given the size of the site it is likely that there will be a maximum of between 10-50 outward heavy vehicle movements per day. Based on the example definitions set out in Table A2.1 in Appendix A2, the dust emission class for trackout is considered to be *medium*.

5.7 Table 6 summarises the dust emission magnitude for the proposed development.

Table 6: Summary of Dust Emission Magnitude

Source	Dust Emission Magnitude
Demolition	Medium
Earthworks	Medium
Construction	Medium
Trackout	Medium

Sensitivity of the Area

5.8 This assessment step combines the sensitivity of individual receptors to dust effects with the number of receptors in the area and their proximity to the site. It also considers additional site-specific factors such as topography and screening, and in the case of sensitivity to human health effects, baseline PM_{10} concentrations.

Sensitivity of the Area to Effects from Dust Soiling

5.9 The IAQM guidance, upon which the GLA's guidance is based, explains that residential properties are 'high' sensitivity receptors to dust soiling (Table A2.2 in Appendix A2). There are approximately 20 residential properties within 20 m of the site (see Figure 5). Using the matrix set out in Table A2.3 in Appendix A2, the area surrounding the onsite works is of 'high' sensitivity to dust soiling.

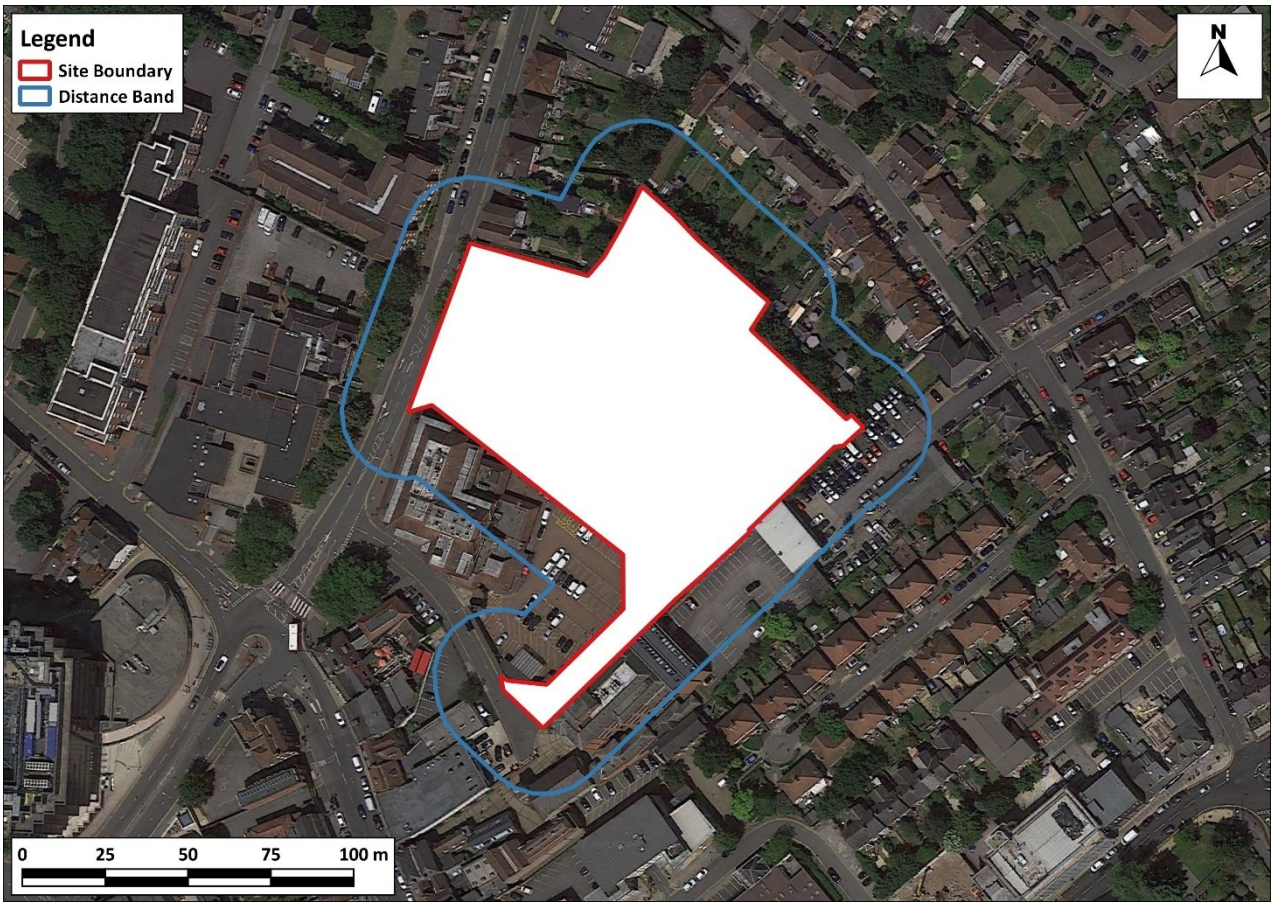


Figure 5: 20 m Distance Band around Application Site Boundary

Imagery ©2020 Google.

5.10 Table 6 shows that the dust emission magnitude for trackout is *medium* and Table A2.3 in Appendix A2 thus explains that there is a risk of material being tracked 200 m from the site exit. Since it is not known which roads construction vehicles will use, it has been assumed that all possible routes could be affected. There are approximately 53 residential properties within 20 m of the roads along which material could be tracked (see Figure 6), and Table A2.3 in Appendix A2 thus indicates that the area is of 'high' sensitivity to dust soiling due to trackout. Taking these points into account, it is judged that the area surrounding the onsite works and the area surrounding roads along which material may be tracked from the site are of 'high' sensitivity to dust soiling.

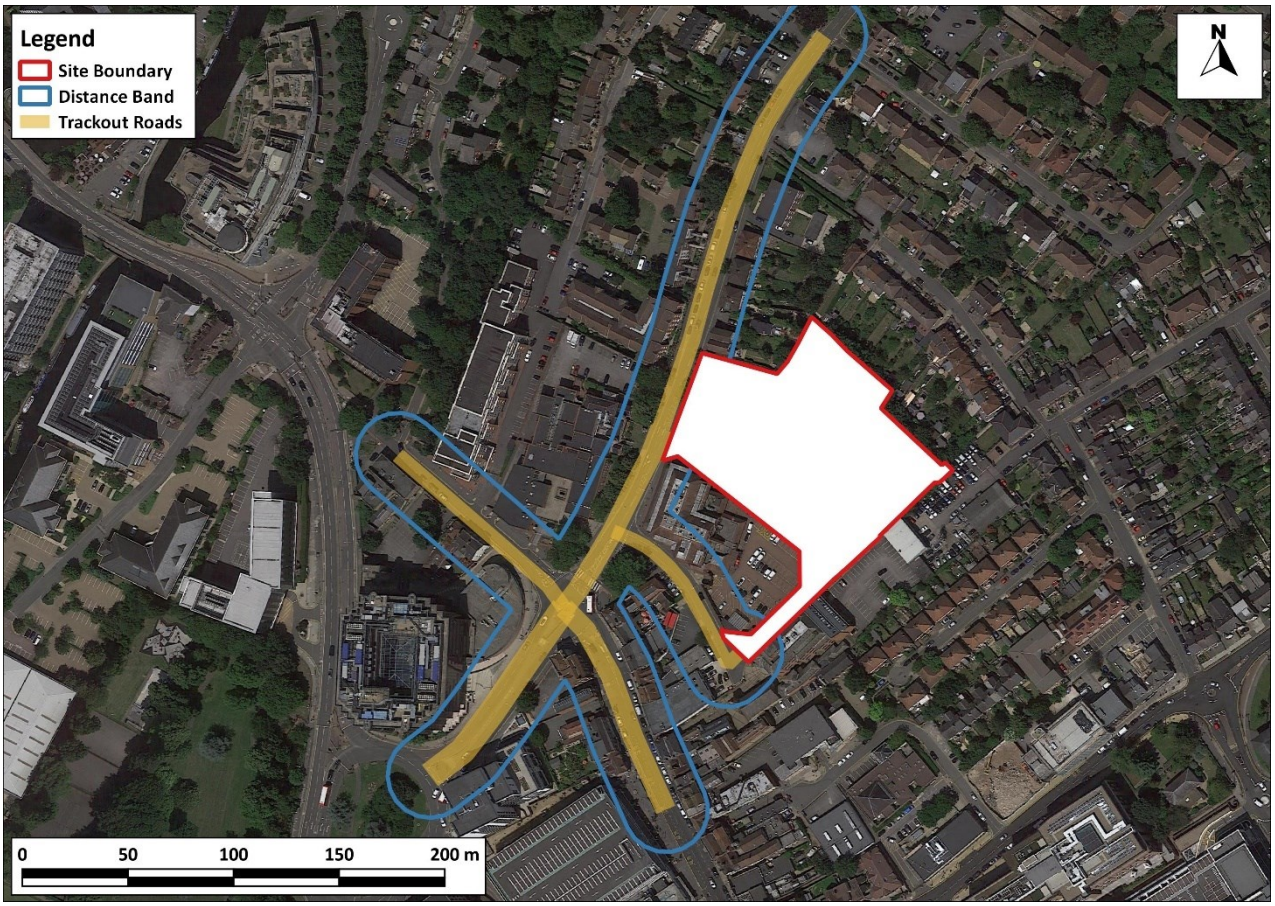


Figure 6: 20 m Distance Band around Roads Used by Construction Traffic Within 200 m of the Site Exits

Imagery ©2020 Google.

Sensitivity of the Area to any Human Health Effects

5.11 Residential properties are also classified as being of 'high' sensitivity to human health effects. The matrix in Table A2.4 in Appendix A2 requires information on the baseline annual mean PM_{10} concentration in the area. The HI1 automatic monitoring station is deemed representative of conditions at the proposed development, and thus the 2018 measured PM_{10} concentration of 17.0 $\mu g/m^3$ (see Table 3) has been used. Using the matrix in Table A2.4 in Appendix A2, the areas surrounding the onsite works and surrounding roads along which material may be tracked from the site are of 'low' sensitivity to human health effects.

Sensitivity of the Area to any Ecological Effects

5.12 The guidance only considers designated ecological sites within 50 m to have the potential to be impacted by the construction works. There are no designated ecological sites within 50 m of the site boundary or those roads along which material may be tracked, thus ecological impacts will not be considered further.

Summary of the Area Sensitivity

5.13 Table 7 summarises the sensitivity of the area around the proposed construction works.

Table 7: Summary of the Area Sensitivity

Effects Associated With:	Sensitivity of the Surrounding Area	
	On-site Works	Trackout
Dust Soiling	High Sensitivity	High Sensitivity
Human Health	Low Sensitivity	Low Sensitivity

Risk and Significance

5.14 The dust emission magnitudes in Table 6 have been combined with the sensitivities of the area in Table 7 using the matrix in Table A2.6 in Appendix A2, in order to assign a risk category to each activity. The resulting risk categories for the four construction activities, without mitigation, are set out in Table 8. These risk categories have been used to determine the appropriate level of mitigation as set out in Section 8 (step 3 of the assessment procedure).

Table 8: Summary of Risk of Impacts Without Mitigation

Source	Dust Soiling	Human Health
Demolition	Medium Risk	Low Risk
Earthworks	Medium Risk	Low Risk
Construction	Medium Risk	Low Risk
Trackout	Medium Risk	Low Risk

5.15 The IAQM guidance does not provide a method for assessing the significance of effects before mitigation, and advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, the IAQM guidance is clear that the residual effect will normally be 'not significant' (IAQM, 2016).

6 Operational Phase Impact Assessment

Impacts at Existing Receptors

Initial Screening Assessment of Development-Generated Road Traffic Emissions

6.1 The trip generation of the proposed development on local roads (as provided by the project transport consultants, Pell Frischmann) has initially been compared to the screening criteria set out in the EPUK/IAQM guidance (Moorcroft and Barrowcliffe et al, 2017) (see Paragraphs A3.7 to A3.10 in Appendix A3). The proposed development will lead to a net reduction of approximately 206 daily vehicular trips on the local road network, compared to the existing operation at the site. As such, there is no requirement for a detailed assessment of road traffic impacts at existing receptors. Using professional judgement, it is concluded that traffic generated by the proposed development will have a negligible or beneficial impact anticipated as a result of the net reduction in traffic. As such the effect of the traffic emissions associated with the proposed development are considered 'not significant'.

Initial Screening Assessment of Energy Plant Emissions

6.2 The calculated total NOx emission rates from the emergency plant at full load (266.7 mg/s of NOx in total) and off-load (266.8 mg/s of NOx in total) exceed the screening threshold of 5 mg/s set out in the EPUK/IAQM guidance (see Paragraph A3.11 in Appendix A3). As such, dispersion modelling has been undertaken. Further details of the emergency plant emissions are provided in Appendices A5 and A7.

6.3 The maximum predicted nitrogen dioxide and PM_{10} process contributions at existing receptors associated with emissions from the emergency plant are shown in Table 9. The maximum predicted concentrations are provided from any of the six scenarios considered (see paragraph 3.28).

Table 9: Predicted Maximum Process Contributions to Pollutant Concentrations at Off-site Receptors associated with Emergency Plant Emissions (µg/m³)

Pollutant/Averaging Period	Maximum Process Contribution		Screening Criteria	Objective
	µg/m³	% of Objective	% of Objective	
Annual Mean NO_2	<0.1	<0.1	**0.5**	**40**
100th %ile of 1-hour NO_2 (full load)	37.9	18.9	**10**	**200**
100th %ile of 1-hour NO_2 (off-load)	43.3	21.6	**10**	**200**
Annual Mean PM_{10}	<0.1	<0.1	**0.5**	**40**
100th %ile of 24-hour PM_{10} (full load)	0.2	0.3	**10**	**50**
100th %ile of 24-hour PM_{10} (off-load)	0.2	0.3	**10**	**50**
Annual Mean $PM_{2.5}$[a]	<0.1	<0.1	**0.5**	**25[b]**

[a] In the absence of a specific emission factor for $PM_{2.5}$, modelled contributions to PM_{10} concentrations were considered in the context of the annual mean $PM_{2.5}$ objective, which is conservative.

[b] The $PM_{2.5}$ objective, which is to be met by 2020, is not currently in Regulations and there is no requirement for local authorities to meet it.

6.4 These predicted maximum concentrations can be compared with the EPUK/IAQM screening criteria, as previously described in Section 2, and the following conclusions can be drawn:

- the predicted maximum contribution to annual mean nitrogen dioxide concentrations (<0.1% of the objective) is well below the screening criterion (0.5%);
- the predicted maximum 100th percentile of 1-hour mean nitrogen dioxide concentrations (18.9% and 21.6% of the objective for full load and off-load fuel consumptions, respectively) are above the screening criterion (10%);
- the predicted maximum contribution to annual mean PM_{10} concentrations (<0.1% of the objective) is well below the screening criterion (0.5%);
- the predicted maximum 100th percentile of 24-hour-mean PM_{10} concentrations (0.3% of the objective for both full load and off-load fuel consumptions) are well below the screening criterion (10%); and
- the predicted maximum contribution to annual mean $PM_{2.5}$ concentrations (<0.1% of the objective) is well below the screening criterion (0.5%).

6.5 The potential for significant impacts on the annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations and on the 24-hour mean PM_{10} concentrations at existing receptors as a result of emissions from the emergency plant can be discounted. Further consideration is required with regards to the contribution of the emergency plant to the 1-hour mean NO_2 concentrations.

Detailed Assessment of Energy Plant Emissions

6.6 The 1-hour mean nitrogen dioxide concentrations objective is 200 µg/m^3, not to be exceeded more than 18 times (hours) in the year (see Table 1). Monitoring carried out by LBH at the HI1 roadside automatic monitoring station, which is deemed to be representative of conditions at the site, show no recorded 1-hour mean nitrogen dioxide concentrations above 200 µg/m^3 from 2013 to 2018 (see Table 2). It is thus reasonable to assume that currently, 1-hour mean nitrogen dioxide concentrations do not exceed 200 µg/m^3 at the site.

6.7 Table 9 shows the 100th percentile of 1-hour mean nitrogen dioxide contributions from the emergency plant, for both full load and off-load scenarios. These are the highest concentrations at any existing receptor included in the assessment and in any hour of the year, assuming the plant operates continuously (which is worst case as the emergency plant will only operate for 12 hours a year for testing purposes). As shown in Table 9 the maximum 100th percentile 1-hour mean process contributions from the emergency plant are 37.9 µg/m^3 and 43.3 µg/m^3, for the full load and off-load scenarios, respectively. These maximum impacts are predicted at the residential property located at 27 Wilmar Close. Considering the maximum modelled annual mean nitrogen dioxide concentration at the off-site location predicted to be the most affected by emergency plant emissions (20.6 µg/m^3), the 1-hour mean NO_2 concentration would not exceed 79.1 µg/m^3 (full load) or 84.5 µg/m^3 (off-load)[3], which is well below 200 µg/m^3. The maximum predicted process contribution would only occur under the least favourable meteorological conditions. In reality, as the emergency plant will be tested for 12 hours a year, it is unlikely the testing hours would coincide with the least favourable meteorological conditions, and that such process contributions would occur. Nevertheless, even considering these worst-case contributions, the proposed emergency plant would not lead to exceedances of the 1-hour nitrogen dioxide objective at any location near the proposed development.

6.8 The air quality effects at existing receptors associated with the proposed emergency diesel generator are thus considered to be 'not significant'.

Impacts of Existing and Proposed Sources on Future Occupants of the Development

6.9 Predicted air quality conditions for future residents of the proposed development, taking account of emissions from both the adjacent road network and the emergency plant within the proposed development, are set out in Table A8.1 in Appendix A8 for Receptors 1 to 28 (see Figure 1 for receptor locations).

[3] Calculated by adding the 100th percentile of 1-hour mean nitrogen dioxide process contributions from the emergency plant to two times the predicted annual mean concentration at the receptor (including the contribution of road traffic emissions), which is common practice.

6.10 Annual mean nitrogen dioxide, PM_{10} and $PM_{2.5}$ concentrations are predicted to be well below the objectives throughout the site, with maximum annual mean concentrations of 23.3 µg/m^3 for nitrogen dioxide, 16.2 µg/m^3 for PM_{10}, and 11.0 µg/m^3 for $PM_{2.5}$.

6.11 The maximum 1-hour mean NO_2 concentrations are, however, predicted to be above 200 µg/m^3 at some receptor locations within the proposed development, under either or both the full load and off load testing regimes. As explained in paragraph 6.7, the assessment has adopted a worst-case approach in presenting the maximum process contributions to pollutant concentrations considering that the emergency plant will be in use 100% of the time. In reality, the emergency plant will only be running for 12 hours a year for testing purposes, and it is unlikely the least favourable meteorological conditions would coincide with the testing hours and that such contributions would occur.

6.12 The emergency plant will be tested two hours a year at full load, and 10 hours a year off-load. This means that for receptor locations where both the off-load and full-load maximum 1-hour mean nitrogen dioxide concentrations are above 200 µg/m^3, emissions from the emergency plant could lead to up to 12 1-hour mean concentrations above 200 µg/m^3 in a year. As explained in paragraph 6.6, the objective is for the value of 200 µg/m^3 not to be exceeded more than 18 times in the year, and local monitoring data indicate that this value is not currently exceeded anytime in the year in the study area. As such, the 1-hour mean nitrogen dioxide concentration of 200 µg/m^3 not to be exceeded 18 times a year will be met, and the diesel generator does not result in any exceedances.

6.13 In addition, as discussed in paragraph 3.31, it is considered the final plant to be installed within the proposed development, will adhere to, or be better than, the emissions set out in Appendix A7. Despite the conservative approach adopted, the assessment has therefore shown that pollutant concentrations at the site will be below the objectives. Air quality for future residents and users within the development will thus be acceptable.

Significance of Operational Air Quality Effects

6.14 The operational air quality effects without mitigation are judged to be 'not significant'. This professional judgement is made in accordance with the methodology set out in Appendix A3, and takes account of the assessment that:

- the proposed development will lead to a net decrease in vehicle movements on the local road network compared to the site's current use, and thus existing sensitive receptors will not be adversely impacted by development-generated traffic, with possible localised beneficial impacts;
- emissions from the proposed emergency plant will lead to negligible air quality impacts at nearby existing receptors; and
- pollutant concentrations within the proposed development will all be below the objectives, thus future residents and users will experience acceptable air quality.

7 'Air Quality Neutral'

7.1 The purpose of the London Plan's requirement that development proposals be 'air quality neutral' is to prevent the gradual deterioration of air quality throughout Greater London. The 'air quality neutrality' of a proposed development, as assessed in this section, does not directly indicate the potential of the proposed development to have significant impacts on human health (this has been assessed separately in the previous section).

7.2 As of 1st September 2020, Use Classes A1/2/3, B1, D1(a-b) and 'indoor sport' from D2(e) have been revoked and covered by the broader Use Class E. For the purposes of the air quality neutral assessment, and in the absence of an updated set of benchmark values, the building and transport benchmarks determined for the previous Use Classes and presented within the air quality neutral guidance document ((AQC, 2014) and Appendix A9) were used.

Building Emissions

7.3 Chapman BDSP has advised that the proposed development will include a diesel fuel oil emergency generator, which will be tested for 10 hours a year off-load (75% fuel consumption) and two hours a year at full load (100% fuel consumption). Based on the EU Stage IIIA emission rate of 4,000 mg/kWh for NOx and 200 mg/kWh for PM_{10}, the plant will emit a total of 3.8 kg of NOx and 0.2 kg of PM_{10} per year.

7.4 Appendix A9 shows the Building Emissions Benchmarks (BEBs) for each land use category. Table 10 shows the calculation of the BEBs for this development.

Table 10: Calculation of Building Emissions Benchmark for the Development

	Description	Value	Reference
NOx			
A	**Gross Internal Floor Area of C2 Residential Institutions (m^2)**	11,658	Marchese Partners
B	**NOx BEB for C2 Residential Institutions (g/m^2/annum)**	68.5	Table A9.1
C	**Gross Internal Floor Area of Amenities (A1/A3, taken as A3 which applies to food and drink) (m^2)**	760	Marchese Partners
D	**NOx BEB for A3 (g/m^2/annum)**	75.2	Table A9.1
E	**Gross Internal Floor Area of D1(b) Nursery (m^2)**	319	Marchese Partners
F	**NOx BEB for D1 (b) (g/m^2/annum)**	75	Table A9.1
Total BEB NOx Emissions (kg/annum)		879.7	(A x B + C x D + E x F) / 1,000
PM_{10}			
G	**Gross Internal Floor Area of C2 Residential Institutions (m^2)**	11,568	Marchese Partners
H	**PM_{10} BEB for C2 Residential Institutions (g/m^2/annum)**	5.97	Table A9.1

	Description	Value	Reference
NOx			
I	**Gross Internal Floor Area of Amenities (A1/A3, taken as A3 which applies to food and drink) (m^2)**	760	Marchese Partners
J	**PM_{10} BEB for B1 Offices (g/m^2/annum)**	4.32	Table A9.1
K	**Gross Internal Floor Area of D1(b) Nursery (m^2)**	319	Marchese Partners
L	**PM_{10} BEB for D1 (b) (g/m^2/annum)**	4.3	Table A9.1
Total BEB PM_{10} Emissions (kg/annum)		74.3	(G x H + I x J + K x L) / 1,000

7.5 The Total Building Emissions are less than the Total Building Emissions Benchmarks for both NOx and PM_{10}. The proposed development is thus better than air quality neutral in terms of building emissions.

Road Transport Emissions

7.6 The Transport Emissions Benchmarks (TEBs) are based on the number of car trips generated by different land-use classes, together with the associated trip lengths and vehicle emission rates. However, the guidance (AQC, 2014) only provides trip lengths and emission rates for A1, B1 and C3 uses, thus a TEB cannot be calculated for the proposed development. The guidance does provide an alternative methodology, based on trip rates only, and this has been followed in considering the air quality neutrality of the proposed development in terms of transport emissions.

7.7 Table A9.6 in Appendix A8 provides default trip rates for different development categories. This information has been used to calculate a benchmark trip rate for the proposed development in Table 11. This has then been compared with the actual trip rate of the development.

Table 11: Calculation of Trip Rate Benchmark for the Development

	Description	Value	Reference
Residential Institutions (C2)			
A	**Gross Internal Floor Area (m^2)**	11,658	Pell Frischmann
B	**Benchmark Trip Rate (trips/m^2/annum)**	19.5	Table A9.3
C	**Benchmark Trip Rate (trips/annum)**	227,331	A x B
Nursery (D1)			
D	**Gross Internal Floor Area (m^2)**	319	Pell Frischmann
E	**Benchmark Trip Rate (trips/m^2/annum)**	46.1	Table A9.3
F	**Benchmark Trip Rate (trips/annum)**	14,706	D x E
Café/Restaurant (A3)			
G	**Gross Internal Floor Area (m^2)**	760	Pell Frischmann
H	**Benchmark Trip Rate (trips/m^2/annum)**	170	Table A9.3
I	**Benchmark Trip Rate (trips/annum)**	129,200	G x H
Entire Development			
Total Benchmark Trip Rate (trips/annum)		371,237	C + F + I

[a] Each trip is 1-way (i.e. a return journey would be two trips).

7.8 Pell Frischmann has advised that the Total Trip Rate of the proposed development is of 266,815 trips annually (731 daily LDV trips generated by the development over 365 days), which is less than the Total Trip Rate Benchmark, and therefore the proposed development is better than air quality neutral in terms of transport emissions.

8 Mitigation

Mitigation Included by Design

8.1 The EPUK/IAQM guidance advises that good design and best practice measures should be considered, whether or not more specific mitigation is required. The proposed development incorporates the following good design and best practice measures:

- adoption of a Dust Management Plan (DMP) or Construction Environmental Management Plan (CEMP) to minimise the environmental impacts of the construction works;
- setting back of the development buildings from roads by at least 4 m;
- use of air source heat pumps for the provision of some of the heat and hot water to be used at the site; and
- running of the emergency diesel generator flue to 6.4 m above ground to ensure the best possible dispersion environment.

Recommended Mitigation

Construction Impacts

8.2 Measures to mitigate dust emissions will be required during the construction phase of the development in order to minimise effects upon nearby sensitive receptors.

8.3 The proposed development has been identified as a *Medium* Risk site during demolition, earthworks, construction and trackout, as set out in Table 8. The GLA's SPG on *The Control of Dust and Emissions During Construction and Demolition* (GLA, 2014b) describes measures that should be employed, as appropriate, to reduce the impacts, along with guidance on what monitoring should be undertaken during the construction phase. This reflects best practice experience and has been used, together with the professional experience of the consultant who has undertaken the dust impact assessment and the findings of the assessment, to draw up a set of measures that should be incorporated into the specification for the works. These measures are described in Appendix A10.

8.4 The mitigation measures should be written into a dust management plan (DMP). The DMP may be integrated into a Code of Construction Practice or the Construction Environmental Management Plan and may require monitoring. The GLA's guidance suggests that, for a Medium Risk site, automatic monitoring of particulate matter (as PM_{10}) will be required. It also states that, on certain sites, it may be appropriate to determine the existing (baseline) pollution levels before work begins. However, the guidance is clear that the Local Authority should advise as to the appropriate air quality monitoring procedure and timescale on a case-by-case basis.

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

Road Traffic Impacts

8.6 The assessment has demonstrated that the proposed development will lead to a net decrease in traffic on local roads and that future residents and users of the proposed development will be exposed to acceptable air quality. It is, therefore, not considered appropriate to propose further mitigation measures for this development. Measures to reduce pollutant emissions from road traffic are principally being delivered in the longer term by the introduction of more stringent emissions standards, largely via European legislation (which is written into UK law).

Emergency Plant Impacts

8.7 The assessment has demonstrated that the emissions from the emergency plant within the proposed development will have an insignificant impact on air quality at existing nearby properties and will not lead to any objective exceedances within the development itself. As such, there is no requirement for mitigation beyond the best practice design measures highlighted above. The emergency plant installed within the development should, however, meet the specifications set out in Appendix A7; if the installed plant does not conform to these specifications, additional assessment and/or mitigation may be required.

9 Residual Impacts and Effects

Construction

9.1 The IAQM guidance, on which the GLA's guidance is based, is clear that, with appropriate mitigation in place, the residual effects will normally be 'not significant'. The mitigation measures set out in Section 8 and Appendix A10 are based on the GLA guidance. With these measures in place and effectively implemented the residual effects are judged to be 'not significant'.

9.2 The IAQM guidance does, however, recognise that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all of the time, for instance under adverse weather conditions. During these events, short-term dust annoyance may occur, however, the scale of this would not normally be considered sufficient to change the conclusion that overall the effects will be 'not significant'.

Operation

9.3 The residual impacts will be the same as those identified in Section 6. The overall effects of the proposed development will be 'not significant'.

10 Conclusions

10.1 The construction works have the potential to create dust. During construction it will therefore be necessary to apply a package of mitigation measures to minimise dust emissions. With these measures in place, it is expected that any residual effects will be 'not significant'.

10.2 The proposed development will lead to a net decrease in traffic along the local road network, and there will thus be no adverse impacts at existing receptors associated with development-generated traffic, with impacts expected to be negligible or beneficial.

10.3 The proposed development will, however, include emergency plant (diesel generator), and the impacts that plant emissions could have on air quality for existing and proposed receptors were assessed. The assessment showed that impacts at existing receptors would be negligible. In addition, based on the testing regime for the generator, it was demonstrated that plant emissions would not lead to any exceedances of the air quality objectives within the proposed development. Overall, emissions from the proposed emergency plant will have insignificant effects on air quality.

10.4 In addition, the assessment has showed that future air quality conditions at the site would be acceptable, with pollutant concentrations predicted to be below the objectives throughout the site.

10.5 An air quality neutral assessment was also carried out and showed that the proposed development would be better than air quality neutral for building and transport emissions.

10.6 The overall construction and operational air quality effects of the development are thus judged to be 'not significant'.

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12 Glossary

AADT	Annual Average Daily Traffic
ADMS-Roads	Atmospheric Dispersion Modelling System model for Roads
ADMS-5	Atmospheric Dispersion Modelling System model for point sources
AQC	Air Quality Consultants
AQAL	Air Quality Assessment Level
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
BEB	Building Emissions Benchmark
CAZ	Clean Air Zone
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMP	Dust Management Plan
EFT	Emission Factor Toolkit
EPUK	Environmental Protection UK
Exceedance	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
EU	European Union
EV	Electric Vehicle
Focus Area	Location that not only exceeds the EU annual mean limit value for NO_2 but also has a high level of human exposure
GIA	Gross Internal Floor Area
GLA	Greater London Authority
HDV	Heavy Duty Vehicles (> 3.5 tonnes)
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
JAQU	Joint Air Quality Unit
kph	Kilometres Per hour
kW	Kilowatt

LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LB	London Borough
LDV	Light Duty Vehicles (<3.5 tonnes)
LEZ	Low Emission Zone
LGV	Light Goods Vehicle
µg/m^3	Microgrammes per cubic metre
MCPD	Medium Combustion Plant Directive
MW$_{th}$	Megawatts Thermal
NO	Nitric oxide
NO$_2$	Nitrogen dioxide
NOx	Nitrogen oxides (taken to be NO_2 + NO)
NPPF	National Planning Policy Framework
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
OLEV	Office for Low Emission Vehicles
PC	Process Contribution
PHV	Private Hire Vehicle
PM$_{10}$	Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter
PM$_{2.5}$	Small airborne particles less than 2.5 micrometres in aerodynamic diameter
PPG	Planning Practice Guidance
RDE	Real Driving Emissions
SCR	Selective Catalytic Reduction
SPG	Supplementary Planning Guidance
SPD	Supplementary Planning Document
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal

TEA	Triethanolamine – used to absorb nitrogen dioxide
TEB	Transport Emissions Benchmark
TEMPro	Trip End Model Presentation Program
TfL	Transport for London
TRAVL	Trip Rate Assessment Valid for London
ULEZ	Ultra Low Emission Zone
ZEC	Zero Emission Capable

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A1 London-Specific Policies and Measures

London Plan

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

"Development proposals should:

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

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

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

d) ensure that where provision needs to made to reduce emissions from a development, these usually are made on site. Where it can be demonstrated that on-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

A1.2 The air quality chapter of the London Environment Strategy sets out three main objectives, each of which is supported by sub-policies and proposals. The Objectives and their sub-policies are set out below:

"Objective 4.1: Support and empower London and its communities, particularly the most disadvantaged and those in priority locations, to reduce their exposure to poor air quality.

- *Policy 4.1.1 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*
- *Policy 4.1.2 Improve the understanding of air quality health impacts to better target policies and action*

Objective 4.2: Achieve legal compliance with UK and EU limits as soon as possible, including by mobilising action from London Boroughs, government and other partners

- *Policy 4.2.1 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*
- *Policy 4.2.2 Reduce emissions from non-road transport sources, including by phasing out fossil fuels*
- *Policy 4.2.3 Reduce emissions from non-transport sources, including by phasing out fossil fuels*
- *Policy 4.2.4 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*
- *Policy 4.2.5 The Mayor will work with other cities (here and internationally), global city and industry networks to share best practice, lead action and support evidence based steps to improve air quality*

Objective 4.3: Establish and achieve new, tighter air quality targets for a cleaner London by transitioning to a zero emission London by 2050, meeting world health organization health-based guidelines for air quality

- *Policy 4.3.1 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*
- *Policy 4.3.2 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*
- *Policy 4.3.3 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*
- *Policy 4.3.4 Work to reduce exposure to indoor air pollutants in the home, schools, workplace and other enclosed spaces"*

A1.3 While the policies targeting transport sources are significant, there are less obvious ones that will also require significant change. In particular, the aim to phase out fossil-fuels from building heating and cooling and from NRMM will demand a dramatic transition.

Low Emission Zone (LEZ)

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

A1.5 The Mayor of London confirmed in June 2018 that the LEZ will be amended such that a Euro VI standard will apply for heavy vehicles from 26 October 2020. Requirements relating to larger vans, minibuses and other specialist diesel vehicles will not change.

Ultra Low Emission Zone (ULEZ)

A1.6 London's ULEZ was introduced on 8 April 2019. The ULEZ currently operates 24 hours a day, 7 days a week in the same area as the current Congestion Charging zone. All cars, motorcycles, vans, minibuses and Heavy Goods Vehicles will need to meet exhaust emission standards (ULEZ standards) or pay an additional daily charge to travel within the zone. The ULEZ standards are Euro 3 for motorcycles; Euro 4 for petrol cars, vans and minibuses; Euro 6 for diesel cars, vans and minibuses; and Euro VI for HGVs, buses and coaches.

A1.7 The Mayor of London confirmed in June 2018 that, from 25 October 2021, the ULEZ will cover the entire area within the North and South Circular roads, applying the emissions standards set out in Paragraph A1.6 for light vehicles. The ULEZ will not include any requirements relating to heavy vehicle emissions beyond 26 October 2020, as these will be addressed by the amendments to the LEZ described in Paragraph A1.5.

Other Measures

A1.8 From 2018 all taxis presented for licencing for the first time must be zero emission capable (ZEC). This means they must be able to travel a certain distance in a mode which produces no air pollutants. From 2018 all private hire vehicles (PHVs) presented for licensing for the first time must meet Euro 6 emissions standards. From 1 January 2020, all newly manufactured PHVs presented for licensing for the first time must be ZEC (with a minimum zero emission range of 10 miles). The Mayor's aim is that the entire taxi and PHV fleet will be made up of ZEC vehicles by 2033.

A1.9 The Mayor has also proposed to make sure that TfL leads by example by cleaning up its bus fleet, implementing the following measures:

- TfL will procure only hybrid or zero emission double-decker buses from 2018;
- a commitment to providing 3,100 double decker hybrid buses by 2019 and 300 zero emission single-deck buses in central London by 2020;
- introducing 12 Low Emission Bus Zones by 2020;
- investing £50m in Bus Priority Schemes across London to reduce engine idling; and
- retrofitting older buses to reduce emissions (selective catalytic reduction (SCR) technology has already been fitted to 1,800 buses, cutting their NOx emissions by around 88%).

A2 Construction Dust Assessment Procedure

A2.1 The criteria developed by IAQM (2016), upon which the GLA's guidance is based, divide the activities on construction sites into four types to reflect their different potential impacts. These are:

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

A2.2 The assessment procedure includes the four steps summarised below:

STEP 1: Screen the Need for a Detailed Assessment

A2.3 An assessment is required where there is a human receptor within 350 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s), or where there is an ecological receptor within 50 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

A2.4 Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is *negligible* and that any effects will be 'not significant'. No mitigation measures beyond those required by legislation will be required.

STEP 2: Assess the Risk of Dust Impacts

A2.5 A site is allocated to a risk category based on two factors:

- the scale and nature of the works, which determines the potential dust emission magnitude (Step 2A); and
- the sensitivity of the area to dust effects (Step 2B).

A2.6 These two factors are combined in Step 2C, which is to determine the risk of dust impacts with no mitigation applied. The risk categories assigned to the site may be different for each of the four potential sources of dust (demolition, earthworks, construction and trackout).

Step 2A – Define the Potential Dust Emission Magnitude

A2.7 Dust emission magnitude is defined as either 'Small', 'Medium', or 'Large'. The IAQM guidance explains that this classification should be based on professional judgement, but provides the examples in Table A2.1.

Table A2.1: Examples of How the Dust Emission Magnitude Class May be Defined

Class	Examples
Demolition	
Large	Total building volume >50,000 m^3, potentially dusty construction material (e.g. concrete), on site crushing and screening, demolition activities >20 m above ground level
Medium	Total building volume 20,000 m^3 – 50,000 m^3, potentially dusty construction material, demolition activities 10-20 m above ground level
Small	Total building volume <20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months
Earthworks	
Large	Total site area >10,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry to due small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes
Medium	Total site area 2,500 m^2 – 10,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m – 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes
Small	Total site area <2,500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10,000 tonnes, earthworks during wetter months
Construction	
Large	Total building volume >100,000 m^3, piling, on site concrete batching; sandblasting
Medium	Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching
Small	Total building volume <25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber)
Trackout [a]	
Large	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m
Medium	10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m
Small	<10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m

[a] These numbers are for vehicles that leave the site after moving over unpaved ground.

Step 2B – Define the Sensitivity of the Area

A2.8 The sensitivity of the area is defined taking account of a number of factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of PM_{10}, the local background concentration; and
- site-specific factors, such as whether there are natural shelters to reduce the risk of wind-blown dust.

A2.9 The first requirement is to determine the specific sensitivities of local receptors. The IAQM guidance recommends that this should be based on professional judgment, taking account of the principles in Table A2.2. These receptor sensitivities are then used in the matrices set out in Table A2.3, Table A2.4 and Table A2.5 to determine the sensitivity of the area. Finally, the sensitivity of the area is considered in relation to any other site-specific factors, such as the presence of natural shelters etc., and any required adjustments to the defined sensitivities are made.

Step 2C – Define the Risk of Impacts

A2.10 The dust emission magnitude determined at Step 2A is combined with the sensitivity of the area determined at Step 2B to determine the *risk* of impacts with no mitigation applied. The IAQM guidance provides the matrix in Table A2.6 as a method of assigning the level of risk for each activity.

STEP 3: Determine Site-specific Mitigation Requirements

A2.11 The IAQM guidance provides a suite of recommended and desirable mitigation measures which are organised according to whether the outcome of Step 2 indicates a low, medium, or high risk. The list provided in the IAQM guidance has been used as the basis for the requirements set out in Appendix A10.

STEP 4: Determine Significant Effects

A2.12 The IAQM guidance does not provide a method for assessing the significance of effects before mitigation, and advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, the IAQM guidance is clear that the residual effect will normally be 'not significant'.

A2.13 The IAQM guidance recognises that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all of the time, for instance under adverse weather conditions. The local community may therefore experience occasional, short-term dust annoyance. The scale of this would not normally be considered sufficient to change the conclusion that the effects will be 'not significant'.

Table A2.2: Principles to be Used When Defining Receptor Sensitivities

Class	Principles	Examples
Sensitivities of People to Dust Soiling Effects		
High	users can reasonably expect enjoyment of a high level of amenity; or the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected a to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land	dwellings, museum and other culturally important collections, medium and long term car parks and car showrooms
Medium	users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or the appearance, aesthetics or value of their property could be diminished by soiling; or the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land	parks and places of work
Low	the enjoyment of amenity would not reasonably be expected; or there is property that would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land	playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads
Sensitivities of People to the Health Effects of PM_{10}		
High	locations where members of the public may be exposed for eight hours or more in a day	residential properties, hospitals, schools and residential care homes
Medium	locations where the people exposed are workers, and where individuals may be exposed for eight hours or more in a day.	may include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}
Low	locations where human exposure is transient	public footpaths, playing fields, parks and shopping streets
Sensitivities of Receptors to Ecological Effects		
High	locations with an international or national designation and the designated features may be affected by dust soiling; or locations where there is a community of a particularly dust sensitive species	Special Areas of Conservation with dust sensitive features
Medium	locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or locations with a national designation where the features may be affected by dust deposition	Sites of Special Scientific Interest with dust sensitive features
Low	locations with a local designation where the features may be affected by dust deposition	Local Nature Reserves with dust sensitive features

Table A2.3: Sensitivity of the Area to Dust Soiling Effects on People and Property [4]

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

[4] For demolition, earthworks and construction, distances are taken either from the dust source or from the boundary of the site. For trackout, distances are measured from the sides of roads used by construction traffic. Without mitigation, trackout may occur from roads up to 500 m from sites with a *large* dust emission magnitude for trackout, 200 m from sites with a *medium* dust emission magnitude and 50 m from sites with a *small* dust emission magnitude, as measured from the site exit. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50 m from the edge of the road.

Table A2.4: Sensitivity of the Area to Human Health Effects [4]

Receptor Sensitivity	Annual Mean PM_{10}	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 µg/m³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table A2.5: Sensitivity of the Area to Ecological Effects [4]

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

Table A2.6: Defining the Risk of Dust Impacts

Sensitivity of the Area	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible
Earthworks			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Construction			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Trackout			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

A3 EPUK & IAQM Planning for Air Quality Guidance

A3.1 The guidance issued by EPUK and IAQM (Moorcroft and Barrowcliffe et al, 2017) is comprehensive in its explanation of the place of air quality in the planning regime. Key sections of the guidance not already mentioned above are set out below.

Air Quality as a Material Consideration

"Any air quality issue that relates to land use and its development is capable of being a material planning consideration. The weight, however, given to air quality in making a planning application decision, in addition to the policies in the local plan, will depend on such factors as:

- *the severity of the impacts on air quality;*
- *the air quality in the area surrounding the proposed development;*
- *the likely use of the development, i.e. the length of time people are likely to be exposed at that location; and*
- *the positive benefits provided through other material considerations".*

Recommended Best Practice

A3.2 The guidance goes into detail on how all development proposals can and should adopt good design principles that reduce emissions and contribute to better air quality management. It states:

"The basic concept is that good practice to reduce emissions and exposure is incorporated into all developments at the outset, at a scale commensurate with the emissions".

A3.3 The guidance sets out a number of good practice principles that should be applied to all developments that:

- include 10 or more dwellings;
- where the number of dwellings is not known, residential development is carried out on a site of more than 0.5 ha;
- provide more than 1,000 m^2 of commercial floorspace;
- are carried out on land of 1 ha or more.

A3.4 The good practice principles are that:

- New developments should not contravene the Council's Air Quality Action Plan, or render any of the measures unworkable;
- Wherever possible, new developments should not create a new "street canyon", as this inhibits pollution dispersion;

- Delivering sustainable development should be the key theme of any application;
- New development should be designed to minimise public exposure to pollution sources, e.g. by locating habitable rooms away from busy roads;
- The provision of at least 1 Electric Vehicle (EV) "rapid charge" point per 10 residential dwellings and/or 1000 m^2 of commercial floorspace. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made available;
- Where development generates significant additional traffic, provision of a detailed travel plan (with provision to measure its implementation and effect) which sets out measures to encourage sustainable means of transport (public, cycling and walking) via subsidised or free-ticketing, improved links to bus stops, improved infrastructure and layouts to improve accessibility and safety;
- All gas-fired boilers to meet a minimum standard of <40 mgNOx/kWh;
- Where emissions are likely to impact on an AQMA, all gas-fired CHP plant to meet a minimum emissions standard of:
    - Spark ignition engine: 250 mgNOx/Nm^3;
    - Compression ignition engine: 400 mgNOx/Nm^3;
    - Gas turbine: 50 mgNOx/Nm^3.
- A presumption should be to use natural gas-fired installations. Where biomass is proposed within an urban area it is to meet minimum emissions standards of 275 mgNOx/Nm^3 and 25 mgPM/Nm^3.

A3.5 The guidance also outlines that offsetting emissions might be used as a mitigation measure for a proposed development. However, it states that:

"It is important that obligations to include offsetting are proportional to the nature and scale of development proposed and the level of concern about air quality; such offsetting can be based on a quantification of the emissions associated with the development. These emissions can be assigned a value, based on the "damage cost approach" used by Defra, and then applied as an indicator of the level of offsetting required, or as a financial obligation on the developer. Unless some form of benchmarking is applied, it is impractical to include building emissions in this approach, but if the boiler and CHP emissions are consistent with the standards as described above then this is not essential".

A3.6 The guidance offers a widely used approach for quantifying costs associated with pollutant emissions from transport. It also outlines the following typical measures that may be considered to offset emissions, stating that measures to offset emissions may also be applied as post assessment mitigation:

- Support and promotion of car clubs;
- Contributions to low emission vehicle refuelling infrastructure;
- Provision of incentives for the uptake of low emission vehicles;
- Financial support to low emission public transport options; and
- Improvements to cycling and walking infrastructures.

Screening

Impacts of the Local Area on the Development

"There may be a requirement to carry out an air quality assessment for the impacts of the local area's emissions on the proposed development itself, to assess the exposure that residents or users might experience. This will need to be a matter of judgement and should take into account:

- *the background and future baseline air quality and whether this will be likely to approach or exceed the values set by air quality objectives;*
- *the presence and location of Air Quality Management Areas as an indicator of local hotspots where the air quality objectives may be exceeded;*
- *the presence of a heavily trafficked road, with emissions that could give rise to sufficiently high concentrations of pollutants (in particular nitrogen dioxide), that would cause unacceptably high exposure for users of the new development; and*
- *the presence of a source of odour and/or dust that may affect amenity for future occupants of the development".*

Impacts of the Development on the Local Area

A3.7 The guidance sets out two stages of screening criteria that can be used to identify whether a detailed air quality assessment is required, in terms of the impact of the development on the local area. The first stage is that you should proceed to the second stage if any of the following apply:

- 10 or more residential units or a site area of more than 0.5 ha residential use; and/or
- more than 1,000 m^2 of floor space for all other uses or a site area greater than 1 ha.

A3.8 Coupled with any of the following:

- the development has more than 10 parking spaces; and/or
- the development will have a centralised energy facility or other centralised combustion process.

A3.9 If the above do not apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area. If they do apply then you proceed to stage 2, which sets out indicative criteria for requiring an air quality assessment. The stage 2 criteria relating to vehicle emissions are set out below:

- the development will lead to a change in LDV flows of more than 100 AADT within or adjacent to an AQMA or more than 500 AADT elsewhere;
- the development will lead to a change in HDV flows of more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere;
- the development will lead to a realigning of roads (i.e. changing the proximity of receptors to traffic lanes) where the change is 5m or more and the road is within an AQMA;
- the development will introduce a new junction or remove an existing junction near to relevant receptors, and the junction will cause traffic to significantly change vehicle acceleration/deceleration, e.g. traffic lights or roundabouts;
- the development will introduce or change a bus station where bus flows will change by more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere; and
- the development will have an underground car park with more than 100 movements per day (total in and out) with an extraction system that exhausts within 20 m of a relevant receptor.

A3.10 The criteria are more stringent where the traffic impacts may arise on roads where concentrations are close to the objective. The presence of an AQMA is taken to indicate the possibility of being close to the objective, but where whole authority AQMAs are present and it is known that the affected roads have concentrations below 90% of the objective, the less stringent criteria are likely to be more appropriate.

A3.11 On combustion processes (including standby emergency generators and shipping) where there is a risk of impacts at relevant receptors, the guidance states that:

"Typically, any combustion plant where the single or combined NOx emission rate is less than 5 mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion. As a guide, the 5 mg/s criterion equates to a 450 kW ultra-low NOx gas boiler or a 30kW CHP unit operating at <95mg/Nm^3.

In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates.

Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable".

A3.12 Should none of the above apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area, provided that professional judgement is applied; the guidance importantly states the following:

"The criteria provided are precautionary and should be treated as indicative. They are intended to function as a sensitive 'trigger' for initiating an assessment in cases where there is a possibility of significant effects arising on local air quality. This possibility will, self-evidently, not be realised in many cases. The criteria should not be applied rigidly; in some instances, it may be appropriate to amend them on the basis of professional judgement, bearing in mind that the objective is to identify situations where there is a possibility of a significant effect on local air quality".

A3.13 Even if a development cannot be screened out, the guidance is clear that a detailed assessment is not necessarily required:

"The use of a Simple Assessment may be appropriate, where it will clearly suffice for the purposes of reaching a conclusion on the significance of effects on local air quality. The principle underlying this guidance is that any assessment should provide enough evidence that will lead to a sound conclusion on the presence, or otherwise, of a significant effect on local air quality. A Simple Assessment will be appropriate, if it can provide this evidence. Similarly, it may be possible to conduct a quantitative assessment that does not require the use of a dispersion model run on a computer".

A3.14 The guidance also outlines what the content of the air quality assessment should include, and this has been adhered to in the production of this report.

Impact Descriptors and Assessment of Significance

A3.15 There is no official guidance in the UK in relation to development control on how to describe the nature of air quality impacts, nor how to assess their significance. The approach within the EPUK/IAQM guidance has, therefore, been used in this assessment. This approach involves a two stage process:

- a qualitative or quantitative description of the impacts on local air quality arising from the development; and
- a judgement on the overall significance of the effects of any impacts.

Impact Descriptors

A3.16 Impact description involves expressing the magnitude of incremental change as a proportion of a relevant assessment level and then examining this change in the context of the new total

concentration and its relationship with the assessment criterion. Table A3.1 sets out the method for determining the impact descriptor for annual mean concentrations at individual receptors, having been adapted from the table presented in the guidance document. For the assessment criterion the term Air Quality Assessment Level or AQAL has been adopted, as it covers all pollutants, i.e. those with and without formal standards. Typically, as is the case for this assessment, the AQAL will be the air quality objective value. Note that impacts may be adverse or beneficial, depending on whether the change in concentration is positive or negative.

Table A3.1: Air Quality Impact Descriptors for Individual Receptors for All Pollutants [a]

Long-Term Average Concentration At Receptor In Assessment Year [b]	Change in concentration relative to AQAL [c]				
	0%	1%	2-5%	6-10%	>10%
75% or less of AQAL	Negligible	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Negligible	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Negligible	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Negligible	Moderate	Substantial	Substantial	Substantial

[a] Values are rounded to the nearest whole number.

[b] This is the "Without Scheme" concentration where there is a decrease in pollutant concentration and the "With Scheme" concentration where there is an increase.

[c] AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.

Assessment of Significance

A3.17 The guidance recommends that the assessment of significance should be based on professional judgement, with the overall air quality impact of the development described as either 'significant' or 'not significant'. In drawing this conclusion, the following factors should be taken into account:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts;
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts;
- the potential for cumulative impacts and, in such circumstances, several impacts that are described as '*slight*' individually could, taken together, be regarded as having a significant effect for the purposes of air quality management in an area, especially where it is proving difficult to reduce concentrations of a pollutant. Conversely, a '*moderate*' or '*substantial*' impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health; and

- the judgement on significance relates to the consequences of the impacts; will they have an effect on human health that could be considered as significant? In the majority of cases, the impacts from an individual development will be insufficiently large to result in measurable changes in health outcomes that could be regarded as significant by health care professionals.

A3.18 The guidance is clear that other factors may be relevant in individual cases. It also states that the effect on the residents of any new development where the air quality is such that an air quality objective is not met will be judged as significant. For people working at new developments in this situation, the same will not be true as occupational exposure standards are different, although any assessment may wish to draw attention to the undesirability of the exposure.

A3.19 A judgement of the significance should be made by a competent professional who is suitably qualified. A summary of the professional experience of the staff contributing to this assessment is provided in AppendixA4.

A4 Professional Experience

Guido Pellizzaro, BSc (Hons) MIAQM MIEnvSc PIEMA

Mr Pellizzaro is an Associate Director with AQC, with more than 14 years' experience in the field of air quality management and assessment. His main experience relates to managing and delivering air quality assessments for major planning applications and EIA development. Guido is a Member of the Institute of Environmental Sciences and of the Institute of Air Quality Management, and a Practitioner of the Institute of Environmental Management and Assessment.

Pauline Jezequel, MSc MIEnvSc MIAQM

Miss Jezequel is a Principal Consultant with AQC with ten years' relevant experience. Prior to joining AQC she worked as an air quality consultant at AECOM. She has also worked as an air quality controller at Bureau Veritas in France, undertaking a wide range of ambient and indoor air quality measurements for audit purposes. She now works in the field of air quality assessment, undertaking air quality impact assessments for a wide range of development projects in the UK and abroad, including for residential and commercial developments, transport schemes (rail, road and airport), waste facilities and industrial sites. Miss Jezequel has also undertaken a number of odour surveys and assessments in the context of planning applications. She has experience in monitoring construction dust, as well as indoor pollutant levels for BREEAM purposes. She is a Member of the Institute of Air Quality Management.

George Chousos, BSc MSc AMIEnvSc AMIAQM

Mr Chousos is an Assistant Consultant with AQC, having joined in May 2019. Prior to joining AQC, he completed an MSc in Air Pollution Management and Control at the University of Birmingham, specialising in air pollution control technologies and management, and data processing using R. He also holds a degree in Environmental Geoscience from the University of Cardiff, where he undertook a year in industry working in the field of photo-catalytic technology. He is now gaining experience in the field of air quality monitoring and assessment.

A5 Modelling Methodology

Model Inputs

Road Traffic

A5.1 Predictions have been carried out using the ADMS-Roads dispersion model (v5). The model requires the user to provide various input data, including emissions from each section of road and the road characteristics (including road width, where applicable). Vehicle emissions have been calculated based on vehicle flow, composition and speed data using the EFT (Version 9.0) published by Defra (2020b).

A5.2 Hourly sequential meteorological data from Northolt for 2018 have been used in the model. The Northolt meteorological monitoring station is located at Northolt Airfield, approximately 4.4 km to the northeast of the proposed development site. It is deemed to be the nearest monitoring station representative of meteorological conditions in the vicinity of the proposed development site; both the development site and the Northolt meteorological monitoring station are located in the Greater London area where they will be influenced by the effects of inland meteorology over urban topography.

A5.3 Traffic data have been taken from the London Atmospheric Emissions Inventory (LAEI) (GLA, 2019b) for 2016. The 2016 traffic data have been factored forwards to the assessment years of 2018 and 2024 using growth factor derived using the TEMPRo System v7.2 (DfT, 2017); a factor of 1.0212 for 2018 and a factor of 1.0639 for 2024 have been used. Traffic speeds have been estimated based on professional judgement, taking account of the road layout, speed limits and the proximity to a junction. The traffic data used in this assessment are summarised in Table A5.1. Diurnal and monthly flow profiles for the traffic have been derived from the national profiles published by DfT (2019).

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

Road Link	AADT	% Petrol Car	% Diesel Car	% Taxi (black cab)	% LGV	% Rigid HGV	% Artic HGV	% Bus/ Coach	% Motor Cycle
2018									
Harefield Road (south of High Street)	4,788	43.5	29.6	0.9	7.3	1.0	0.0	16.4	1.4
High Street	10,571	40.6	27.6	1.5	7.8	5.2	1.2	14.9	1.3
Harefield Road (north of High Street)	8,107	51.3	34.9	1.0	8.7	1.1	0.0	1.3	1.6
Park Road (B483)	20,225	54.8	37.3	1.1	4.7	1.0	0.1	0.4	0.6
Swakeleys Roundabout	22,788	48.1	32.7	1.8	9.3	4.9	1.1	0.6	1.5
Western Avenue (A40)	53,741	48.8	33.2	0.2	12.3	2.4	1.6	0.5	1.0
Swakeleys Road (B467)	22,788	48.1	32.7	1.8	9.3	4.9	1.1	0.6	1.5
Hillingdon Road(A4020)	23,028	51.8	35.2	1.0	6.4	1.1	0.0	3.5	0.9
2024									
Harefield Road (south of High Street)	4988	43.5	29.6	0.9	7.3	1.0	0.0	16.4	1.4
High Street	11013	40.6	27.6	1.5	7.8	5.2	1.2	14.9	1.3
Harefield Road (north of High Street)	8446	51.3	34.9	1.0	8.7	1.1	0.0	1.3	1.6
Park Road (B483)	21071	54.8	37.3	1.1	4.7	1.0	0.1	0.4	0.6
Swakeleys Roundabout	23741	48.1	32.7	1.8	9.3	4.9	1.1	0.6	1.5
Western Avenue (A40)	55988	48.8	33.2	0.2	12.3	2.4	1.6	0.5	1.0
Swakeleys Road (B467)	23741	48.1	32.7	1.8	9.3	4.9	1.1	0.6	1.5
Hillingdon Road(A4020)	23991	51.8	35.2	1.0	6.4	1.1	0.0	3.5	0.9

A5.4 The LAEI traffic data include flows for electric vehicles, which generate no tailpipe emissions, but will generate some particulate matter through brake and tyre wear and resuspension. The EFT's default inputs do not allow for electric vehicles to be entered separately, thus the electric vehicles have been grouped with cars and the EFT's default assumptions on electric vehicle proportions have been used when calculating emissions. While this may mean that the proportion of electric vehicles is understated when compared to that in the LAEI (as the proportions in the EFT are very low), this is unlikely to have significantly affected the predicted concentrations and will not have affected the

conclusions of the assessment. This is because electric vehicle flows are extremely low in comparison to those of other vehicles.

A5.5 Figure A5.1 shows the road network included within the model, along with the speed at which each link was modelled.

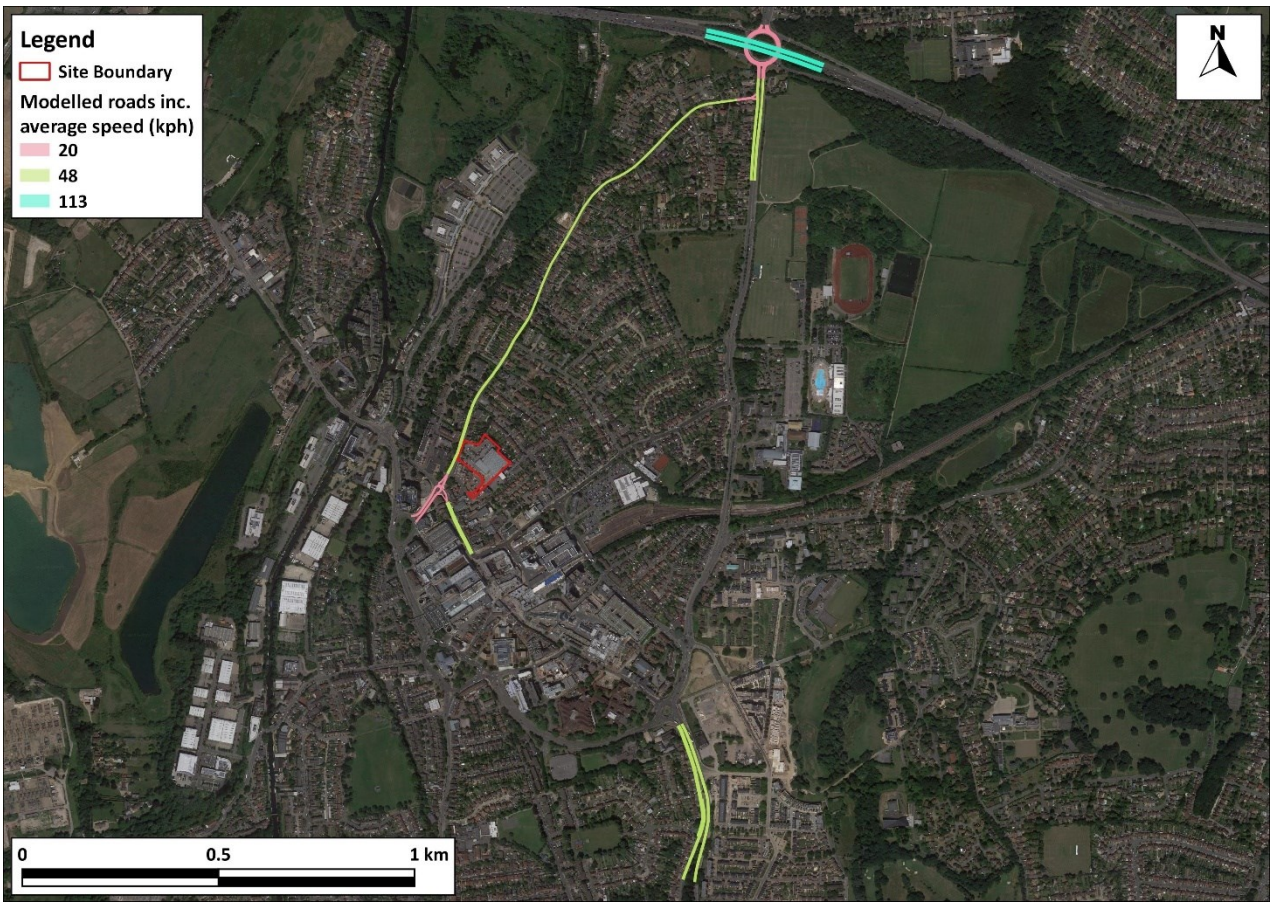


Figure A5.1: Modelled Road Network & Speed and the Application Site Boundary

Imagery ©2020 Google.

Point Sources

A5.6 The impacts of emissions from the proposed emergency plant have been predicted using the ADMS-5 dispersion model. ADMS-5 is a new generation model that incorporates a state-of-the-art understanding of the dispersion processes within the atmospheric boundary layer. The model has been run to predict the contribution of the proposed emergency plant emissions to annual mean concentrations of nitrogen oxides and PM (assumed to be both $PM_{2.5}$ and PM_{10}), the 100th percentile of 1-hour mean nitrogen oxides concentrations, and the 100th percentile of 24-hour mean PM_{10} concentrations.

A5.7 The emergency diesel generator plant proposed to be installed into the development will have an assumed net fuel input of 633 kW_{th} (full load) or 496 kW_{th} (off-load) when testing which is equivalent to a fuel consumption of 63.7 and 49.8 litres per hour of diesel oil, respectively. The generator will be capable of delivering 300 kVA on demand. Emissions will rise to roof level at the single-storey outbuilding which houses the emergency generator. Chapman BDSP has advised that the backup generator plant will operator for 1 hours per month on off-load fuel consumption and bi-annually (or two hours a year) at full load, in accordance with the testing regimes. The exhaust volume flow rate for the diesel generator has been calculated based on the complete combustion of the assumed diesel oil composition in Table A5.2. Modelled emissions and release conditions are presented in Table A5.3,

Table A5.2: Typical Diesel Fuel Composition

Elemental Component	Diesel Oil
Carbon	86.5%
Hydrogen	13.2%
Oxygen	0.3%
Net Calorific Value (LHV) (MJ/kg)	42.82
Gross Calorific Value (HHV) (MJ/kg)	45.70
HHV/LHV	1.07
Liquid Density @ 15°C (kg/m^3)	835

Table A5.3: Plant Specifications and Modelled Emissions and Release Conditions

Parameter	Value
Flue Internal Diameter (m)	0.15
Calculated Actual Exhaust Volume Flow (m^3/s) [a] – full load	0.5
Calculated Actual Exhaust Volume Flow (m^3/s) [a] – off-load	0.4
Calculated Exit Velocity (m/s) – full load	29.0
Calculated Exit Velocity (m/s) – off-load	22.6
Specified NOx Emission Rate (mg/kWh)	4,000
Calculated NOx Emission Rate (g/s) – full load	0.26670
Calculated NOx Emission Rate (g/s) – off-load	0.26667
Specified PM_{10} Emission Rate (mg/kWh)	200
Calculated PM_{10} Emission Rate (g/s) – full load	0.01334
Calculated PM_{10} Emission Rate (g/s) – off-load	0.01333
Specified Exhaust Temperature (°C)	512
Flue Location (x,y)	505487.7, 184433.5
Modelled Flue Height (m)	6.4

[a] Not normalised.

A5.8 Entrainment of the plume into the wake of the buildings (the so-called building downwash effect) has been taken into account in the model. The building dimensions and flue location have been obtained from drawings provided by Marchese Partners. The location of the flue is shown in Figure A5.2 along with the modelled buildings and their heights. The flue has been modelled at a height of 6.4 m (3 m above the roof level).

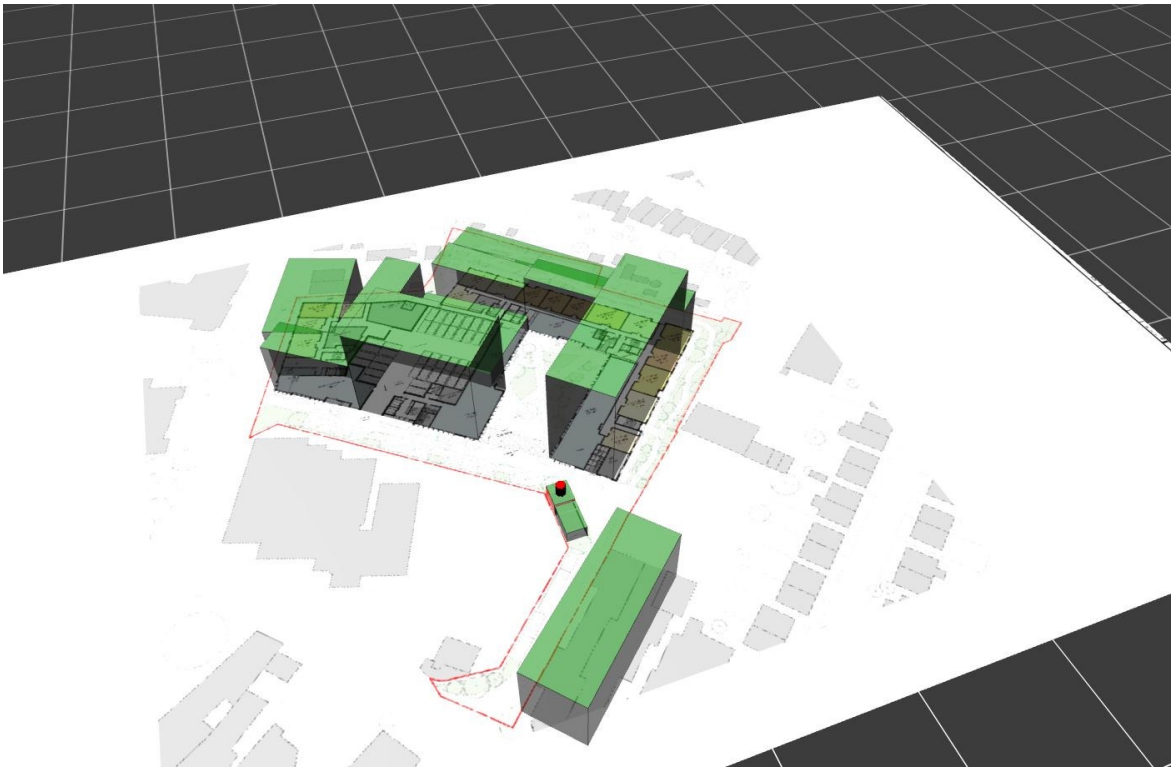


Figure A5.2: Flue Location (red circle) & Modelled Buildings

Contains data from Marchese Partners drawing no. UXB001-MPI-20_000.

A5.9 To account for variations in meteorological conditions, hourly sequential meteorological data from Northolt for 2016, 2017 and 2018 have been used in the plant dispersion model.

Background Concentrations

A5.10 The background pollutant concentrations across the study area have been defined using the 2017-based national pollution maps published by Defra (2020b). These cover the whole of the UK on a 1x1 km grid and are published for each year from 2017 until 2030. The background annual mean nitrogen dioxide maps for 2018 have been calibrated against concurrent measurements from national monitoring sites (AQC, 2019). The calibration factor calculated has also been applied to future year backgrounds. This has resulted in slightly higher predicted nitrogen dioxide concentrations for the future assessment year than those derived from the Defra maps.

Model Verification

A5.11 In order to ensure that ADMS-Roads accurately predicts local concentrations, it is necessary to verify the model against local measurements. It is not practical, nor usual, to verify the ADMS-5 model, and, because ADMS-5 does not rely on estimated road-vehicle emission factors, the adjustment used for ADMS-Roads cannot be applied to ADMS-5. Predictions made using ADMS-5 have thus not been verified.

Nitrogen Dioxide

A5.12 Most nitrogen dioxide (NO_2) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NOx = NO + NO_2). The model has been run to predict the annual mean NOx concentrations during 2018 at the HD211 and HD212 diffusion tube monitoring sites. Diffusion tube HD43 was considered for model verification purposes as it is located in proximity to the site of proposed development; however, it was excluded as the diffusion tube appears to be covered by plastic sheeting, rendering any result not representative of actual conditions, and thus not appropriate for model verification.

A5.13 The model output of road-NOx (i.e. the component of total NOx coming from road traffic) has been compared with the 'measured' road-NOx. Measured road-NOx has been calculated from the measured NO_2 concentrations and the predicted background NO_2 concentration using the NOx from NO_2 calculator (Version 7.1) available on the Defra LAQM Support website (Defra, 2020b).

A5.14 The unadjusted model has under predicted the road-NOx contribution; this is a common experience with this and most other road traffic emissions dispersion models. An adjustment factor has been determined as the slope of the best-fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (Figure A5.3). The calculated adjustment factor of 2.1951 has been applied to the modelled road-NOx concentration for each receptor to provide adjusted modelled road-NOx concentrations.

A5.15 The total nitrogen dioxide concentrations have then been determined by combining the adjusted modelled road-NOx concentrations with the predicted background NO_2 concentration within the NOx to NO_2 calculator. Figure A5.4 compares final adjusted modelled total NO_2 at each of the monitoring sites to measured total NO_2, and shows a close agreement.

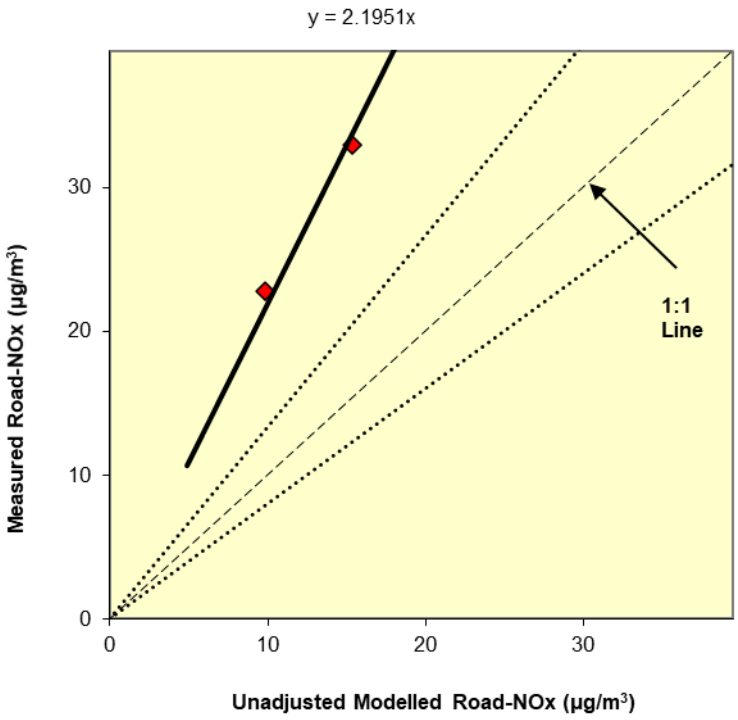


Figure A5.3: Comparison of Measured Road NOx to Unadjusted Modelled Road NOx Concentrations. The dashed lines show ± 25%.

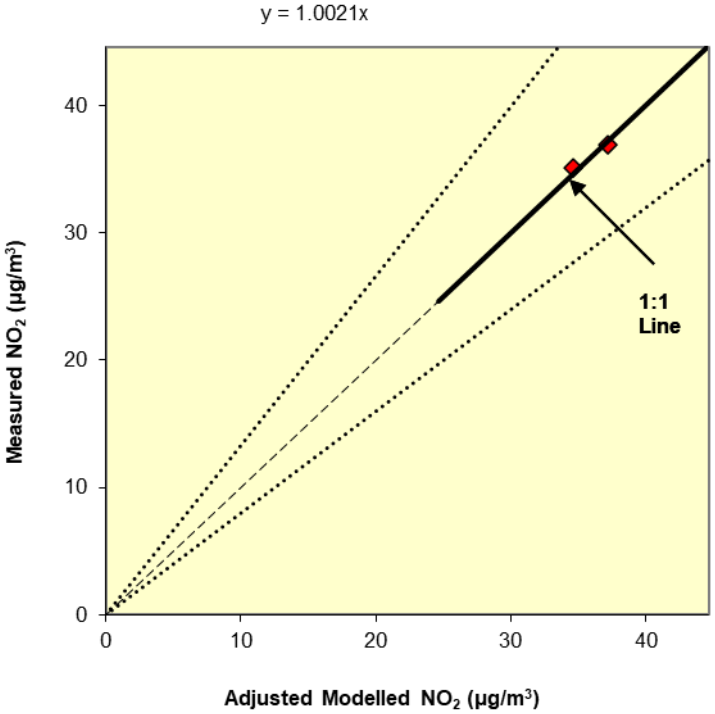


Figure A5.4: Comparison of Measured Total NO_2 to Final Adjusted Modelled Total NO_2 Concentrations. The dashed lines show ± 25%.

PM_{10} and $PM_{2.5}$

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

Model Post-processing

Road Traffic

A5.17 The model predicts road-NOx concentrations at each receptor location. These concentrations have been adjusted using the adjustment factor set out above, which, along with the background NO_2, has been processed through the NOx to NO_2 calculator available on the Defra LAQM Support website (Defra, 2020b). The traffic mix within the calculator has been set to "All London traffic", which is considered suitable for the study area. The calculator predicts the component of NO_2 based on the adjusted road-NOx and the background NO_2.

Point Sources

A5.18 Emissions from the emergency plant will be predominantly in the form of nitrogen oxides (NOx) and PM_{10}. ADMS-5 has been run to predict the contribution of the proposed emergency plant emissions to annual mean concentrations of nitrogen oxides and PM, to the 100th percentile of 1-hour mean nitrogen oxides concentrations and the 100th percentile of 24-hour mean PM_{10} concentrations. For the initial screening of the process contributions, the approach recommended by the Environment Agency (2005) has been used to predict nitrogen dioxide concentrations, assuming that:

- annual mean NO_2 concentration = annual mean NOx concentration multiplied by 0.7; and
- 99.79th percentile of 1-hour mean NO_2 concentrations = 99.79th percentile of 1-hour mean NOx concentrations multiplied by 0.35.

A5.19 The PM output requires no further adjustment.

A6 London Vehicle Fleet Projections

A6.1 TfL has published an Integrated Impact Assessment (Jacobs, 2017) setting out the impacts of the changes to the LEZ and ULEZ described in Paragraphs A1.5 and A1.7. The assessment predicts that the changes will reduce overall NOx emissions from vehicles in London by 28% in 2021 (32% in Inner London and 27% in Outer London) and by 21% in 2025 (24% in Inner London and 21% in Outer London). The percentage reduction reduces with time due to the natural turnover of the fleet that would have occurred regardless of the introduction of the proposed changes. The proposed changes will not significantly affect emissions in Central London, where the ULEZ will already be implemented, but concentrations here will still reduce due to the lower emissions in surrounding areas.

A6.2 The report projects that the changes will reduce exposure to exceedances of the annual mean nitrogen dioxide objective by 40% and 21% in Central London in 2021 and 2025, respectively; by 4% and 0% in Inner London in 2021 and 2025, respectively; and by 23% and 27% in Outer London in 2021 and 2025, respectively, when compared to the baseline scenario.

A6.3 The changes are not projected to have a significant effect on PM_{10} and $PM_{2.5}$ concentrations, although a small reduction is predicted.

A6.4 AQC's report on the performance of Defra's EFT (AQC, 2020) also highlighted that the EFT's assumptions regarding future fleet composition in London and across the UK may be over-pessimistic in terms of NOx emissions. The future fleet projection derived from the EFT for Outer London, for example, shows a very small reduction in the proportion of diesel cars between 2016 and 2030, and a very limited uptake of electric cars. The AQC report highlights that this contrasts with the expectations of many observers, as well as the most recent trends publicised by the media. When considered alongside the future requirements of the LEZ and ULEZ, these future fleet projections seem all the more unrealistic (i.e. worst-case in terms of emissions), as the changes to the LEZ and ULEZ would reasonably be expected to significantly increase the uptake of lower emissions vehicles in London.

A6.5 The changes to the LEZ and ULEZ announced by the Mayor of London in June 2018 are not reflected in Defra's latest EFT and thus have not been considered in this assessment. The potentially over-pessimistic fleet projections built in to the EFT have not been addressed in this report either. Paragraphs A6.1 and A6.2 highlight that the changes to the LEZ and ULEZ will result in significant reductions in vehicle nitrogen oxides emissions and resultant nitrogen dioxide concentrations. The changes might reasonably also be expected to expedite the uptake of cleaner vehicles well beyond that projected in the EFT's fleet projections for London. As such, while the results presented in this report represent a reasonably conservative reflection of likely concentrations in the absence of the changes to the LEZ and ULEZ, they almost certainly represent an unrealistically worst-case assessment of likely concentrations bearing in mind the implementation of these changes.

A7 Emergency Plant Specifications

A7.1 The proposed development will include one emergency diesel generator. Specifications for this plant, upon which the assessment has been based, is shown in Table A7.1.

Table A7.1: Energy Plant Specifications

Parameter	Value	Restriction
HSW-305 T5 (off-load)		
Gross Peak Fuel Input (kW)	495.0	Max
Hours of Use per Annum	10	Max
Annual Fuel Input (kWh/annum)	1,056.6	Max
Exhaust Temperature (°C)	512	Min
Flue Internal Diameter (m)	0.15	Max
Efflux Velocity (m/s)	22.6	Min
NOx Emission Rate (mg/kWh)	4,000	Max
PM_{10} Emission Rate (mg/kWh)	200	Max
HSW-305 T5 (full load)		
Gross Peak Fuel Input (kW)	633.0	Max
Hours of Use per Annum	2	Max
Annual Fuel Input (kWh/annum)	1,351.2	Max
Exhaust Temperature (°C)	512	Min
Flue Internal Diameter (m)	0.15	Max
Efflux Velocity (m/s)	29.0	Min
NOx Emission Rate (mg/kWh)	4,000	Max
PM_{10} Emission Rate (mg/kWh)	200	Max

A7.2 The restrictions set out in Table A7.1 should be adhered in order to ensure that the final plant design does not lead to impacts greater than those modelled. To further emphasise these, the final design should ensure the stack discharges vertically upwards and is unimpeded by any fixture on top of the stack (e.g., rain cowls or conical cowls).

A7.3 If the final design deviates significantly from the modelled specification, additional future modelling may be required in order to ensure that there are no significant adverse air quality impacts.

A7.4 The GLA's Sustainable Design and Construction SPG (GLA, 2014a) also states that the measures set out in Technical Guidance Note D1 (Dispersion) (1993) should also be adhered to in order to ensure adequate dispersion of emissions from discharging stacks and vents. These include the following, all of which are complied with for the proposed development:

- discharges should be vertically upwards and unimpeded by cowls or any other fixtures on top of the stack. However, the use of coning or of flame traps at the tops of stacks is

acceptable. In the case of discharge stacks (whether single or multiple stack) with shrouds or casings around the stack(s), the stack(s) alone should extend above the shroud or casing. This extension should be at least 50% of the shroud or casing's greatest lateral dimension;

- irrespective of the pollutant discharge, there are minimum discharge stack heights based on the heat release and the discharge momentum. These can be calculated following calculations set out in the guidance note, but the absolute minimum value is 1 m; and
- no discharge stack should be less than 3 m above the ground or any adjacent area to which there is general access. For example, roof areas and elevated walkways.

A8 Predicted Concentrations at Proposed Receptors

A8.1 Table A8.1 includes the predicted air quality conditions for future residents of the proposed development, taking account of emissions from both the adjacent road network and the emergency plant within the proposed development.

Table A8.1: Predicted Concentrations of Nitrogen Dioxide (NO_2), PM_{10} and $PM_{2.5}$ in 2024 for New Receptors in the Development Site (µg/m^3)

Receptor	Height (m)	Annual Mean NO_2	100th %ile of Hourly Mean NO_2 (full load) [a]	100th %ile of Hourly Mean NO_2 (off-load) [a]	Annual Mean PM_{10}	Annual Mean $PM_{2.5}$
P1	4.9	21.4	62.7	65.4	15.5	10.6
P1	12.6	20.6	67.7	69.4	15.2	10.5
P2	1.5	20.9	89.5	103.6	15.3	10.5
P2	6.8	20.8	64.2	67.3	15.3	10.5
P2	10.2	20.7	71.9	74.5	15.3	10.5
P2	13.5	20.6	78.2	81.4	15.2	10.4
P3	1.5	20.8	60.6	62.9	15.3	10.5
P3	6.8	20.7	65.6	68.8	15.3	10.5
P3	10.2	20.6	74.9	77.8	15.2	10.5
P3	13.5	20.6	82.6	85.7	15.2	10.4
P4	1.5	20.7	88.5	97.1	15.3	10.5
P4	6.8	20.7	66.6	69.2	15.3	10.5
P4	10.2	20.6	71.3	74.0	15.2	10.4
P4	13.5	20.5	76.2	78.7	15.2	10.4
P5	1.5	20.7	88.4	96.4	15.3	10.5
P5	6.8	20.6	66.6	69.1	15.3	10.5
P5	10.2	20.6	72.1	74.8	15.2	10.4
P5	13.5	20.5	78.7	81.2	15.2	10.4
P6	1.5	20.6	83.1	86.4	15.3	10.5
P6	6.8	20.6	70.1	73.9	15.2	10.4
P6	10.2	20.6	79.9	83.9	15.2	10.4
P6	13.5	20.5	90.0	92.2	15.2	10.4
P7	1.5	20.6	65.8	68.9	15.2	10.4
P7	6.8	20.6	71.5	75.4	15.2	10.4
P7	10.2	20.6	80.7	83.3	15.2	10.4
P7	13.5	20.5	88.7	93.0	15.2	10.4
P8	1.5	20.6	69.1	72.6	15.2	10.4
P8	6.8	20.6	75.5	79.6	15.2	10.4

P8	10.2	20.5	85.5	89.4	15.2	10.4
P8	13.5	20.5	97.2	101.4	15.2	10.4
P9	1.5	20.6	74.1	77.7	15.2	10.4
P9	6.8	20.6	86.3	91.1	15.2	10.4
P9	10.2	20.6	103.8	110.1	15.2	10.4
P9	13.5	20.5	120.4	124.2	15.2	10.4
P9	16.9	20.5	129.4	131.7	15.2	10.4
P9	20.3	20.4	134.4	135.2	15.2	10.4
P9	27.4	20.3	118.7	118.4	15.2	10.4
P10	1.5	20.7	92.0	108.5	15.2	10.5
P10	6.8	20.6	117.5	125.8	15.2	10.4
P10	10.2	20.6	161.7	170.4	15.2	10.4
P10	13.5	20.6	194.1	206.0	15.2	10.4
P10	16.9	20.5	205.9	212.8	15.2	10.4
P10	20.3	20.4	204.1	198.7	15.2	10.4
P10	27.4	20.3	169.6	164.0	15.2	10.4
P11	1.5	20.7	110.0	130.9	15.3	10.5
P11	6.8	20.7	160.6	175.1	15.2	10.5
P11	10.2	20.7	301.6	324.0	15.2	10.4
P11	13.5	20.6	389.9	400.8	15.2	10.4
P11	16.9	20.5	347.5	353.3	15.2	10.4
P11	20.3	20.4	290.7	270.7	15.2	10.4
P11	27.4	20.3	227.0	215.3	15.2	10.4
P12	1.5	20.7	110.0	130.9	15.3	10.5
P12	6.8	20.8	231.0	262.1	15.3	10.5
P12	10.2	20.8	553.9	611.0	15.2	10.5
P12	13.5	20.6	676.7	662.0	15.2	10.4
P12	16.9	20.5	588.2	555.5	15.2	10.4
P12	20.3	20.4	513.5	497.5	15.2	10.4
P12	27.4	20.3	252.5	212.2	15.2	10.4
P13	1.5	20.7	110.1	131.0	15.3	10.5
P13	6.8	20.9	355.0	410.2	15.3	10.5
P13	10.2	20.9	1005.2	1135.0	15.3	10.5
P13	13.5	20.7	1085.5	1174.6	15.2	10.4
P13	16.9	20.5	883.9	918.0	15.2	10.4
P13	20.3	20.5	753.4	702.4	15.2	10.4
P13	23.7	20.4	445.6	361.2	15.2	10.4
P13	27.4	20.3	257.9	232.7	15.2	10.4
P14 [d]	1.5	n/a	95.7	111.6	n/a	n/a

P14	6.8	20.8	348.8	407.1	15.3	10.5
P14	10.2	20.9	965.2	1094.5	15.3	10.5
P14	13.5	20.7	1063.2	1170.5	15.2	10.4
P14	16.9	20.6	948.9	1021.3	15.2	10.4
P14	20.3	20.5	816.6	762.7	15.2	10.4
P14	23.7	20.4	515.5	420.3	15.2	10.4
P14	27.4	20.3	230.7	203.3	15.2	10.4
P15 [d]	1.5	n/a	95.7	111.6	n/a	n/a
P15	6.8	20.8	251.7	288.6	15.3	10.5
P15	10.2	20.8	615.0	684.3	15.3	10.5
P15	13.5	20.7	748.4	730.8	15.2	10.4
P15	16.9	20.6	680.3	640.9	15.2	10.4
P15	20.3	20.5	604.3	593.9	15.2	10.4
P15	23.7	20.4	470.6	429.3	15.2	10.4
P15	27.4	20.3	281.1	231.1	15.2	10.4
P16 [d]	1.5	n/a	88.6	96.5	n/a	n/a
P16	6.8	20.7	160.6	181.1	15.3	10.5
P16	10.2	20.7	298.1	324.7	15.2	10.5
P16	13.5	20.6	385.8	401.1	15.2	10.4
P16	16.9	20.5	358.1	363.7	15.2	10.4
P16	20.3	20.5	298.5	301.4	15.2	10.4
P16	23.7	20.4	288.2	287.7	15.2	10.4
P16	27.4	20.3	251.5	232.4	15.2	10.4
P17 [d]	1.5	n/a	83.2	86.5	n/a	n/a
P17	6.8	20.7	108.8	118.2	15.3	10.5
P17	10.2	20.6	150.1	158.8	15.2	10.4
P17	13.5	20.6	181.2	193.6	15.2	10.4
P17	16.9	20.5	193.8	190.3	15.2	10.4
P17	20.3	20.4	186.5	184.5	15.2	10.4
P17	23.7	20.4	162.7	156.0	15.2	10.4
P17	27.4	20.3	149.6	148.2	15.2	10.4
P18 [d]	1.5	n/a	73.6	77.0	n/a	n/a
P18	6.8	20.6	86.6	93.4	15.2	10.4
P18	10.2	20.6	108.6	113.5	15.2	10.4
P18	13.5	20.5	125.3	132.1	15.2	10.4
P18	16.9	20.5	137.9	138.8	15.2	10.4
P19 [d]	1.5	n/a	87.3	97.1	n/a	n/a
P19	6.8	20.7	77.0	81.4	15.3	10.5
P19	10.2	20.6	94.6	99.6	15.2	10.4

P19	13.5	20.6	109.8	114.2	15.2	10.4
P20 [d]	1.5	n/a	95.8	111.6	n/a	n/a
P21 [d]	1.5	n/a	89.4	103.5	n/a	n/a
P21	6.8	20.8	106.6	114.9	15.3	10.5
P21	10.9	20.7	175.0	186.0	15.3	10.5
P21	14.3	20.6	207.6	217.4	15.2	10.4
P21	17.7	20.5	205.0	209.4	15.2	10.4
P21	21.1	20.4	194.9	187.1	15.2	10.4
P21	24.4	20.4	182.1	181.2	15.2	10.4
P22 [d]	1.5	n/a	91.2	97.9	n/a	n/a
P22	6.8	20.8	161.3	176.3	15.3	10.5
P22	10.9	20.7	260.1	282.2	15.3	10.5
P22	14.3	20.6	327.0	339.8	15.2	10.4
P22	17.7	20.5	315.3	315.7	15.2	10.4
P22	21.1	20.4	274.8	257.3	15.2	10.4
P22	24.4	20.4	228.4	224.6	15.2	10.4
P23 [d]	1.5	n/a	87.6	92.9	n/a	n/a
P23	6.8	20.9	119.0	129.0	15.3	10.5
P23	10.2	20.8	179.0	199.8	15.3	10.5
P23	13.5	20.7	231.9	232.4	15.3	10.5
P23	16.9	20.6	223.4	226.6	15.2	10.4
P23	20.3	20.5	218.2	212.8	15.2	10.4
P23	23.7	20.4	186.7	183.2	15.2	10.4
P23	27.4	20.3	170.6	163.3	15.2	10.4
P24 [d]	1.5	n/a	73.3	76.9	n/a	n/a
P24	6.8	21.1	77.0	83.0	15.4	10.5
P24	10.2	20.9	97.2	104.6	15.3	10.5
P24	13.5	20.7	116.0	119.9	15.3	10.5
P24	16.9	20.5	116.6	115.6	15.2	10.4
P24	20.3	20.5	109.5	112.1	15.2	10.4
P24	23.7	20.4	109.2	108.1	15.2	10.4
P24	27.4	20.3	99.4	95.5	15.2	10.4
P25 [d]	1.5	n/a	67.0	69.9	n/a	n/a
P25	6.8	21.2	65.5	68.8	15.4	10.6
P25	10.2	20.8	71.3	75.1	15.3	10.5
P25	13.5	20.7	79.3	82.0	15.2	10.4
P25	16.9	20.5	81.9	82.2	15.2	10.4
P25	20.3	20.4	79.0	79.4	15.2	10.4
P25	23.7	20.4	79.4	80.0	15.2	10.4

P25	27.4	20.3	78.0	77.1	15.1	10.4
P26 [d]	1.5	n/a	67.3	69.9	n/a	n/a
P26	3.2	22.4	65.8	68.7	15.9	10.8
P26	6.8	21.2	64.9	68.1	15.4	10.6
P26	10.9	20.8	74.7	78.3	15.3	10.5
P26	14.3	20.6	82.0	84.2	15.2	10.4
P27	1.5	23.2	66.5	68.9	16.1	11.0
P27	3.2	22.4	65.1	67.4	15.9	10.8
P27	6.8	21.2	63.4	66.7	15.4	10.5
P27	10.9	20.7	72.4	75.6	15.3	10.5
P27	14.3	20.6	78.9	80.9	15.2	10.4
P28	1.5	23.0	64.6	67.0	16.1	10.9
P28	3.2	22.3	63.4	65.9	15.8	10.8
P28	6.8	21.1	62.2	65.2	15.4	10.5
Objective / Criterion	**-**	**40**	**200**	**200**	**32 [b]**	**25 [c]**

[a] Calculated by adding the 100th percentile of 1-hour mean nitrogen dioxide process contributions from the emergency plant to two times the predicted annual mean concentration at each receptor (including the contribution of road traffic emissions), which is common practice.

[b] While the annual mean PM_{10} objective is 40 µg/m^3, 32 µg/m^3 is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible, as outlined in LAQM.TG16 (Defra, 2018b). A value of 32 µg/m^3 is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM_{10} objective, as recommended in EPUK & IAQM guidance (Moorcroft and Barrowcliffe et al, 2017).

[c] The $PM_{2.5}$ objective, which is to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

[d] The annual mean objectives do not apply for these heights

A9 'Air Quality Neutral'

A9.1 The GLA's SPG on Sustainable Design and Construction (GLA, 2014a), and its accompanying Air Quality Neutral methodology report (AQC, 2014), provide an approach to assessing whether a development is air quality neutral. The approach is to compare the expected emissions from the building energy use and the car use associated with the proposed development against defined emissions benchmarks for buildings and transport in London.

A9.2 The benchmarks for heating and energy plant (termed 'Building Emissions Benchmarks' or 'BEBs') are set out in Table A9.1, while the 'Transport Emissions Benchmarks' ('TEBs') are set out in Table A9.2. In order to assess against the TEBs, it is necessary to combine the expected trip generation from the development with estimates of average trip length and average emission per vehicle. So as to ensure a consistent methodology, the report which accompanies the SPG (AQC, 2014) recommends that the information in Table A9.3 and Table A9.4 (upon which the TEBs are based) is used. Similarly, the information in Table A9.5 may be used if site-specific information are not available (AQC, 2014). For use classes other than A1, B1 and C3, trip lengths and average emissions per vehicle are not provided, thus the trip rates in Table A9.6 alone may be used to consider the air quality neutrality of a development. These have been derived from the Trip Rate Assessment Valid for London (TRAVL) database.

Table A9.1: Building Emissions Benchmarks (g/m^2 of Gross Internal Floor Area)

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

Table A9.2: Transport Emissions Benchmarks

Land use	CAZ [a]	Inner [b]	Outer [b]
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,C4)	40.7	100	267

[a] Central Activity Zone.

[b] Inner London and Outer London as defined in the LAEI (GLA, 2019b).

Table A9.3: Average Distance Travelled by Car per Trip

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

Table A9.4: Average Road Traffic Emission Factors in London in 2010

Pollutant	g/vehicle-km		
	CAZ	Inner	Outer
NOx	0.4224	0.370	0.353
PM_{10}	0.0733	0.0665	0.0606

Table A9.5: Average Emissions from Heating and Cooling Plant in Buildings in London in 2010

	Gas (kg/kWh)		Oil (kg/kWh)	
	NOx	PM_{10}	NOx	PM_{10}
Domestic	0.0000785	0.00000181	0.000369	0.000080
Industrial/Commercial	0.000194	0.00000314	0.000369	0.000080

Table A9.6: Average Number of Trips per Annum for Different Development Categories

Land use	Number of Trips (trips/m^2/annum)		
	CAZ	Inner	Outer
A1	43	100	131
A3	153	137	170
A4	2.0	8.0	-
A5	-	32.4	590
B1	1	4	18
B2	-	15.6	18.3
B8	-	5.5	6.5
C1	1.9	5.0	6.9
C2	-	3.8	19.5
D1	0.07	65.1	46.1
D2	5.0	22.5	49.0
Number of Trips (trips/dwelling/annum)			
C3	129	407	386

A10 Construction Mitigation

A10.1 The following is a set of best-practice measures from the GLA guidance (GLA, 2014b) that should be incorporated into the specification for the works. These measures should be written into a Dust Management Plan. Some of the measures may only be necessary during specific phases of work, or during activities with a high potential to produce dust, and the list should be refined and expanded upon in liaison with the construction contractor when producing the Dust Management Plan.

Site Management

- develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- develop a Dust Management Plan (DMP);
- display the name and contact details of person(s) accountable for air quality pollutant emissions and dust issues on the site boundary;
- display the head or regional office contact information;
- record and respond to all dust and air quality pollutant emissions complaints;
- make a complaints log available to the local authority when asked;
- carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the Local Authority when asked;
- increase the frequency of site inspections by those accountable for dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions are being carried out and during prolonged dry or windy conditions;
- record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and ensure that the action taken to resolve the situation is recorded in the log book; and
- hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.

Preparing and Maintaining the Site

- Plan the site layout so that machinery and dust-causing activities are located away from receptors, as far as is possible;
- erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;

- fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;
- install green walls, screens or other green infrastructure to minimise the impact of dust and pollution;
- avoid site runoff of water or mud;
- keep site fencing, barriers and scaffolding clean using wet methods;
- remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below;
- cover, seed, or fence stockpiles to prevent wind whipping;
- carry out regular dust soiling checks of buildings within 100 m of site boundary and provide cleaning if necessary;
- provide showers and ensure a change of shoes and clothes are required before going off-site to reduce transport of dust;
- put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly;
- agree monitoring locations with the Local Authority; and
- where possible, commence baseline monitoring at least three months before work begins.

Operating Vehicle/Machinery and Sustainable Travel

- Ensure all on-road vehicles comply with the requirements of the London LEZ (and ULEZ);
- ensure all Non-road Mobile Machinery (NRMM) comply with the standards set within the GLA's Control of Dust and Emissions During Construction and Demolition SPG. This outlines that, from 1 September 2015, all NRMM of net power 37 kW to 560 kW used on the site of a major development in Greater London must meet Stage IIIA of EU Directive 97/68/EC (The European Parliament and the Council of the European Union, 1997) and its subsequent amendments as a minimum. From 1 September 2020 NRMM used on any site within Greater London will be required to meet Stage IIIB of the Directive as a minimum.
- ensure all vehicles switch off engines when stationary – no idling vehicles;
- avoid the use of diesel- or petrol-powered generators and use mains electricity or battery-powered equipment where practicable;
- impose and signpost a maximum-speed-limit of 10 mph on surfaced haul routes and work areas (if long haul routes are required these speeds may be increased with suitable

additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the Local Authority, where appropriate);

- produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials; and
- implement a Travel Plan that supports and encourages sustainable staff travel (public transport, cycling, walking, and car-sharing).

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using recycled water where possible and appropriate;
- use enclosed chutes, conveyors and covered skips;
- minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; and
- ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Reuse and recycle waste to reduce dust from waste materials; and
- avoid bonfires and burning of waste materials.

Measures Specific to 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);
- ensure water suppression is used during demolition operations;
- avoid explosive blasting, using appropriate manual or mechanical alternatives; and
- bag and remove any biological debris or damp down such material before demolition.

Measures Specific to Earthworks

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

- use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable; and
- only remove the cover from small areas during work, not all at once.

Measures Specific to Construction

- Avoid scabbling (roughening of concrete surfaces), if possible;
- ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- 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 smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

Measures Specific to Trackout

- Regularly use a water-assisted dust sweeper on the access and local roads, as necessary, to remove any material tracked out of the site;
- avoid dry sweeping of large areas;
- ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- access gates should be located at least 10 m from receptors, where possible; and
- apply dust suppressants to locations where a large volume of vehicles enter and exit the construction site.