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Air Quality Appendices:
Elephant Park H1 Development

February 2021

Experts in air quality
management & assessment

Document Control

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8.1 Legislative and Planning Policy Context

8.1.1 All European legislation referred to in this report is written into UK law and will remains in place, although there is uncertainty at this point in time as to who will enforce the requirements of some of this legislation.

Air Quality Strategy

8.1.2 The Air Quality Strategy[1] 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.

Clean Air Strategy 2019

8.1.3 The Clean Air Strategy[2] 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

8.1.4 The Office for Low Emission Vehicles (OLEV) and Department for Transport (DfT) published a Policy Paper[3] 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

[1] Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Defra.

[2] Defra (2019) Clean Air Strategy 2019, Available: https://www.gov.uk/government/publications/clean-air-strategy-2019.

[3] DfT (2018) The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy.

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.

8.1.5 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 that the phase-out date for the sale of new petrol and diesel cars and vans will be brought forward to 2030 and that all new cars and vans must be fully zero emission at the tailpipe from 2035. 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

8.1.6 The National Planning Policy Framework (NPPF)[4] 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 (Paragraph 8c) 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".

8.1.7 To prevent unacceptable risks from air pollution, Paragraph 170 of 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".

8.1.8 Paragraph 180 states:

"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".

[4] Ministry of Housing, Communities & Local Government (2019) National Planning Policy Framework, Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/779764/NPPF_Feb_2019_web.pdf.

8.1.9 More specifically on air quality, Paragraph 180 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".

8.1.10 The NPPF is supported by Planning Practice Guidance (PPG)[5], 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".

8.1.11 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".

8.1.12 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 *"Odour and dust can also be a planning concern, for example, because of the effect on local amenity"*.

8.1.13 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".

[5] Ministry of Housing, Communities & Local Government (2019b) Planning Practice Guidance, Available: https://www.gov.uk/government/collections/planning-practice-guidance

8.1.14 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".

8.1.15 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

8.1.16 The key London-specific policies are summarised below.

The London Plan

8.1.17 The London Plan[6] sets out the spatial development strategy for London over the next 20 – 25 year and promotes the fundamental objective of accommodating London's population and economic growth through sustainable development.

8.1.18 The key policy relating to air quality is Policy SI1 on Improving air quality, Part B1 of which sets out three key requirements for developments:

"Development proposals should not:

a) lead to further deterioration of existing poor air quality

b) create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits

c) create unacceptable risk of high levels of exposure to poor air quality".

8.1.19 The Policy then details how developments should meet these requirements, stating:

"In order to meet the requirements in Part 1, as a minimum:

a) development proposals must be at least Air Quality Neutral

[6] GLA. (2021). The London Plan: The Spatial Development Strategy for Greater London. Retrieved from https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf

b) development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality in preference to post-design or retro-fitted mitigation measures

c) major development proposals must be submitted with an Air Quality Assessment. Air quality assessments should show how the development will meet the requirements of B1

d) development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people should demonstrate that design measures have been used to minimise exposure".

8.1.20 Part C of the Policy introduces the concept of Air Quality Positive for large-scale development, stating:

"Masterplans and development briefs for large-scale development proposals subject to an Environmental Impact Assessment should consider how local air quality can be improved across the area of the proposal as part of an air quality positive approach. To achieve this a statement should be submitted demonstrating:

1) how proposals have considered ways to maximise benefits to local air quality, and

2) what measures or design features will be put in place to reduce exposure to pollution, and how they will achieve this."

8.1.21 Regarding construction and demolition impacts, Part D of Policy SI1 of the London Plan states:

"In order to reduce the impact on air quality during the construction and demolition phase development proposals must demonstrate how they plan to comply with the Non-Road Mobile Machinery Low Emission Zone and reduce emissions from the demolition and construction of buildings following best practice guidance".

8.1.22 Part E of Policy SI1 states the following regarding mitigation and offsetting of emissions:

"Development proposals should ensure that where emissions need to be reduced to meet the requirements of Air Quality Neutral or to make the impact of development on local air quality acceptable, this is done on-site. Where it can be demonstrated that emissions cannot be further reduced by on-site measures, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated within the area affected by the development".

8.1.23 The explanatory text around Policy SI1 of the London Plan states the following with regard to assessment criteria:

"The Mayor is committed to making air quality in London the best of any major world city, which means not only achieving compliance with legal limits for Nitrogen Dioxide as soon as possible and

maintaining compliance where it is already achieved, but also achieving World Health Organisation targets for other pollutants such as Particulate Matter.

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

Where this policy refers to 'existing poor air quality' this should be taken to include areas where legal limits for any pollutant, or World Health Organisation targets for Particulate Matter, are already exceeded and areas where current pollution levels are within 5 per cent of these limits".

London Environment Strategy

8.1.24 The London Environment Strategy was published in May 2018[7]. 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

8.1.25 The Mayor's Transport Strategy[8] 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".*

Low Emission Zone (LEZ)

8.1.26 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

[7] GLA. (2018). London Environment Strategy. Retrieved from https://www.london.gov.uk/what-we-do/environment/london-environment-strategy

[8] GLA (2018) Mayor's Transport Strategy

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.

8.1.27 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, although this was delayed to 1 March 2021 to give affected businesses more time to meet the new standards in light of the unanticipated demands of the coronavirus pandemic. Requirements relating to larger vans, minibuses and other specialist diesel vehicles will not change.

Ultra Low Emission Zone (ULEZ)

8.1.28 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.

8.1.29 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 for light vehicles. The ULEZ will not include any requirements relating to heavy vehicle emissions beyond 1 March 2021, as these will be addressed by the amendments to the LEZ described above.

Other Measures

8.1.30 Since 2018, all taxis presented for licencing for the first time had to be zero emission capable (ZEC). This means they must be able to travel a certain distance in a mode which produces no air pollutants, and all private hire vehicles (PHVs) presented for licensing for the first time had to meet Euro 6 emissions standards. Since January 2020, all newly manufactured PHVs presented for licensing for the first time had to 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.

8.1.31 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%).

GLA SPG: Sustainable Design and Construction

8.1.32 The GLA's SPG on Sustainable Design and Construction[9] 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' should be implemented.

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

8.1.33 The GLA's SPG on The Control of Dust and Emissions During Construction and Demolition[10] 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 IAQM's guidance[11], and it states that "*the latest version of the IAQM Guidance should be used*".

Air Quality Focus Areas

8.1.34 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 proposed development is located within the Elephant and Castle to St George's Circus and Kennington Lane air quality Focus Area.

Local Transport Plan

8.1.1 The Southwark Transport Plan identified how the LBS will improve travel to, within and from the borough. One of the plan's eight transport objectives is to "*reduce the impact of transport on the environment*"; the plan states that "*To improve the borough's air quality, we will encourage the take*

[9] GLA (2014) Sustainable Design and Construction Supplementary Planning Guidance

[10] GLA (2014) The Control of Dust and Emissions from Construction and Demolition SPG

[11] IAQM (2016) Guidance on the Assessment of Dust from Demolition and Construction v1.1

up of sustainable travel and reduced reliance on private vehicles. We will consult on introducing emission based parking permits and continue to support the take up of new technologies including lower emission vehicles…".

8.1.2 Additionally, the Southwark Movement Plan[12] sets out how LBS aims to improve peoples' experience of travel to, within and around the borough through nine specific missions and actions. Action 15 of the plan specifically targets a reduction in exposure to air pollution.

Local Policies

8.1.3 The Local Plan currently comprises the Core Strategy and the Saved Southwark Plan policies[13]. The Core Strategy[14] includes two policies that are directly relevant to air quality:

- Strategic Policy 13 'High Environmental Standards' states that "*Development will help us live and work in a way that respects the limits of the planet's natural resources, reduces pollution and damage to the environment… We will do this by…Setting high standards and supporting measures for reducing air…pollution and avoiding amenity and environmental problems that affect how we enjoy the environment in which we live and work…*"; and
- Strategic Policy 2 'Sustainable Transport' states that "*We will encourage walking, cycling and the use of public transport rather than travel by car. This will help create safe, attractive, vibrant and healthy places for people to live and work by reducing…pollution…*".

8.1.4 The Saved Southwark Plan Policies[15] include four policies that are directly relevant to air quality:

- Policy 1.7 'Development within town and local centres' states that "*Within the centres the LPA [Local Planning Authority] will permit developments providing a range of uses, including retail and services, leisure, entertainment and community, civic, cultural and tourism, residential and employment (Class B) uses, where the following criteria are met…the road network has sufficient capacity to take any additional servicing traffic generated by the proposal without causing adverse effects on…air quality…*";
- Policy 3.6 'Air Quality' states that "*Planning permission will not be granted for development that would lead to a reduction in air quality*"; and

[12] Southwark Council (2019). Movement Plan.

[13] Southwark Council. (2007). Saved Southwark Plan Policies, Available: https://www.southwark.gov.uk/planning-and-building-control/planning-policy-and-transport-policy/development-plan/local-plan

[14] Southwark Council. (2011). Core Strategy, Available: https://www.southwark.gov.uk/planning-and-building-control/planning-policy-and-transport-policy/development-plan/local-plan.

[15] Southwark Council. (2007). Saved Southwark Plan Policies, Available: https://www.southwark.gov.uk/planning-and-building-control/planning-policy-and-transport-policy/development-plan/local-plan

- Policy 4.2 'Quality of Residential Accommodation' states that "*Planning permission will be granted for residential development, including dwellings within mixed-use schemes, provided that they…include high standards of…protection from pollution…*";
- Policy 5.2 'Transport Impacts' states that "*Planning permission will be granted for development unless…there is an adverse impact on transport networks for example through significant increases in transport or pollution…*".

8.1.5 The LBS is currently in the process of developing a new Local Plan to replace the Core Strategy and the saved Southwark Plan policies. The proposed submission version of the New Southwark Plan (NSP)[16] includes four policies that are directly relevant to this assessment:

- SP6 'Cleaner, greener, safer' states that "*We will lead the way in making people feel safe, creating cleaner streets…This will be achieved through…improving …air quality*";
- P45 states that "*Development should be permitted when it does not cause an unacceptable loss of amenity to present or future occupiers or users*";
- P60 'Trees' states that "*The selection and position of trees should improve air quality…*";
- P66 'Improving air quality' states that "*Development must:*
    - *Achieve or exceed air quality neutral standards; and*
    - *Address the impacts of poor air quality on building occupiers and public realm users by reducing exposure to and mitigating the effects of poor air quality. This must be achieved through design solutions that include:*
        - *Orientation and layout of buildings, taking into account vulnerable building occupiers, and public realm and amenity space users; and*
        - *Ventilation systems; and*
        - *Urban greening appropriate for providing air quality benefits proportionate to the scale of the development;*
        - *'Ultra low' NOx boilers where the development is not connected to a decentralised energy network; or*
        - *Appropriate abatement technologies to bring emissions within the equivalent of 'ultra low' NOx boiler emissions levels where decentralised energy networks are implemented or utilised.*
    - *Where air quality neutral standards are not met for buildings or transport, measures to offset any shortfall will be required, according to the following hierarchy:*

[16] Southwark Council. (2017). New Southwark Plan; Proposed Submission Version.

- *i. On-site measures; then*
- *ii. Off-site measures; then;*
- *iii. Financial contributions to provide measures*".

8.1.6 The LBS has developed two Supplementary Planning Documents (SPDs) that are relevant to air quality; the Sustainable Design and Construction SPD[17] and the Draft Bankside, Borough and London Bridge SPD[18]. The Sustainable Design and Construction SPD provides guidance on how new development should be designed and built so that it has a positive impact on the environment. It considers air quality impacts in relation to building design, materials and mechanical systems, emissions from boiler systems and construction activity. It addresses these points by stating:

- "*Development should maximise the use of passive design features that provide natural background ventilation…*";
- "*Mechanical systems should only be used as a compliment to natural ventilation to ensure a constant standard of indoor air quality…Where mechanical systems are used, careful consideration will need to be given to ensure air intakes are positioned appropriately.*";
- "*Low NOx burners should be used*";
- "*Fuels and technology chosen for CHP and other energy systems should be of a high quality resulting in low air pollution. If bio-fuels are to be used, the preference is for biogases, such as methane and hydrogen and alcohol, or for systems that use a gasification process. Generally, large-scale community CHP systems are preferred as these are likely to be less polluting than the combined impact of individual boilers*";
- "*As a last resort, technical measures such as filters may be required to keep polluting emissions at an acceptable level.*";
- "*Polluting emissions from energy systems must not exceed the legal limits. A permit from the Environment Agency may be required. You may also need to get approval from the council's Environmental Protection Team to burn permitted fuels*";
- "*Construction sites should be carefully managed and maintained to…control dust…emissions…causing nuisance to surrounding properties. The type of machinery used, hours that construction occurs and the times that deliveries are made should be carefully managed so as to reduce impact*"; and
- "*Planning conditions will be used to control impacts from the construction of new development. This may include restrictions on hours of operation and construction.*".

[17] Southwark Council. (2009). Sustainable Design and Construction: Supplementary Planning Document

[18] Southwark Council. (2010). Bankside, Borough and London Bridge; Draft Supplementary Planning Document and Opportunity Area Planning Framework.

8.1.7 The Draft Bankside, Borough and London Bridge SPD was put on hold in 2011. The draft document includes the following guidelines for development that are relevant to the Proposed Development in terms of air quality:

- "*All development should:*
  - *…Avoid polluting or damaging the ecology of the River Thames…*
  - *Explore opportunities to link into and develop local energy networks…"*

8.1.8 The LBS has also developed a guidance document for demolition and construction activities within the borough; the Technical Guidance for Demolition and Construction SPD[19] was adopted by the Council in September 2016. The document identifies a number of impacts associated with demolition and construction activities (including air pollution), and sets out measures expected to be employed by developers and contractors undertaking demolition and construction works within LBS. In terms of dust control, the document makes reference to the GLA's SPG, the IAQM 'Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction sites' and the IAQM's document for the 'Assessment of Dust from Demolition and Construction', and outlines a number of dust control measures. The document also requires the following:

- all major developments in Southwark are considered 'high risk'. The highest level of dust control, including continuous monitoring of dust deposition, will be required to be employed at all times;
- continuous dust monitoring on all major sites in Southwark. In the absence of any other national control limit, the IAQM's recommended site action levels are to be adopted;
- Non Road Mobile Machinery (NRMM) used on the site of any major development within Greater London will be required to meet Stage IIIA of EU Directive 97/68/EC as a minimum; and
- all Light Goods Vehicles (LDVs) and Heavy Duty Vehicles (HDVs) servicing sites must meet emission criteria Euro 6 / Euro VI.

[19] Southwark Council. (2016). London Borough of Southwark Technical Guidance for Demolition and Construction, Available: https://www.southwark.gov.uk/environment/environmental-protection/construction

Air Quality Action Plans

National Air Quality Plan

8.1.9 Defra has produced an Air Quality Plan to tackle roadside nitrogen dioxide concentrations in the UK[20]; a supplement to the 2017 Plan[21] 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

8.1.10 The LBS has declared an AQMA (Southwark AQMA) as a result of exceedances of the annual mean nitrogen dioxide objective and the 24-hour mean PM_{10} objective. Southwark AQMA encompasses the entire northern part of the borough, extending from Rotherhithe to Walworth and Camberwell and up to the boundary on the River Thames, and the Proposed Development lies within this area. The LBS has since developed an Air Quality Strategy and Action Plan[22]; this plan outlines actions that the LBS will undertake to improve air quality.

[20] Defra (2017) Air quality plan for nitrogen dioxide (NO2) in the UK

[21] Defra (2018) Supplement to the UK plan for tackling roadside nitrogen dioxide concentrations

[22] Southwark Council. (2017). Air Quality Strategy and Action Plan.

8.2 EPUK & IAQM Planning for Air Quality Guidance

8.2.1 The guidance issued by EPUK and IAQM[23] 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

8.2.2 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".

8.2.3 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.

8.2.4 The good practice principles are that:

[23] Moorcroft and Barrowcliffe et al (2017) Land-Use Planning & Development Control: Planning For Air Quality v1.2, IAQM, London, Available: http://iaqm.co.uk/guidance/.

- 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.

8.2.5 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".

8.2.6 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

8.2.7 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.

8.2.8 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.

8.2.9 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.

8.2.10 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.

8.2.11 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".

8.2.12 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".

8.2.13 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".

8.2.14 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.

Assessment of Significance

8.2.15 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.

8.2.16 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.

8.2.17 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.

8.2.18 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 Appendix 8.3.

8.3 Professional Experience

Laurence Caird, MEarthSci CSci MIEnvSc MIAQM

Mr Caird is an Associate Director with AQC, with 15 years' experience in the field of air quality including the detailed assessment of emissions from road traffic, airports, heating and energy plant, and a wide range of industrial sources including the thermal treatment of waste. He has experience in ambient air quality monitoring for numerous pollutants using a wide range of techniques and is also competent in the monitoring and assessment of nuisance odours and dust. Mr Caird has worked with a variety of clients to provide expert air quality services and advice, including local authorities, planners, developers and process operators. He is a Member of the Institute of Air Quality Management and is a Chartered Scientist.

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. He is a Member of the Institution of Environmental Sciences and of the Institute of Air Quality Management, and a Practitioner of the Institute of Environmental Management and Assessment.

Jack Buckley, BSc (Hons) MSc AMIEnvSc AMIAQM

Mr Buckley is a Consultant with AQC with three years' experience in the field of air quality. Prior to joining AQC in June 2019, he worked as a Consultant at Capita, where he gained experience in the assessment of air quality impacts for a range of projects, including road and rail infrastructure schemes, residential developments and industrial facilities sizes. He has experience in producing air quality assessments for EIA schemes, using qualitative and quantitative methods, including ADMS-Roads and air quality neutral calculations, and has undertaken diffusion tube monitoring studies. Prior to joining Capita, Jack completed a BSc (Hons) in Chemistry and an MSc in Environmental Science and Management, with both dissertations investigating the performance of low-cost air quality sensors. He is an Associate Member of both the Institute of Air Quality Management and the Institution of Environmental Sciences.

8.4 Modelling Methodology

Road Traffic

Model Inputs

8.4.1 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 10.0) published by Defra[24]. Model input parameters are summarised in Table A4.1 and, where considered necessary, discussed further below.

Table A4.1: Summary of Model Inputs

Model Parameter	Value Used
Terrain Effects Modelled?	No
Variable Surface Roughness File Used?	No
Urban Canopy Flow Used?	Yes
Advanced Street Canyons Modelled?	No
Noise Barriers Modelled?	No
Meteorological Monitoring Site	Heathrow
Meteorological Data Year	2019
Dispersion Site Surface Roughness Length (m)	1
Dispersion Site Minimum MO Length (m)	100
Met Site Surface Roughness Length (m)	0.2
Met Site Minimum MO Length (m)	30
Gradients?	No

8.4.2 AADT flows, diurnal flow profiles, speeds, and vehicle fleet composition data have been provided by Buro Happold, who have undertaken the transport assessment work for the proposed development. Traffic speeds have been based on those presented in the LAEI, with some having been adjusted 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 A4.2. Diurnal and monthly flow profiles for the traffic have been derived from the national profiles published by DfT.

[24] Defra (2021) Local Air Quality Management (LAQM) Support Website, Available: http://laqm.defra.gov.uk/.

Table A4.2: Summary of Traffic Data used in the Assessment (AADT Flows)

Road Link	2019		2026 (Without Scheme)		2026 (With Scheme)	
	AADT	%HDV	AADT	%HDV	AADT	%HDV
St George's Road	10,970	14.1	11,079	14.0	11,103	14.1
London Road	11,492	42.1	11,560	41.8	11,583	41.8
Newington Causeway	13,125	23.8	13,353	23.5	13,373	23.5
Meadow Row	2,111	16.7	2,119	16.7	2,119	16.7
Falmouth Road	859	8.2	859	8.2	859	8.2
Harper Road	3,216	30.3	3,216	30.3	3,216	30.3
Rodney Road (North of Balfour Street)	6,329	25.8	6,537	25.1	6,572	25.1
Rodney Road (South of Balfour Street)	8,759	24.1	8,967	23.6	9,001	23.6
Munton Road	2,224	8.3	2,224	8.3	2,224	8.3
Rodney Place	1,501	6.5	1,636	5.1	1,649	5.2
Balfour Street	950	17.0	950	17.0	950	17.0
Walworth Road (North of Heygate Street)	15,647	28.8	16,093	28.0	16,196	28.0
Walworth Road (South of Heygate Street)	11,724	17.2	11,887	17.0	11,935	17.0
Heygate Street	6,231	16.7	6,747	15.4	6,795	15.5
Steedman Street	1,512	6.8	1,512	6.8	1,512	6.8
Hampton Street	875	17.5	875	17.5	875	17.5
Kennington Park Road	23,669	6.7	23,794	6.7	23,812	6.7
Kennington Lane	16,615	5.1	16,740	5.1	16,758	5.1
Newington Butts	35,188	7.5	35,437	7.4	35,475	7.4
Elephant and Castle	37,306	15.1	37,581	15.0	37,654	15.0
New Kent Road (West of Elephant Road)	33,289	10.6	33,478	10.5	33,512	10.5
New Kent Road (West of Rodney Place)	33,289	10.6	33,554	10.5	33,587	10.5
Wadding Street	2,992	10.0	2,992	10.0	2,992	10.0
Stead Street	2,862	8.4	2,862	8.4	2,862	8.4
New Kent Road (west of A2)	33,289	10.6	33,414	10.6	33,434	10.6
Old Kent Road (north of Mandela Way)	37,487	9.9	37,619	9.9	37,626	9.9
Tower Bridge Road	25,085	5.7	25,148	5.7	25,155	5.7
Great Dover Street	13,247	6.3	13,292	6.3	13,299	6.3
Elephant Road	1,552	6.2	1,416	7.7	1,416	7.7
Walworth Road (North of Deacon Street)	15,647	28.8	16,093	28.0	16,203	27.9
Deacon Street	0	0.0	307	0.0	499	9.0
Sayer Street	0	0.0	307	0.0	322	0.0

8.4.3 Figure A4.1 shows the road network included within the model, along with the speed at which each link was modelled.

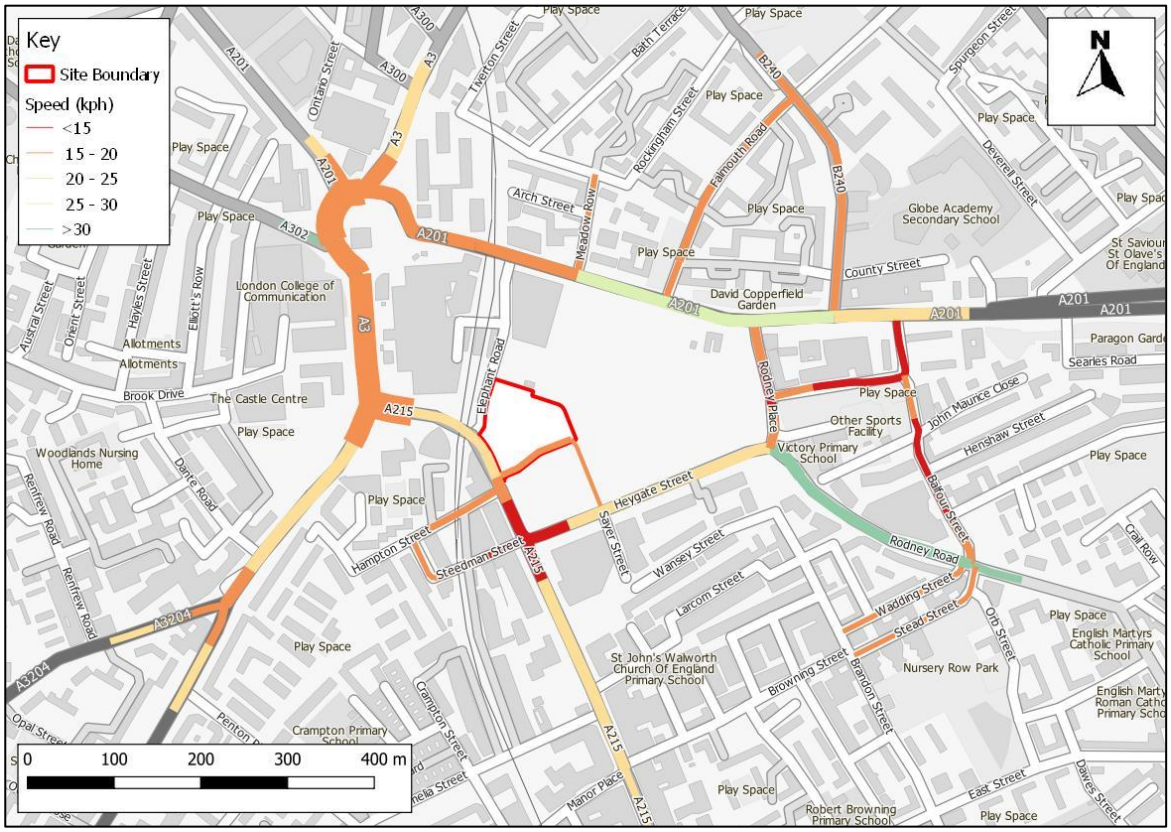

Figure A4.1: Modelled Road Network & Speed

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Model Verification

8.4.4 In order to ensure that ADMS-Roads accurately predicts local concentrations, it is necessary to verify the model against local measurements. The model has been run to predict the annual mean concentrations during 2019 at the SDT 38, 41, 104 and 111 diffusion tube monitoring sites. These sites have been selected because they all represent relevant roadside locations in the vicinity of the Site.

8.4.5 There are no nearby roadside 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.

8.4.6 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 ($NOx = NO + NO_2$).

8.4.7 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 8.1) available on the Defra LAQM Support website[25].

8.4.8 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 A4.2). The calculated adjustment factor of 3.024 has been applied to the modelled road-NOx concentration for each receptor to provide adjusted modelled road-NOx concentrations.

8.4.9 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 A4.3 compares final adjusted modelled total NO_2 at each of the monitoring sites to measured total NO_2, and shows a close agreement.

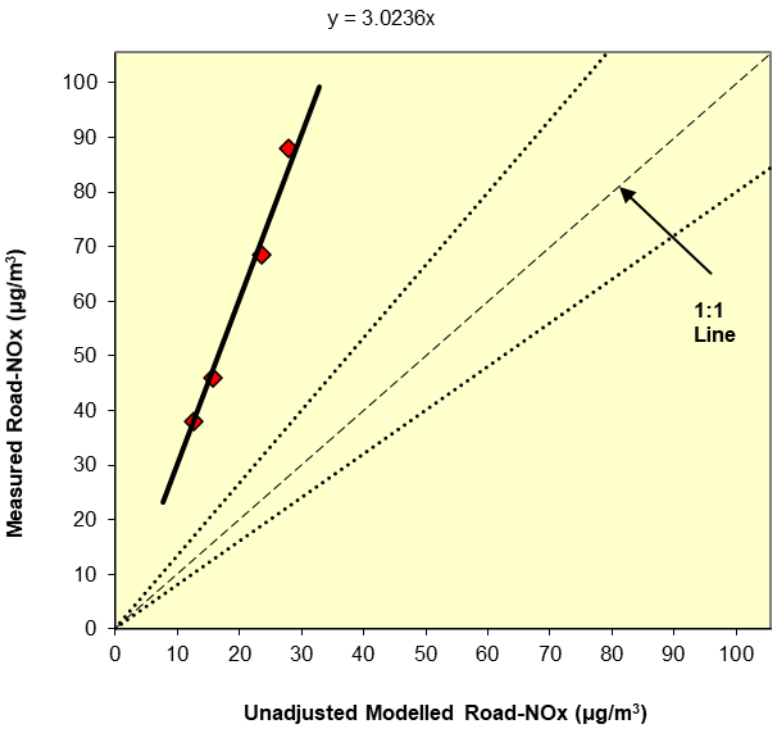

Figure A4.2: Comparison of Measured Road NOx to Unadjusted Modelled Road NOx Concentrations. The dashed lines show ± 25%.

[25] Defra (2018) Local Air Quality Management (LAQM) Support Website, Available: http://laqm.defra.gov.uk/.

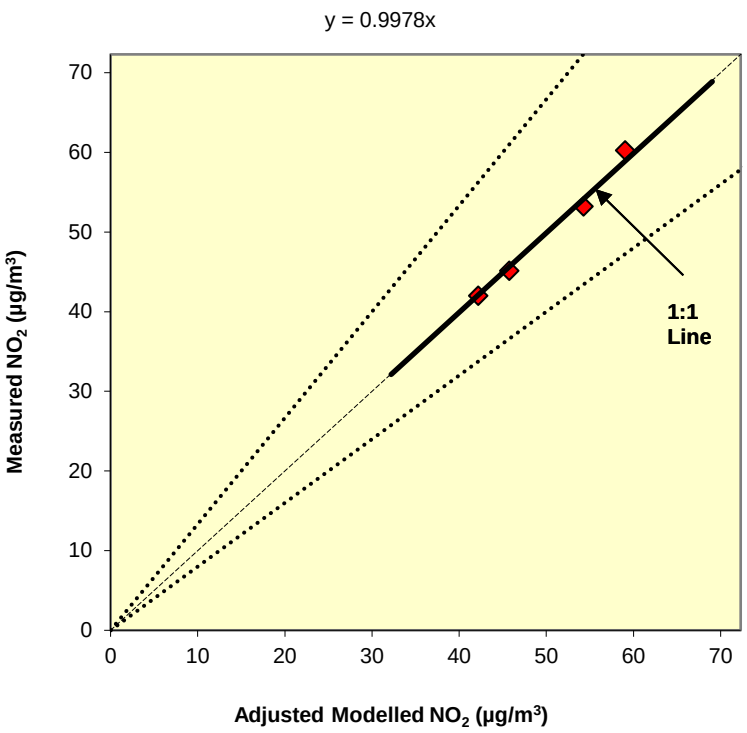

Figure A4.3: Comparison of Measured Total NO_2 to Final Adjusted Modelled Total NO_2 Concentrations. The dashed lines show ± 25%.

Post-processing

8.4.10 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. 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

Model Inputs

8.4.11 The impacts of emissions from the consented Energy Centre within the wider Masterplan Site on the 2026 future baseline concentrations 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 Energy Centre emissions to annual mean concentrations of nitrogen oxides. Model input selections, taken from the assessment carried out for the previous ES, are summarised in Table A4.3 and, where considered necessary, discussed further below. Input emission parameters are presented later in Table A4.4.

Table A4.3: Summary of Model Inputs

Model Parameter	Value Used
Terrain Effects Modelled?	No
Variable Surface Roughness File Used?	No
Urban Canopy Flow Used?	No
Building Downwash Effects Modelled?	Yes
Meteorological Monitoring Site	Heathrow
Meteorological Data Years	2017 – 2019
Dispersion Site Surface Roughness Length (m)	1
Dispersion Site Minimum MO Length (m)	100
Met Site Surface Roughness Length (m)	0.2
Met Site Surface Minimum MO Length (m)	30

8.4.12 The emissions from the CHPs and boilers have been combined in the model into a single flue; the emission parameters employed in the modelling are set out in Table A4.4.

Table A4.4: Plant Specifications and Modelled Emissions and Release Conditions

Parameter	Value
CHPs (per unit)	
Specified Net Fuel Input (kW)	891
Flue Internal Diameter (m)	0.4
Calculated Actual Exhaust Volume Flow (m^3/s)	1.38
Calculated Exit Velocity (m/s)	11.0
Specified Exhaust O_2 Content (%)	10.1
Specified Exhaust H_2O Content (% v/v)	10.4
Specified Exhaust Temperature (°C)	120
Calculated Normalised Exhaust Volume Flow (Nm^3/s)	0.57
Specified NOx Emission Rate (mg/Nm^3)	25
Calculated NOx Emission Rate (g/s)	0.014
Gas Boilers (per unit)	
Specified Flue Internal Diameter (m)	0.3
Calculated Actual Exhaust Volume Flow (m^3/s)	0.36
Calculated Exit Velocity (m/s)	5.1
Specified Exhaust O_2 Content (%)	4.2
Specified Exhaust H_2O Content (% v/v)	16.3
Specified Net Fuel Input (kW)	750
Specified NOx Emission Rate (mg/kWh)	37.9
Calculated NOx Emission Rate (g/s)	0.0079
Specified Exhaust Temperature (°C)	82

Calculated Combined Flue Emissions	
Flue Internal Diameter (m)	1.54596
Actual Exhaust Volume Flow (m^3/s)	11.04
Exit Velocity (m/s)	5.8814
NOx Emission Rate (g/s)	0.2097
Exhaust Temperature (°C)	90.79
Flue Location (x,y)	532423.03, 178801.73
Modelled Flue Height Above Ground (m)	21

Note: Orange highlighted cells contain the values entered into the model. The number of significant figures presented should not be taken to represent the accuracy of the information used.

8.4.13 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 also been obtained from the previous ES. The location of the flue is shown in Figure A4.4 along with the modelled buildings and their heights. The flue has been modelled at a height of 21 m.

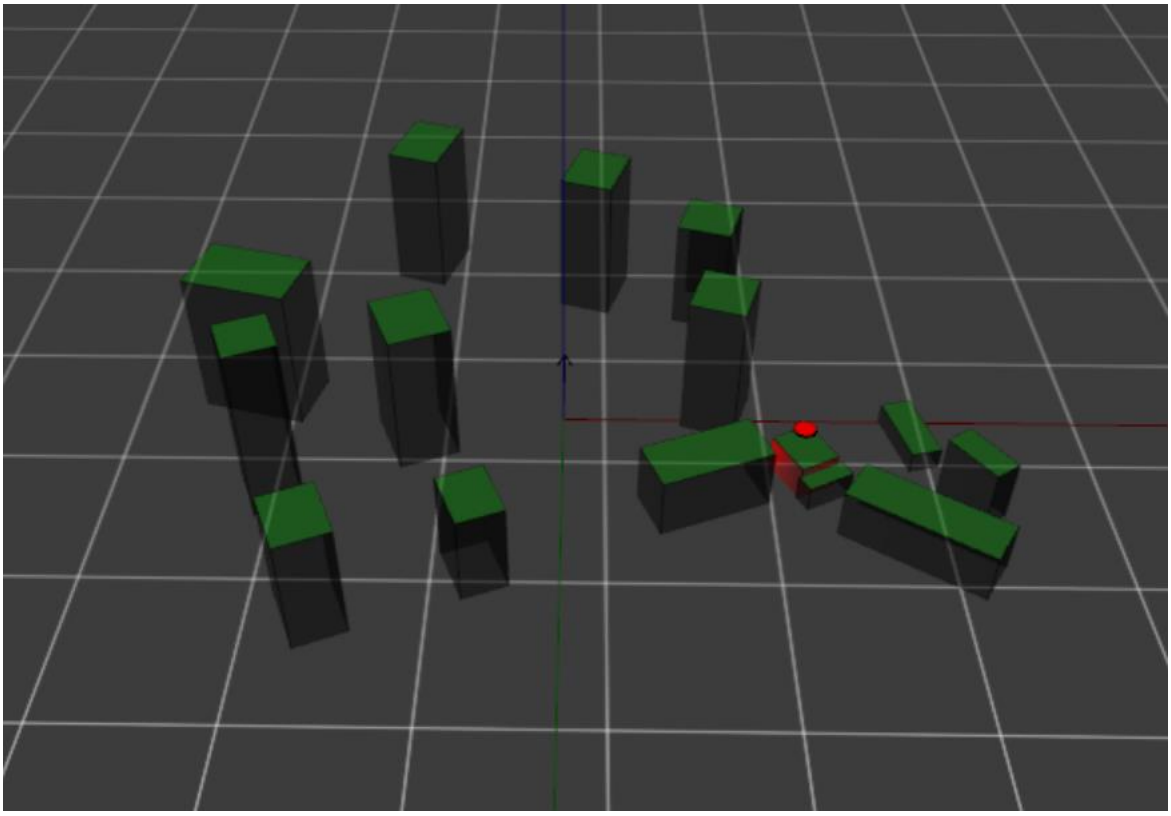

Figure A4.4: Flue Location (red) & Modelled Buildings (green)

8.4.14 Hourly sequential meteorological data in sectors of 10 degrees from Heathrow for 2017 – 2019 have been used in the model. The Heathrow meteorological monitoring station is located approximately 25 km to the west of the proposed development. It is deemed to be the nearest monitoring station representative of meteorological conditions in the vicinity of the proposed development; both the

application site and the Heathrow meteorological monitoring station are located in, or close to, London where they will be influenced by the effects of inland meteorology in urban topography, to differing extents. A wind rose for the site for the years 2017-2019 is provided in Figure A4.5. The station is operated by the UK Met Office. Raw data were provided by the Met Office and processed by AQC for use in ADMS.

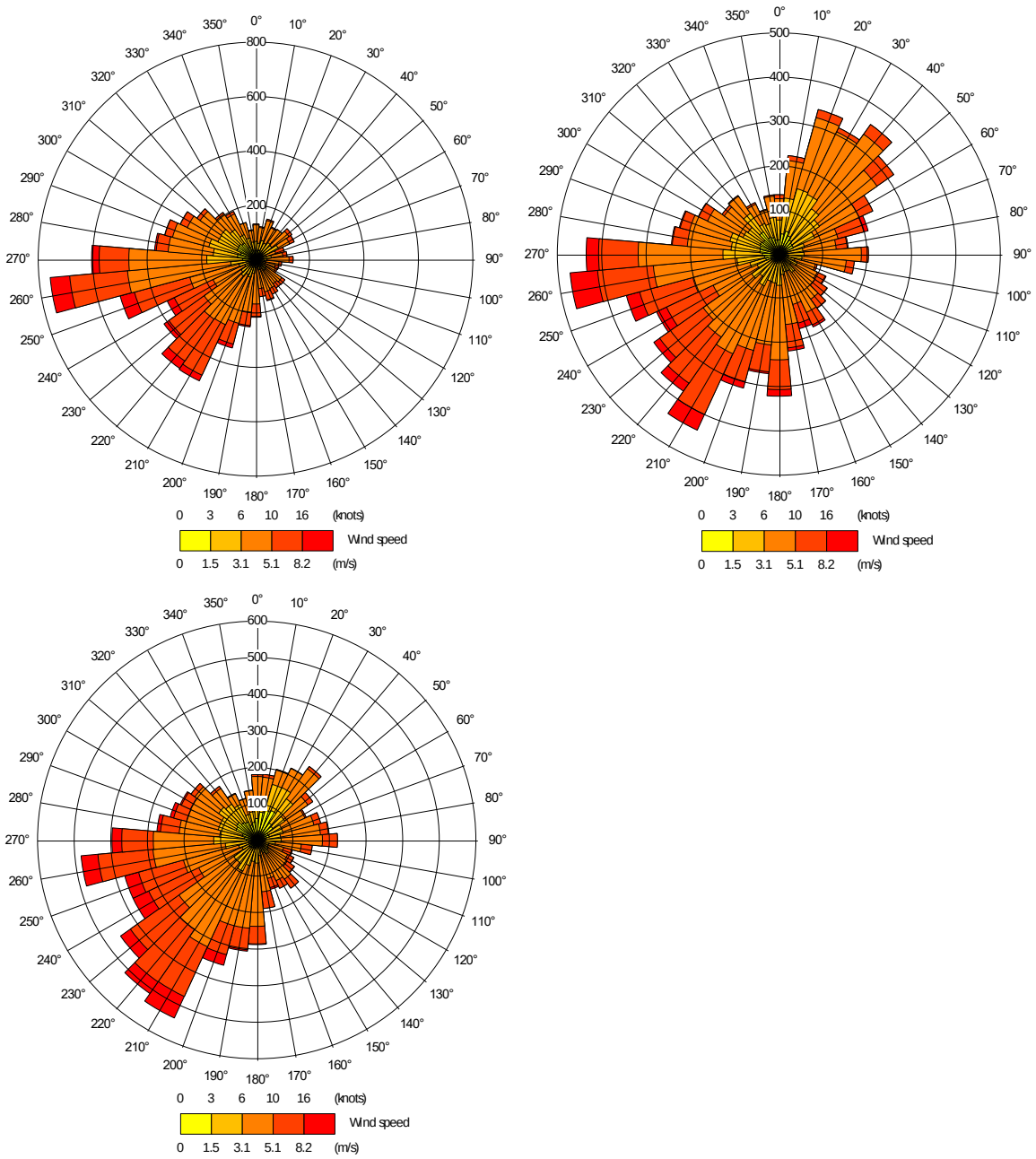

Figure A4.5: Heathrow Wind Rose for 2017 (top left), 2018 (top right) and 2019 (bottom)

Model Verification

8.4.15 It is not practical, nor usual, to verify the ADMS-5 model.

Post-processing

8.4.16 Emissions from the Energy Centre will be predominantly in the form of nitrogen oxides (NOx). ADMS-5 has been run to predict the contribution of the proposed Energy Centre emissions to annual mean concentrations of nitrogen oxides. The approach recommended by the Environment Agency[26] has been used to predict nitrogen dioxide concentrations, assuming that annual mean NO_2 concentration = annual mean NOx concentration multiplied by 0.7.

[26] Environment Agency (2005) Conversion ratios for NOx and NO2, Available: http://webarchive.nationalarchives.gov.uk/20140328084622/http:/www.environment-agency.gov.uk/static/documents/Conversion_ratios_for__NOx_and_NO2_.pdf.

8.5 London Vehicle Fleet Projections

8.5.1 TfL has published an Integrated Impact Assessment[27] setting out the impacts of the changes to the LEZ and ULEZ. 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.

8.5.2 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.

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

8.5.4 AQC's report on the performance of Defra's EFT[28] 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 (and no changes to the fleet mix within London were made between versions 9 and 10 of the EFT). 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.

8.5.5 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 8.5.1 and 8.5.2 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

[27] Jacobs (2017) Integrated Impact Assessment, Ultra Low Emission Zone - Further Proposals, Available: https://consultations.tfl.gov.uk/environment/air-quality-consultation-phase-3b/user_uploads/integrated-impact-assessment.pdf

[28] AQC (2020) Performance of Defra's Emission Factor Toolkit 2013-2019, Available: https://www.aqconsultants.co.uk/CMSPages/GetFile.aspx?guid=7fba769d-f1df-49c4-a2e7-f3dd6f316ec1

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 and impacts in the absence of the changes to the LEZ and ULEZ, they almost certainly represent an unrealistically worst-case assessment of likely concentrations and impacts bearing in mind the implementation of these changes.

8.6 'Air Quality Neutral'

8.6.1 The GLA's SPG on Sustainable Design and Construction, and its accompanying Air Quality Neutral methodology report[29], 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.

8.6.2 The benchmarks for heating and energy plant (termed 'Building Emissions Benchmarks' or 'BEBs') are set out in Table A6.1, while the 'Transport Emissions Benchmarks' ('TEBs') are set out in Table A6.2. 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 recommends that the information in Table A6.3 and Table A6.4 (upon which the TEBs are based) is used. Similarly, the information in Table A6.5 may be used if site-specific information are not available. 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 A6.6 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. The air quality neutral benchmarks are based around old planning use classes.

Table A6.1: 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

[29] AQC (2014) Air Quality Neutral Planning Support Update: GLA 80371, Available: https://www.aqconsultants.co.uk/CMSPages/GetFile.aspx?guid=226d8d5e-d7e9-40e1-bf0d-85c4554496da

Table A6.2: Transport Emissions Benchmarks

Land use	Central Activity Zone	Inner [a]	Outer [b]
NOx (g/m²/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/m²/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] Inner London and Outer London as defined in the LAEI.

Table A6.3: Average Distance Travelled by Car per Trip

Land use	Distance (km)		
	Central Activity Zone	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 A6.4: Average Road Traffic Emission Factors in London in 2010

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

Table A6.5: 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 A6.6: Average Number of Trips per Annum for Different Development Categories

Land use	Number of Trips (trips/m²/annum)		
	Central Activity Zone	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

8.7 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
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
BEB	Building Emissions Benchmark
CAZ	Clean Air Zone
CHP	Combined Heat and Power
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
GLA	Greater London Authority
HDV	Heavy Duty Vehicles (> 3.5 tonnes)
HMSO	Her Majesty's Stationery Office
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
kph	Kilometres Per hour
kW	Kilowatt
LAEI	London Atmospheric Emissions Inventory

LAQM	Local Air Quality Management
LDV	Light Duty Vehicles (<3.5 tonnes)
LEZ	Low Emission Zone
LGV	Light Goods Vehicle
µg/m^3	Microgrammes per cubic metre
NO	Nitric oxide
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides (taken to be NO_2 + NO)
NPPF	National Planning Policy Framework
NRMM	Non-road Mobile Machinery
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
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
TEB	Transport Emissions Benchmark
TfL	Transport for London
TRAVL	Trip Rate Assessment Valid for London
ULEZ	Ultra Low Emission Zone

WHO	World Health Organisation
ZEC	Zero Emission Capable