Greggs Bakery / Twickenham

Air Quality Assessment

Prepared by Air Quality Consultants

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Air Quality Assessment: Former Greggs Bakery Site – **Scheme 2**

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Client	London Square Developments Ltd	**Principal Contact**	Vanessa Jones

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Report Prepared By:	Isabel Stanley and Samantha Barber

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Air Quality Consultants Ltd
23 Coldharbour Road, Bristol BS6 7JT Tel: 0117 974 1086
24 Greville Street, Farringdon, London, EC1N 8SS Tel: 020 3873 4780
aqc@aqconsultants.co.uk

Registered Office: 23 Coldharbour Road, Bristol BS6 7JT
Companies House Registration No: 2814570

Executive Summary

The air quality impacts associated with the proposed mixed-use development of the former Gregg's Bakery Site and No. 2 Gould Road have been assessed. The proposed development will consist of residential and industrial uses, with the provision of up to 97 dwellings, 883 m^2 of industrial floorspace and 117 m^2 of affordable workspace.

The site is located adjacent to Gould Road and Edwin Road, which are quiet roads, and the assessment has demonstrated that future residents and users of the proposed development will experience acceptable air quality, with pollutant concentrations below the air quality objectives.

The proposed development will generate additional traffic on the local road network, but the assessment has shown that there will be no significant effects at any existing, sensitive receptor.

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 air quality neutrality of the proposed development has also been assessed in line with London Plan requirements.

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1 Introduction

1.1 This report describes the potential air quality impacts associated with the proposed redevelopment of the former Gregg's Bakery Site and No. 2 Gould Road, Twickenham, TW2 6RT (hereafter referred to as the 'site') within the administrative boundary of the London Borough of Richmond-upon-Thames (LBRuT). The proposed development will consist of a mixed-use, residential-led scheme described as follows:

"Demolition of existing buildings (with retention of a single dwelling) and redevelopment of the site to provide 97 residential units and 883 sqm industrial floorspace (Use Class E(g)(iii)) and 117 sqm of affordable workspace (Use Class E) with associated hard and soft landscaping, car parking and highways works and other associated works."

1.2 The proposed development lies within a borough-wide Air Quality Management Area (AQMA) declared by the LBRuT for exceedances of the annual mean nitrogen dioxide (NO_2) objective and the annual- and 24-hour mean PM_{10} objectives. It will introduce new residential exposure into this area of potentially poor air quality, thus an assessment is required to determine the air quality conditions that future residents will experience. The proposed development will also generate additional traffic on local roads, which may impact on air quality at existing residential properties along the affected road network. The main air pollutants of concern related to road traffic emissions are NO_2 and fine particulate matter (PM_{10} and $PM_{2.5}$).

1.3 The proposed development will be provided with heat and hot water via all-electric air source heat pump (ASHP) systems; there will be no centralised energy plant and thus no significant point sources of emissions within the proposed development.

1.4 The location and setting of the proposed development is shown in Figure 1.

Figure 1: Proposed Development Layout and Setting

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1.5 The Greater London Authority's (GLA's) London Plan (2021) 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 GLA's Supplementary Planning Guidance (SPG) on Sustainable Design and Construction (2014a)[1].

1.6 The GLA has also released SPG on the Control of Dust and Emissions from Construction and Demolition (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.

1.7 This report describes existing local air quality conditions (base year 2019; 2020 was not used due to the impacts of the Covid-19 pandemic on measured pollutant concentrations due to reduced activity), and the predicted air quality in the future assuming that the proposed development does, or does not proceed. The assessment of traffic-related impacts focuses on 2026, which is the

[1] The Sustainable Design and Construction SPG was revoked upon publication of the new London Plan, but the methodology within it that is relied upon in this report currently remains unchanged.

anticipated year of first occupation of any of the new homes, whilst the assessment of construction dust impacts focuses on the anticipated duration of the works.

2 Policy Context

2.1 All European legislation referred to in this report is written into UK law and remains in place.

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 AQMA, and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

Clean Air Strategy 2019

2.3 The Clean Air Strategy (Defra, 2019b) 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

2.4 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 a

2.5 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.

2.6 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.

Environment Act 2021

2.7 The UK's new legal framework for protection of the natural environment, the Environment Act 2021 passed into UK law on 9th November 2021. The Act gives the Government the power to set long-term, legally binding environmental targets. It also establishes an Office for Environmental Protection (OEP), responsible for holding the government to account and ensuring compliance with these targets.

2.8 The Act requires the government to set at least one long-term target (spanning a minimum of 15 years), supported by interim targets set in a five year cycle, in each of four identified areas: Air Quality, Biodiversity, Water and Resource Efficiency and Waste Reduction. An additional target for mean levels of $PM_{2.5}$ is also required. These targets must be set before November 2022 – a target scope for what these targets will involve has been outlined but they are not yet precisely defined. As the targets have not yet been either finalized or adopted by the Government, they cannot impact on current planning policy.

Planning Policy

National Policies

2.9 The National Planning Policy Framework (NPPF) (2021) 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 protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy".

2.10 To prevent unacceptable risks from air pollution, Paragraph 174 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".

2.11 Paragraph 185 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".

2.12 More specifically on air quality, Paragraph 186 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, 2019), 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 *"Odour and 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, 2021) sets out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years. The key policy relating to air quality is Policy SI 1 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".

2.21 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

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".*

2.22 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."*

2.23 Regarding construction and demolition impacts, Part D of Policy SI 1 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".

2.24 Part E of Policy SI 1 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".

2.25 The explanatory text around Policy SI 1 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"[2].

2.26 The London Plan includes a number of other relevant policies, which are detailed in Appendix A1.

London Environment Strategy

2.27 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".* The strategy sets a target to achieve, by 2030, the guideline value for $PM_{2.5}$ which was set by the World Health Organisation (WHO) in 2005. 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

2.28 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

2.29 The GLA's SPG on Sustainable Design and Construction (2014a) was revoked upon publication of the new London Plan, but it is understood that GLA still expects the emission standards set within it for gas-fired boilers, Combined Heat and Power (CHP) and biomass plant to be met. It is also

[2] The London Plan was developed based on a WHO guideline for $PM_{2.5}$ of 10 $\mu g/m^3$ (see Paragraph 2.27).

currently the only published document that sets out guidance on how an 'air quality neutral' assessment should be undertaken.

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

2.30 The GLA's SPG on The Control of Dust and Emissions During Construction and Demolition (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 (2016), and it states that "*the latest version of the IAQM Guidance should be used*".

Local Transport Plan

2.31 The LBRuT Third Local Implementation Plan (LIP3) (2019b) sets out a programme of measures and schemes to implement the Mayor's Transport Strategy within the Borough. It aims to achieve nine outcomes through the adoption of 14 over-arching objectives, with 57 objectives linked to specific outcomes. These include to:

"Reduce the environmental impacts and pollution levels due to transport, and encourage improvements in air quality, particularly near schools, town centres, along major roads and areas that already exceed acceptable air quality standards."

2.32 Three LIP3 projects and programmes link to the Mayor's Transport Strategy outcomes. These are:

- *"Electric vehicle charge points*
- *Air quality infrastructure and monitoring (air quality monitoring, green walls, air filters, etc)*
- *Air quality revenue (campaigns, awareness, behaviour change, focused on schools and town centres)".*

Local Policies

2.33 The LBRuT Local Plan was adopted in July 2018 (LBRuT, 2018). One of the strategic objectives within this Plan is to:

"Reduce or mitigate environmental impacts and pollution levels (such as air, noise, light, odour, fumes, water and soil) and encourage improvements in air quality, particularly along major roads and areas that already exceed acceptable air quality standards."

2.34 More specifically, Policy LP 10 concerns local environmental impacts, pollution and land contamination. In terms of air quality, Policy LP 10 states:

"The Council promotes good air quality design and new technologies. Developers should secure at least 'Emissions Neutral' development. To consider the impact of introducing new developments in areas already subject to poor air quality, the following will be required:

1. *An air quality impact assessment, including where necessary, modelled data;*
2. *Mitigation measures to reduce the development's impact upon air quality, including the type of equipment installed, thermal insulation and ducting abatement technology;*
3. *Measures to protect the occupiers of new developments from existing sources;*
4. *Strict mitigation for developments to be used by sensitive receptors such as schools, hospitals and care homes in areas of existing poor air quality; this also applies to proposals close to developments used by sensitive receptors."*

2.35 The LBRuT Sustainable Construction Checklist Guidance Document Supplementary Planning Document (SPD) (LBRuT, 2020b) was adopted in June 2020, and forms a mandatory part of the planning application for residential developments providing one or more new dwellings, or 100 m^2 or more floor space for non-residential developments. It provides a list of relevant policies relating to energy use and pollution, including pollution during the construction process, and incorporates policies outlined in the adopted Local Plan.

2.36 The LBRuT also adopted an Air Quality SPD (LBRuT, 2020a) in June 2020. The SPD describes the air quality planning policy context, the planning conditions and obligations that will be required to mitigate adverse air quality impacts (including contributions to the Air Quality Action Fund to off-set impacts off-site where mitigation on-site is not possible), the minimum design features to reduce air quality emissions and exposure and the requirements for the assessment of air quality.

2.37 Paragraph 67 of the Air Quality SPD states:

"Developers will also need to pay the Council's costs of regulating the air quality impacts of new development and enforcement of air quality planning conditions to ensure that there is no detrimental impact on air quality. This fee will depend on the type and size of development."

2.38 Additionally, the Air Quality SPD advises developers to follow the LBRuT's Construction Code of Practice (LBRuT, 2022), namely Section 3 regarding 'Dust and Air Pollution' and Section 4 for Non-Road Mobile Machinery (NRMM).

2.39 For developments within, or close to, a GLA Focus Area the LBRuT Air Quality SPD states:

"All developments proposed in or adjacent to these areas must play their part in ensuring that air quality in these areas does not worsen and must contribute towards an overall improvement in air quality.

Therefore, development within these areas need to robustly demonstrate that the impact of both direct and indirect emissions can be fully mitigated.

All development in these areas should be car-free, with the exception of dedicated spaces for disabled parking and use by a car club as well as appropriate servicing arrangements.

All development in AQFAs, CAZs and LENs should be Air Quality Positive. Where this is not possible, additional contributions to the AQAF will be required."

2.40 With regard to electric vehicle charging points, the LBRuT Air Quality SPD states:

"Car parking should be provided with active and passive electric vehicle charging facilities consistent with the Local Plan and London Plan. At the time of writing this SPD, the current requirements are: 20% active provision (i.e. fully installed from the outset) plus 20% passive provision (i.e. cabling provided for easier future installation of charging equipment) in residential developments, and 10% active provision plus 10% passive provision in all other developments."

2.41 The LBRuT is currently preparing a new Local Plan. The pre-publication version, published in December 2021 (LBRuT, 2021b) states the following within 'Policy 53. Local Environmental Impacts' in relation to Air Quality:

"*D. The Council promotes good air quality design and new technologies. All developments must comply with the new London Plan 2021 Policy SI1 Improving Air Quality.*

E. Major developments and large-scale development subject to an Environmental Impact Assessment (EIA) are required to achieve "Air Quality Positive".

F. All developments must be at least "Air Quality Neutral". Proposals that would materially increase exceedances of local air pollutants will be resisted unless the development mitigates this impact through physical measures and/or financial contributions to implement proposals in Richmond's Local Air Quality Management Plan.

G. To consider the impact of introducing new developments in areas already subject to poor air quality, the following will be required:

1. an air quality impact assessment, including where necessary modelled data; this also applies to change of use to residential at street level;

2. mitigation measures to reduce the development's impact upon air quality, including the type of equipment installed, thermal insulation and ducting abatement technology;

3. measures to protect the occupiers of new developments from existing sources;

4. strict mitigation for developments to be used by sensitive receptors such as schools, hospitals and care homes in areas of existing poor air quality; this also applies to proposals close to developments used by sensitive receptors;

5. mitigation measures to reduce the impact of transport from the development upon air quality, including support for active travel, electric vehicles and car club membership.

H. The Council will require financial contributions towards off-site air quality measures where a proposed development is not air quality neutral, or mitigation measures do not reduce the impact upon poor air quality. Specific guidance for air quality in new developments is set out in the Council's Air Quality SPD (2020)."

Building Standards

2.42 Part F of the Building Regulations (Ministry of Housing, Communities & Local Government, 2020) sets legal requirements related to ventilation for buildings. It identifies performance criteria for ventilation systems for dwellings, stating that NO_2 concentrations of 288 µg/m^3 as a 1-hour average and 40 µg/m^3 as a long-term average should not be exceeded. While these are building control requirements rather than planning requirements, they highlight that where ambient (outdoor) air exceeds the annual mean NO_2 objective, it is expected that an appropriate ventilation system will be installed to ensure that indoor concentrations are below the performance criterion.

Air Quality Action Plans

National Air Quality Plan

2.43 Defra has produced an Air Quality Plan to tackle roadside NO_2 concentrations in the UK (Defra, 2017); a supplement to the 2017 Plan (Defra, 2018) 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 Clean Air Zone (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 limit values that are the focus of the Air Quality Plan.

Local Air Quality Action Plan

2.44 The LBRuT declared a borough-wide AQMA in 2000 for exceedances of the annual mean NO_2 objective, alongside the annual- and 24-hour mean PM_{10} objectives. The LBRuT's most recent Air Quality Action Plan was published in 2019 for the period up to 2024 (LBRuT, 2019a). The Plan focuses on the following five priorities:

- *"Monitoring of air quality"*
- *"Changing our environment"* – to encourage sustainable and active transport and promote electric vehicle uptake
- *"Changing behaviour"* – including campaigns and initiatives and improving communication
- *"Tackling pollution"* – such as anti-idling initiatives, dealing with bonfires and regulating demolition and construction activities.
- *"Protecting our schools".*

3 Assessment Criteria

3.1 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).

3.2 The UK-wide objectives for NO_2 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 was to be achieved by 2020. Measurements across the UK have shown that the 1-hour mean NO_2 objective is unlikely to be exceeded at roadside locations where the annual mean concentration is below 60 µg/m^3 (Defra, 2021). Therefore, 1-hour mean NO_2 concentrations will only be considered if the annual mean concentration is above this level. 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, 2021). 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.

3.3 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 LAQM Technical Guidance (LAQM.TG16) (Defra, 2021). The annual mean objectives for NO_2 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 NO_2 applies wherever members of the public might regularly spend 1-hour or more, including outdoor eating locations and pavements of busy shopping streets.

3.4 EU Directive 2008/50/EC (The European Parliament and the Council of the European Union, 2008) sets limit values for NO_2, PM_{10} and $PM_{2.5}$, and is implemented in UK law through the Air Quality Standards Regulations (2010). The limit values for NO_2 are the same numerical concentrations as the UK objectives, whilst the limit values for PM_{10} and $PM_{2.5}$ are 40 µg/m^3 and 20 µg/m^3, respectively. Achievement of the limit 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).

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

Table 1: Air Quality Criteria for NO_2, PM_{10} and $PM_{2.5}$

Pollutant	Time Period	Objective
NO_2	1-hour Mean	200 µg/m^3 not to be exceeded more than 18 times a year
	Annual Mean	40 µg/m^3
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]
$PM_{2.5}$ [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, 2021).

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

GLA $PM_{2.5}$ Target

3.6 As explained in Paragraph 2.27, the GLA has set a target to achieve an annual mean $PM_{2.5}$ concentration of 10 µg/m^3 by 2030. This target was derived from an air quality guideline set by WHO in 2005. In 2021, WHO updated its guidelines, but the London Environment Strategy (GLA, 2018a) considers the 2005 guideline of 10 µg/m^3. While there is no explicit requirement to assess against the GLA target of 10 µg/m^3, it has nevertheless been included within this assessment.

Construction Dust Criteria

3.7 There are no formal assessment criteria for dust. In the absence of formal criteria, the approach developed by the IAQM[3] (2016) has been used (the GLA's SPG (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

Road Traffic Assessments

3.8 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

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

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.

3.9 The second stage then compares the changes in vehicle flows on local roads that a development will lead to against specified screening criteria. The screening thresholds (described in full in Appendix A3) inside an AQMA are a change in flows of more than 25 heavy duty vehicles (HDVs) or 100 light duty vehicles (LDVs) per day; outside of an AQMA the thresholds are 100 HDVs or 500 LDVs. Where these criteria are exceeded, a detailed assessment is likely to be required, although the guidance advises that *"the criteria provided are precautionary and should be treated as indicative"*, and *"it may be appropriate to amend them on the basis of professional judgement"*.

4 Assessment Approach

Study Area

4.1 The study area for the assessment has been identified using professional judgement, focussing on the areas where impacts are anticipated to be greatest. It includes the application site itself and all of the roads along which the proposed development will lead to a potentially significant change in traffic flows. Specifically, the assessment has focussed on Gould Road, Andover Road and Medway as well as the A316 Chertsey Road. Figure 1 in Section 1 of this report effectively shows the study area.

4.2 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 within 500m of the site. The specific areas considered are detailed in Section 6.

Receptors

4.3 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted at a number of locations close to, the proposed development. Receptors have been identified to represent a range of exposure, including worst-case locations (these being at the façades of the residential properties closest to the roads where the development is predicted to generate most traffic movements). When selecting receptors, particular attention has been paid to assessing impacts close to junctions, where traffic may become congested and where there is a combined effect of several road links.

4.4 There are 16 existing residential properties that have been identified as receptors for the assessment. These locations are described in Table 2 and shown in Figure 2. In addition, concentrations have been modelled at the NO_2 diffusion tube monitoring sites located at Hampton Road and A316 Chertsey Road , in order to verify the model outputs (see Appendix A5 for verification method).

Table 2: Description of Modelled Receptor Locations

Receptor	Type	X-Coordinate	Y-Coordinate	Height Modelled (m) [a]
1	Residential	515249.0	173325.4	1.5
2	Residential	515245.0	173308.1	1.5
3	Residential	515210.8	173305.6	1.5
4	Residential	515182.5	173273.2	1.5
5	Residential	515150.5	173265.8	1.5
6	Residential	515126.4	173229.0	1.5
7	Residential	515085.9	173212.5	1.5
8	Residential	515095.1	173199.5	1.5
9	Residential	514825.8	173064.8	1.5
10	Residential	514806.6	173043.0	1.5
11	Residential	514854.8	173044.2	1.5
12	Residential	514869.2	173030.0	1.5
13	Residential	515396.5	173218.4	1.5
14	Residential	515409.7	173200.4	1.5
15	Residential	513955.4	172977.5	1.5
16	Residential	513992.5	172931.7	1.5

[a] A height of 1.5 m is used to represent ground-floor level exposure.

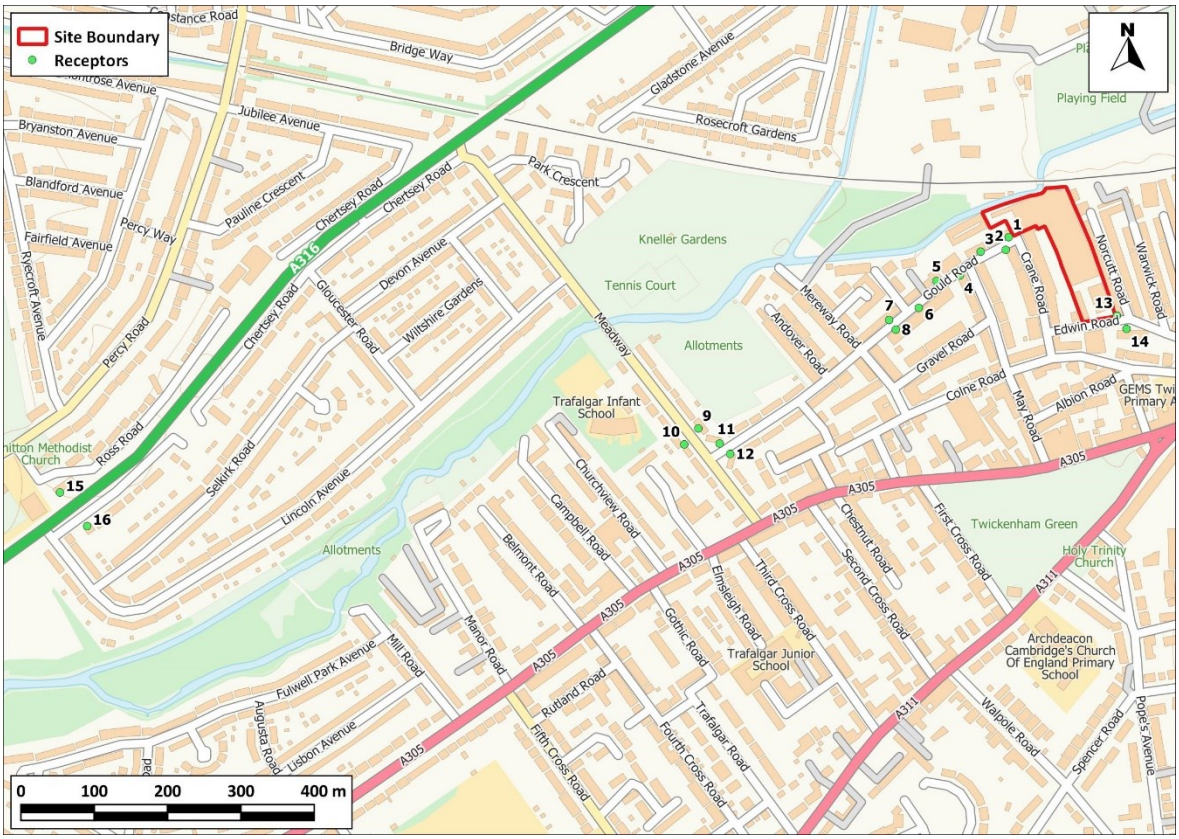

Figure 2: Modelled Receptor Locations

4.5 Selected receptors may be representative of air quality conditions at a number of properties; consideration has been given to how many sensitive locations each modelled receptor represents when considering the impacts of the proposed development and the overall significance of effects.

4.6 The construction dust risk assessment approach does not require specific receptors to be identified; instead, the numbers of different types of receptors within given distance bands are counted. These receptor counts are provided in Section 6.

Existing Conditions

4.7 Existing sources of emissions and baseline air quality conditions 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 (2022a);
- local sources have been identified through examination of the LBRuT's Air Quality Review and Assessment reports;

- information on existing air quality has been obtained by collating the results of monitoring carried out by the LBRuT;
- background concentrations have been defined using Defra's 2018-based background maps (Defra, 2022d). These cover the whole of the UK on a 1x1 km grid. The background annual mean NO_2 maps for 2019 have been calibrated against concurrent measurements from national monitoring sites (AQC, 2020a). The calibration factor calculated has also been applied to future year backgrounds. Mapped background concentrations of PM_{10} and $PM_{2.5}$ have not been adjusted; and
- whether or not there are any exceedances of the annual mean limit value for NO_2 in the study area has been identified using the maps of roadside concentrations published by Defra (2020) (2022b). These are the maps used by the UK Government, together with the results from national Automatic Urban and Rural Network (AURN) monitoring sites that operate to the required data quality standards, to identify and report exceedances of the limit value. The national maps of roadside PM_{10} and $PM_{2.5}$ concentrations (Defra, 2022b), which are available for the years 2009 to 2019, show no exceedances of the limit values anywhere in the UK in 2019.

Construction Impacts

4.8 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 (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

Screening

4.9 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 3.8 and detailed further in Appendix A3. 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 road traffic emissions, which has been required for this project.

Modelling Methodology

4.10 Concentrations have been predicted using the ADMS-Roads dispersion model, with vehicle emissions derived using Defra's Emission Factor Toolkit (EFT) (v11.0) (Defra, 2022d). Details of the model inputs and the model verification are provided in Appendix A5.

Assessment Scenarios

4.11 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted for the following scenarios:

- base year 2019;
- the proposed year of opening of the proposed development (2026) without the proposed development; and
- the proposed year of opening of the proposed development (2026) with the proposed development.

4.12 Predictions for 2026 are based on a return to 'typical' activity levels and assume no impact as a result of the Covid-19 pandemic in this year, to ensure a worst-case assessment (as the influence of the pandemic has generally been to reduce concentrations of the pollutants considered in this assessment); see Paragraphs 4.17 and 4.18.

Impact Description

4.13 The approach developed jointly by EPUK and the IAQM (Moorcroft and Barrowcliffe et al, 2017) has been used in describing the modelled impacts. The approach identifies impacts at individual receptors based on 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. Table 3 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 (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 or the GLA target value. Note that impacts may be adverse or beneficial, depending on whether the change in concentration is positive or negative.

Table 3: 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, GLA target or an Environment Agency 'Environmental Assessment Level (EAL)'.

Uncertainty

4.14 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.

4.15 An important stage in the process is model verification, which involves comparing the model output with measured concentrations (see Appendix A5). Because the model has been verified and adjusted, there can be reasonable confidence in the prediction of base year (2019) concentrations.

4.16 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. Historic versions of Defra's EFT tended to over-state emissions reductions into the future. However, analyses of the most recent versions of Defra's EFT carried out by AQC (2020b) (2020c) suggest that, on balance, these versions are 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 suggests that NOx concentrations are most likely to decline more quickly in the future, on average, than predicted by the current EFT, especially against a base year of 2016 or later. Using EFT v11.0 for future-year forecasts in this report thus provides a robust assessment, given that the model has been verified against measurements made in 2019.

4.17 Forecasts of future-year concentrations are usually based on measurements made during a recent year. They then take account of projected changes over time to factors such as the composition of the vehicle fleet and the uptake of other new technologies, as well as population increases etc.. In

early 2020, activity in the UK was disrupted by the Covid-19 pandemic. As a result, concentrations of traffic-related air pollutants fell appreciably (Defra Air Quality Expert Group, 2020). While the pandemic may cause long-lasting changes to travel activity patterns, it is reasonable to expect a return to more typical activity levels in the future. 2020 is thus likely to present as an atypically low pollution year for roadside pollutant concentrations, as is 2021.

4.18 It is not currently possible to make robust predictions of the rate at which travel activity patterns will return to historically-normal levels; or the extent of any long-lasting changes to travel behaviour. The most robust approach to making future-year projections is thus to base these on measurements made during 2019, and to use activity forecasts made before the impact of the pandemic was understood, which is the approach that has been taken in this assessment.

4.19 Changes were made to the Low Emission Zone (LEZ) from 1 March 2021, and the Ultra-Low Emission Zone (ULEZ) was expanded on 25 October 2021. The changes are described in detail in Appendix A1, and can be expected to significantly reduce NOx emissions in London; 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 5 and 7 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.

4.20 This assessment has also considered the GLA target for $PM_{2.5}$. Whilst the overall approach is essentially unchanged from an assessment against the objectives, it must be recognised that there is increased uncertainty as the criterion is numerically reduced. By way of example a 0.5% increase in a PM_{10} concentration with regard to the objective is 0.2 µg/m^3, whereas a 0.5% increase in a $PM_{2.5}$ concentration with regard to the GLA target is just 0.05 µg/m^3. While such increases can be predicted (as the model will generate outputs to many decimal places), such small increases must be treated with increased caution.

Assumptions

4.21 It is necessary to make a number of assumptions when carrying out an air quality assessment; in order to account for some of the uncertainty in the approach, as described above, assumptions made have generally sought to reflect a realistic worst-case scenario. Key assumptions made in carrying out this assessment include:

- the assumption that the proposed development is complete and fully occupied in 2026. This will have overestimated the traffic emissions and hence the 2026 "With Scheme" concentrations;

- that the Teddington meteorological monitoring station appropriately represents conditions in the study area (this is discussed further in Appendix A5); and
- that the receptors adjacent to Gould Road are located within a street canyon (this is discussed further in Appendix A5).

Assessment of Significance

Construction Dust Significance

4.22 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 (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

4.23 There is no official guidance in the UK in relation to development control on how to assess the significance of air quality impacts. The approach developed jointly by EPUK and the IAQM (Moorcroft and Barrowcliffe et al, 2017) has therefore been used. The overall significance of the air quality impacts is determined using professional judgement, taking account of the impact descriptors; the experience of the consultants preparing the report is set out in Appendix A4. Full details of the EPUK/IAQM approach are provided in Appendix A3.

'Air Quality Neutral'

4.24 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).

4.25 Appendix A7 sets out the emissions benchmarks. The approach has been to calculate the emissions from the development and to compare them with these benchmarks. It should be noted that the current air quality neutral benchmarks are based around the planning use classes that existed prior to September 2020, having not yet been updated to reflect the amended use classes. New guidance on Air Quality Neutral is expected shortly, and will include the updated benchmarks.

5 Baseline Conditions

Relevant Features

5.1 The existing site comprises the former Gregg's Bakery Site and No. 2 Gould Road in Twickenham, within the LBRuT and is located within an AQMA. A range of buildings cover the majority of the site, including a single-storey industrial shed alongside large extract equipment, two- and three-storey commercial buildings, and a two-storey end of terrace house at No. 2 Gould Road.

5.2 The site is L-shaped and is bound by the River Crane to the north and railway line beyond; residential properties on Norcutt Road to the east; Edwin Road to the south; residential properties on Crane Road to the west; and further residential properties on Crane Road/Gould Road and at Crane Mews to the northwest. The surrounding area is predominantly residential in character, comprising rows of terraced streets. Crane News to the west comprises a mixed-use building of residential and small commercial units. To the south of the site is a small workshop in light industrial use, whereas to the east of the site at Lockcorp House on Norcutt Road there is an office building. Craneford Way Depot is located approximately 100 m to the north of the site (beyond the River Crane and railway line) and comprises a large underdeveloped waste site.

Industrial sources

5.3 As discussed above, the Craneford Way Depot is located to the north of the proposed development; this facility is a depot for council vehicles and is unlikely to be a significant source of dust or odour emissions. No other significant industrial or waste management sources have been identified that are likely to affect the proposed development, in terms of air quality.

Local Air Quality Monitoring

5.4 The LBRuT operates three automatic monitoring stations within its area, however, none of these are within the study area. The LBRuT also operates a number of NO_2 monitoring sites using diffusion tubes prepared and analysed by Gradko (using the 50% TEA in acetone method). These include four adjacent to the A305 and one adjacent to the A310 within Twickenham town centre, and another adjacent to Hampton Road. Annual mean results for the years 2015 to 2020 are summarised in Table 4. The monitoring locations are shown in Figure 3 and data have been taken from LBRuT's 2021 Annual Status Report (LBRuT, 2021a).

Table 4: Summary of Annual Mean NO_2 Monitoring (2015-2020) (µg/m^3)

Site No.	Site Type	Location	2015	2016	2017	2018	2019	2020
9	Kerbside	Hampton Road	**42**	**45**	40	40	35	31
32	Roadside	Kings Street	**62**	**64**	**59**	**56**	**47**	40
33	Roadside	Heath Road	**61**	**61**	**53**	**52**	40	34
57	Roadside	A316 (Lincoln Avenue)	33	**44**	**42**	**43**	37	29
61	Roadside	London Road	**48**	**49**	**45**	**43**	38	32
65	Kerbside	York Street	-	**75**	**68**	**55**	**50**	40
Rut01	Roadside	Civic Centre, York Street	**45**	**50**	**51**	38	36	29
Objective			**40**					

[a] Exceedances of the objectives are shown in **bold**. Exceedances of 60 µg/m^3 (indicating a potential exceedance of the 1-hour mean NO_2 objective) are in **bold underline**.

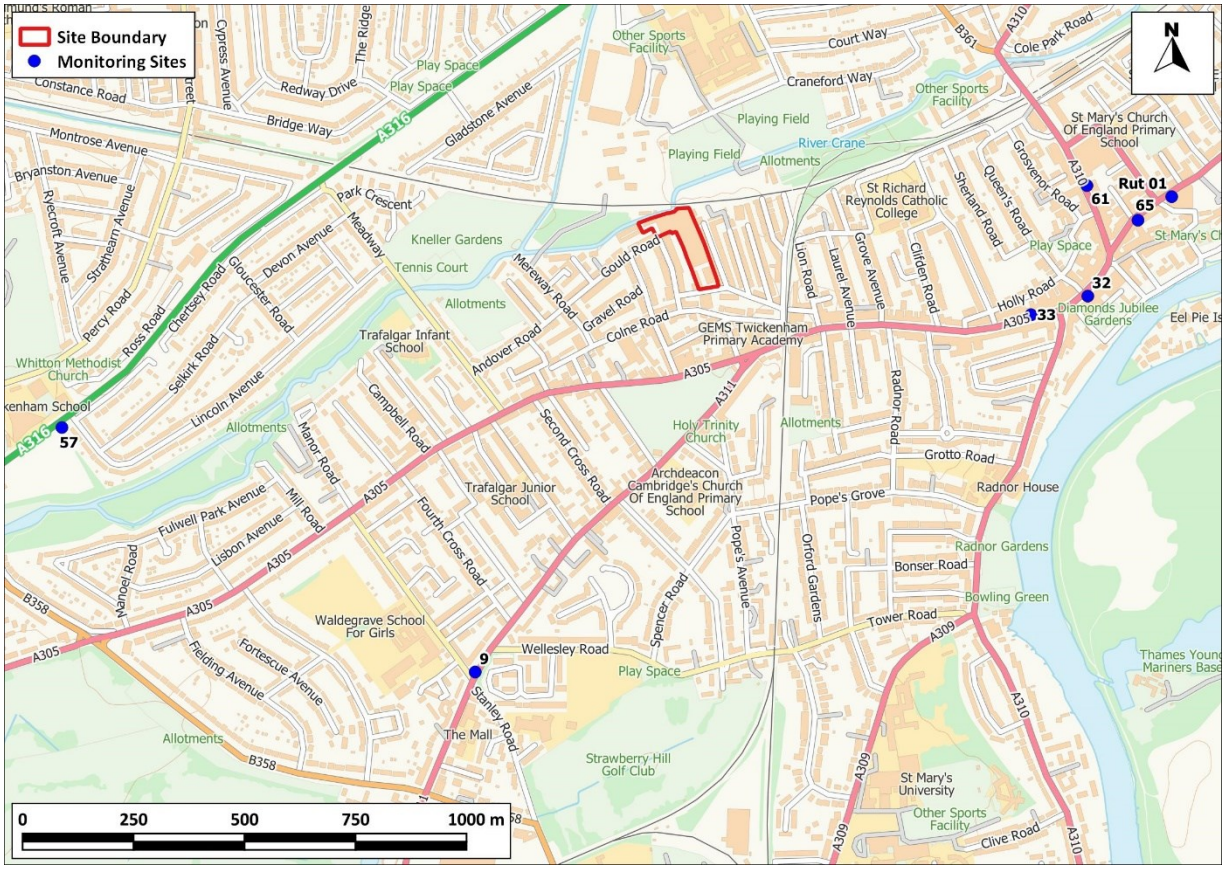

Figure 3: Monitoring Locations

5.5 Exceedances of the annual mean NO_2 objective were recorded in multiple years at all sites within Twickenham town centre. Exceedances were also recorded at Hampton Road in 2015 and 2016, but concentrations fell below the objective from 2017 onwards. Exceedances of 60 µg/m^3 were recorded at sites 32 and 33 in 2015 and 2016 and at site 65 in 2016 and 2017, indicating that the 1-hour mean NO_2 objective was likely to have been exceeded at these locations in these years.

5.6 While 2020 results have been presented in this Section for completeness, they are not to be relied upon in any way as they will not be representative of 'typical' air quality conditions due to the considerable impact of the Covid-19 pandemic on traffic volumes and thus pollutant concentrations.

5.7 No monitoring of PM_{10} or $PM_{2.5}$ concentrations is undertaken in the study area; however, the LBRuT has concluded that there have been no recorded exceedances of the annual mean PM_{10} and $PM_{2.5}$ objectives in the Borough since 2014, alongside the 24-hour mean PM_{10} objective (LBRuT, 2021a).

Exceedances of Limit Value

5.8 There are several AURN monitoring sites within the Greater London Urban Area that have measured exceedances of the annual mean NO_2 limit value (Defra, 2022c). Furthermore, Defra's roadside annual mean NO_2 concentrations (Defra, 2022b), which are used to identify and report exceedances of the limit value, identify exceedances of this limit value in 2019 along many roads in London, including the A316 near to the proposed development. The Greater London Urban Area has thus been reported as exceeding the limit value for annual mean NO_2 concentrations. Defra's predicted concentrations for 2026 (Defra, 2020) also do not identify any exceedances within 1 km of the application site. 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.

5.9 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 an 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

5.10 In addition to the locally measured concentrations presented above, estimated background concentrations in the study area are set out in Table 5 for both 2019 (to align with the most recent year of representative monitoring available from the LBRuT) and 2026 (the proposed year of opening of the proposed development). A range of values is presented as the study area covers multiple 1x1 km grid squares. The background concentrations are all well below the objectives.

Table 5: Estimated Annual Mean Background Pollutant Concentrations in 2019 and 2026 (µg/m^3)

Year	NO_2	PM_{10}	$PM_{2.5}$
2019	20.1 – 21.5	16.7 – 17.0	11.5 – 11.7
2026	15.6 – 16.9	15.4 – 15.7	10.6 – 10.7
Objective / GLA target	**40**	**40**	**25/10** [a]

[a] The 25 µg/m^3 $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it. 10 µg/m^3 is the GLA target for annual mean $PM_{2.5}$; again, there is no requirement for local authorities to meet this.

Baseline Dispersion Model Results

5.11 Baseline concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been modelled at each of the existing receptor locations (see Figure 2 and Table 2 for receptor locations). The results, which cover both the existing (2019) and future year (2026 Without Scheme) baseline scenarios, are set out in Table 6 for NO_2 and Table 7 for PM_{10} and $PM_{2.5}$. The modelled road components of nitrogen oxides have been increased from those predicted by the model based on a comparison with local measurements (see Appendix A5 for the verification methodology).

Table 6: Modelled Annual Mean Baseline Concentrations of NO_2 at Existing Receptors (µg/m^3)

Receptor	2019	2026 Without Scheme
1	24.2	18.8
2	24.4	18.9
3	24.2	18.8
4	25.1	19.3
5	24.9	19.2
6	25.2	19.4
7	25.0	19.2
8	25.0	19.3
9	25.5	19.2
10	24.9	18.8
11	25.3	19.1
12	25.2	19.0
13	24.0	18.7
14	23.8	18.6
15	31.1	21.8
16	29.0	20.6
Objective	**40**	

Table 7: Modelled Annual Mean Baseline Concentrations of PM_{10} and $PM_{2.5}$ at Existing Receptors (µg/m³)

Receptor	PM_{10} [a]		$PM_{2.5}$	
	2019	2026 Without Scheme	2019	2026 Without Scheme
1	17.0	15.7	11.7	10.7
2	17.1	15.7	11.7	10.7
3	17.1	15.7	11.7	10.7
4	17.2	15.8	11.7	10.8
5	17.1	15.8	11.7	10.7
6	17.2	15.8	11.7	10.8
7	17.1	15.8	11.7	10.8
8	17.2	15.8	11.7	10.8
9	17.4	16.0	11.9	10.9
10	17.3	15.9	11.8	10.8
11	17.3	16.0	11.8	10.9
12	17.3	16.0	11.8	10.9
13	17.0	15.7	11.7	10.7
14	17.0	15.7	11.6	10.7
15	18.1	16.8	12.3	11.3
16	17.8	16.4	12.1	11.1
Assessment Criterion	**32 [a]**		**25 [b] / 10 [c]**	

[a] While the annual mean PM_{10} objective is 40 µg/m³, 32 µg/m³ 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, 2021). A value of 32 µg/m³ 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).

[b] The 25 µg/m³ $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

[c] 10 µg/m³ is the GLA target for annual mean $PM_{2.5}$.

5.12 The predicted annual mean concentrations of NO_2 are below the objectives in 2019 and 2026 at all receptors. The annual mean NO_2 concentrations are also below 60 µg/m³ at every receptor in both 2019 and 2026; it is, therefore, unlikely that the 1-hour mean NO_2 objective will be exceeded (see Paragraph 3.2).

5.13 The predicted annual mean concentrations of PM_{10} and $PM_{2.5}$ are below the objectives in both 2019 and 2026 at all receptors. The annual mean PM_{10} concentrations are also below 32 µg/m³ and it is, therefore, unlikely that the 24-hour mean PM_{10} objective will be exceeded.

5.14 The annual mean concentrations of $PM_{2.5}$ exceed the GLA target in both 2019 and 2026. It should be noted, however, that exceedances of the target are common and their nationwide achievement

is very unlikely to be possible before 2030, especially across Greater London (Defra, 2019a). As such, it is unsurprising that there are predicted exceedances of this target value.

6 Construction Phase Impact Assessment

Construction Traffic

6.1 It is anticipated that the average number of additional heavy vehicle movements on local roads will be well below the 25 HDV AADT screening criterion recommended by EPUK/IAQM guidance for use within an AQMA (Moorcroft and Barrowcliffe et al, 2017). It is, therefore, not considered necessary to assess the impacts of traffic emissions during the construction phase.

On-Site Exhaust Emissions

6.2 The IAQM guidance (IAQM, 2016) states:

"Experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. For site plant and on-site traffic, consideration should be given to the number of plant/vehicles and their operating hours and locations to assess whether a significant effect is likely to occur".

6.3 The proposed development site is relatively small, thus the number of NRMM able to operate at any one time will be limited. In line with the GLA's SPG on the Control of Dust and Emissions During Construction and Demolition (2014b), and as described in Appendix A8, NRMM are expected to comply with emissions standards. Additionally, there will be no idling when vehicles are not in use, and machinery will be located away from sensitive receptors as far as possible. It is judged that there no risk of significant effects at existing receptors as a result of on-site machinery emissions.

Construction Dust and Particulate Matter Emissions

6.4 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

6.5 There will be a requirement to demolish the existing brick factory buildings with an approximate total volume of over 50,000 m^3. Based on the example definitions set out in Table A2.1 in Appendix A2, the dust emission class for demolition is considered to be *large.*

Earthworks

6.6 The characteristics of the soil at the site have been defined using the British Geological Survey's UK Soil Observatory website (2022), as set out in Table 8. Overall, it is considered that, when dry, this soil has the potential to be moderately dusty.

Table 8: 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.

6.7 The site covers some 11,500 m^2 and most of this will be subject to earthworks. 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 *large*.

Construction

6.8 Construction will involve some 97 residential properties, an industrial unit and affordable workspace, with a total building volume of around 30,000 m^3. Dust will arise from vehicles travelling over unpaved ground and the handling and storage of dusty materials. 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

6.9 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 between 10-50 outward HDV 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*.

6.10 Table 9 summarises the dust emission magnitude for the proposed development.

Table 9: Summary of Dust Emission Magnitude

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

Sensitivity of the Area

6.11 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.

6.12 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). Residential properties are also classified as being of 'high' sensitivity to human health effects. There are approximately 45 residential properties within 20 m of the site (see Figure 4).

Figure 4: 20 m Distance Band around Site Boundary

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6.13 Table 9 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 exits. Since it is not known which roads construction vehicles will use, it has been assumed that all possible routes could be affected. There are upwards of 100 residential properties within 20 m of the roads along which material could be tracked (see Figure 5).

Figure 5: 20 m Distance Band around Roads Used by Construction Traffic Within 200 m of the Site Exits

Imagery ©2022 Bluesky.

Sensitivity of the Area to Effects from Dust Soiling

6.14 Using the information set out in Paragraph 6.12 and Figure 4 alongside the matrix set out in Table A2.3 in Appendix A2, the area surrounding the onsite works is of 'high' sensitivity to dust soiling. Using the information set out in Paragraph 6.13 and Figure 5 alongside the same matrix, the area is also of 'high' sensitivity to dust soiling due to trackout.

Sensitivity of the Area to any Human Health Effects

6.15 The matrix in Table A2.4 in Appendix A2 requires information on the baseline annual mean PM_{10} concentration in the area. The properties nearest the site are well away from major roads and the existing annual mean PM_{10} concentration is best described by the maximum background concentration from Table 5 (this being 17.0 µg/m^3). Using the information set out in Paragraphs 6.12

and Figure 4, alongside the matrix in Table A2.4 in Appendix A2, the area surrounding the onsite works is of 'low' sensitivity to human health effects. Using the information set out in Paragraph 6.13 and Figure 5, alongside the same matrix, the area surrounding roads along which material may be tracked from the site is of 'medium' sensitivity.

Sensitivity of the Area to any Ecological Effects

6.16 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

6.17 Table 10 summarises the sensitivity of the area around the proposed construction works.

Table 10: 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	Medium Sensitivity

Risk and Significance

6.18 The dust emission magnitudes in Table 9 have been combined with the sensitivities of the area in Table 10 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 11. These risk categories have been used to determine the appropriate level of mitigation as set out in Section 9 (step 3 of the assessment procedure).

Table 11: Summary of Risk of Impacts Without Mitigation

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

6.19 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).

7 Operational Phase Impact Assessment

Impacts at Existing Receptors

Detailed Assessment of Development-Generated Road Traffic Emissions

7.1 The proposed development will generate traffic volumes that exceed the EPUK/IAQM screening thresholds on a number of local roads, thus a detailed assessment is required.

7.2 The study area for the dispersion modelling assessment has been defined by the roads on which the proposed development is expected to increase AADT flows by more than 100 LDVs or 25 HDVs, in line with the EPUK/IAQM screening thresholds for use within an AQMA. Roads where the proposed development is anticipated to increase traffic flows by less than 100 LDVs or 25 HDVs as an AADT have been screened out of the detailed assessment. The traffic data used for the assessment and details of the traffic screening approach is provided in Appendix A5.

NO_2

7.3 Predicted annual mean concentrations of NO_2 in 2026 for existing receptors are set out in Table 12 for both the “Without Scheme” and “With Scheme” scenarios. The impact at each receptor is also described using the impact descriptors given in Table 3.

Table 12: Predicted Impacts on Annual Mean NO_2 Concentrations in 2026 (µg/m^3) [a]

Receptor	Without Scheme	With Scheme	% Change [b]	Impact Descriptor
1	18.8	19.0	1	Negligible
2	18.9	19.2	1	Negligible
3	18.8	19.1	1	Negligible
4	19.3	19.5	1	Negligible
5	19.2	19.4	0	Negligible
6	19.4	19.6	1	Negligible
7	19.2	19.4	0	Negligible
8	19.3	19.4	0	Negligible
9	19.2	19.3	0	Negligible
10	18.8	18.9	0	Negligible
11	19.1	19.2	0	Negligible
12	19.0	19.1	0	Negligible
13	18.7	18.8	0	Negligible
14	18.6	18.7	0	Negligible
15	21.8	21.8	0	Negligible
16	20.6	20.6	0	Negligible
Objective	**40**		**-**	**-**

[a] % changes are relative to the objective and have been rounded to the nearest whole number.

7.4 The annual mean NO_2 concentrations are well below the objective at all receptors. The changes in concentrations are all small (0 to 1% of the objective when rounded), and the resultant impacts are described as *negligible* at all receptors.

PM_{10} and $PM_{2.5}$

7.5 Predicted annual mean concentrations of PM_{10} and $PM_{2.5}$ in 2026 for existing receptors are set out in Table 13 for both the "Without Scheme" and "With Scheme" scenarios. The impacts at each receptor are also described using the impact descriptors given in Table 3.

Table 13: Predicted Impacts on Annual Mean PM_{10} and $PM_{2.5}$ Concentrations in 2026 ($\mu g/m^3$)

Receptor	Annual Mean PM_{10}				Annual Mean $PM_{2.5}$			
	Without Scheme	With Scheme	% Change [a]	Impact Descriptor	Without Scheme	With Scheme	% Change [a]	Impact Descriptor
1	15.7	15.7	0	Negligible	10.7	10.7	0	Negligible
2	15.7	15.8	0	Negligible	10.7	10.7	0	Negligible
3	15.7	15.8	0	Negligible	10.7	10.7	0	Negligible
4	15.8	15.8	0	Negligible	10.8	10.8	0	Negligible
5	15.8	15.8	0	Negligible	10.7	10.8	0	Negligible
6	15.8	15.9	0	Negligible	10.8	10.8	0	Negligible
7	15.8	15.8	0	Negligible	10.8	10.8	0	Negligible
8	15.8	15.8	0	Negligible	10.8	10.8	0	Negligible
9	16.0	16.0	0	Negligible	10.9	10.9	0	Negligible
10	15.9	15.9	0	Negligible	10.8	10.8	0	Negligible
11	16.0	16.0	0	Negligible	10.9	10.9	0	Negligible
12	16.0	16.0	0	Negligible	10.9	10.9	0	Negligible
13	15.7	15.7	0	Negligible	10.7	10.7	0	Negligible
14	15.7	15.7	0	Negligible	10.7	10.7	0	Negligible
15	16.8	16.8	0	Negligible	11.3	11.3	0	Negligible
16	16.4	16.4	0	Negligible	11.1	11.1	0	Negligible
Criterion	**32 [b]**		**-**	**-**	**25 [c]**		**-**	**-**

[a] % changes are relative to the criterion and have been rounded to the nearest whole number.

[b] While the annual mean PM_{10} objective is 40 $\mu g/m^3$, 32 $\mu g/m^3$ 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, 2021). A value of 32 $\mu g/m^3$ 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 was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

7.6 The annual mean PM_{10} and $PM_{2.5}$ concentrations are well below the relevant criteria at all receptors, with or without the proposed development. Furthermore, as the annual mean PM_{10} concentrations are below 32 $\mu g/m^3$, it is unlikely that the 24-hour mean PM_{10} objective will be exceeded at any of the receptors. The impacts on annual mean PM_{10} and $PM_{2.5}$ concentrations all receptors are described as *negligible*.

7.7 Table 14 presents the same $PM_{2.5}$ concentrations as Table 13, but assesses the impacts against the GLA target value for this pollutant (10 µg/m^3).

Table 14: Assessment of Annual Mean $PM_{2.5}$ Concentrations in 2026 against the GLA Target (µg/m^3)

Receptor	Annual Mean $PM_{2.5}$			
	Without Scheme	With Scheme	% Change [a]	Impact Descriptor
1	10.7	10.7	0	Negligible
2	10.7	10.7	0	Negligible
3	10.7	10.7	0	Negligible
4	10.8	10.8	0	Negligible
5	10.7	10.8	0	Negligible
6	10.8	10.8	0	Negligible
7	10.8	10.8	0	Negligible
8	10.8	10.8	0	Negligible
9	10.9	10.9	0	Negligible
10	10.8	10.8	0	Negligible
11	10.9	10.9	0	Negligible
12	10.9	10.9	0	Negligible
13	10.7	10.7	0	Negligible
14	10.7	10.7	0	Negligible
15	11.3	11.3	0	Negligible
16	11.1	11.1	0	Negligible
GLA Target	**10**		**-**	**-**

[a] % changes are relative to the guideline and have been rounded to the nearest whole number.

7.8 The annual mean concentrations of $PM_{2.5}$ exceed the GLA target value with or without the proposed development. However, as previously discussed, exceedances of the guideline are common and its achievement is very unlikely to be possible before 2030, especially across Greater London (Defra, 2019a). As such, it is unsurprising that there are exceedances.

7.9 Based on the rate of reduction in Defra's background maps, it is judged unlikely that the guideline will be achieved before 2028. It is, however, clear from Table 13 that the proposed development's contribution to annual mean $PM_{2.5}$ concentrations is negligible (less than 0.1 µg/m^3), and unlikely to significantly delay achievement of the guideline.

Impacts of Existing Sources on Future Residents of the Development

Preliminary Air Quality Assessment

7.10 The London Plan (GLA, 2021) requires that a Preliminary Air Quality Assessment be carried out for all major developments to inform the design process and ensure that the development reduces exposure to air pollution as far as is practicable.

7.11 A preliminary air quality assessment has been produced and submitted in support of the planning application for the proposed development. The preliminary air quality assessment identified the site as likely to be suitable for residential-led development in terms of air quality.

Assessment of Railway Locomotive Emissions

7.12 Defra guidance (2021) outlines that there is only the potential for an exceedance of the annual mean NO_2 objective where there is long-term exposure within 30 m of railway lines which experience a high volume of diesel passenger trains, and where the annual mean NO_2 background concentration is above 25 µg/m^3.

7.13 The application site falls outside these criteria; while there will be exposure within 30 m of the railway lines, the background NO_2 concentration is below 25 µg/m^3 (see Table 5). Additionally, the nearby railway lines are not identified in Defra's guidance as those experiencing a high volume of diesel passenger trains. It can, therefore, be concluded that there is no risk of an exceedance of the annual mean NO_2 objective within the proposed development as a result of emissions from locomotives using the adjacent railway lines.

Detailed Assessment of Air Quality at Receptors Within the Development

7.14 The proposed development is located well away from any busy roads, where it will not be affected by high pollutant concentrations from road traffic emissions. Receptors 1 and 13 used in the assessment of road traffic impacts at existing locations can be used to best represent the worst-case exposure to road traffic emissions at the proposed development. The context of these receptors in relation to the proposed development is shown in Figure 2.

7.15 Predicted air quality conditions are set out in Table 15 for Receptors 1 and 13. All of the values are well below the objectives and it can therefore be concluded that air quality conditions for future residents of the proposed development will be acceptable. Although the GLA target value for $PM_{2.5}$ is exceeded, as previously discussed in Paragraph 7.8 exceedances of the target value are common throughout Greater London and achievement of this target is not prevented or affected by the proposed development.

Table 15: Predicted Annual Mean Concentrations of NO_2, PM_{10} and $PM_{2.5}$ in 2026 for New Receptors in the Proposed Development (µg/m^3)

Receptor	NO_2	PM_{10}	$PM_{2.5}$
1	19.0	15.7	10.7
13	18.8	15.7	10.7
Objective / Criterion / GLA Target	**40**	**32** [a]	**25/10** [b]

[a] 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, 2021). 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).

[b] The 25 µg/m^3 $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it. 10 µg/m^3 is the GLA target for annual mean $PM_{2.5}$; again, there is no requirement for local authorities to meet this.

Significance of Operational Air Quality Effects

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:

- pollutant concentrations at worst-case locations within the proposed development will all be below the objectives, thus future residents will experience acceptable air quality;
- pollutant concentrations at all of the selected worst-case existing receptors along the local road network will be well below the air quality objectives, and all of the impacts are predicted to be *negligible*; and
- annual mean $PM_{2.5}$ concentrations at existing receptors will exceed the GLA target with or without the proposed development, but this is a common occurrence and the proposed development's contribution to $PM_{2.5}$ concentrations is very small.

8 'Air Quality Neutral'

8.1 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).

Building Emissions

8.2 The proposed development does not include any combustion plant for the routine provision of electricity, heating or hot water and will thus have no direct building emissions. It is, therefore, better than air quality neutral in terms of building emissions.

Road Transport Emissions

8.3 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. TEBs for industrial developments and affordable workspace land-uses are not available and therefore the calculated TEB for the proposed development will be derived from the residential element of the scheme only; this will result in a lower TEB and thus a robust assessment.

8.4 Velocity Transport Planning has advised that the proposed development is expected to generate a total of 92,427 car trips per year; it has been assumed that all of the car trips will be from the residential units. Appendix A7 provides default values for the average trip length for residential properties in Outer London, as well as the average NOx and PM_{10} emissions per vehicle-kilometre. This information has been used to calculate the transport emissions generated by the development (Table 16). These have then been compared with the TEBs for the development set out in Table 17.

Table 16: Calculation of Transport Emissions for the Development

Description	Value	
Residential (C3)		
Total Car Trips per Year [a]	92,427	
Average Distance per Trip (km)	11.4	
	NOx	**PM_{10}**
Emissions per Vehicle-km (g)	0.353	0.0606
Residential Transport Emissions (kg/annum)	371.9	63.9

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

Table 17: Calculation of TEBs for the Development

Description	Value	
Residential (C3)		
Number of Dwellings	97	
	NOx	**PM_{10}**
Benchmark Emissions (g/dwelling/annum)	1,553	267
Residential TEBs (kg/annum)	150.6	25.9

8.5 The total development transport emissions are greater than the total TEBs for both NOx and PM_{10}.

Summary

8.6 While the proposed development will be better than air quality in terms of building emissions, its car trip generation exceeds the air quality neutral benchmark derived for an average development in Outer London.

8.7 Mitigation will thus be required to account for the excess transport emissions above the air quality neutral benchmark; this is discussed in the next Section.

9 Mitigation

Good Design and Best Practice

9.1 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, which have been accounted for in the assessment as far as is possible:

- setting back of the development buildings from the railway lines by at least 20 m, and well away from any busy roads;
- provision of pedestrian and cycle access to the new development, including cycle parking; and
- use of air-source heating for the provision of heat and hot water to the proposed development to avoid the need for on-site combustion.

Recommended Mitigation

Construction Impacts

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

9.3 The site has been identified as a *High* Risk site during demolition and earthworks, *Medium* Risk during construction and for trackout, as set out in Table 11. The GLA's SPG on The Control of Dust and Emissions During Construction and Demolition (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 A8.

9.4 The mitigation measures should be written into a DMP which may be integrated into a Code of Construction Practice or the Construction Environmental Management Plan (CEMP), 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.

9.5 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

9.6 The assessment has demonstrated that the overall air quality effect of the proposed development will be 'not significant'; it will not introduce any new exposure into areas of unacceptable air quality, nor will the proposed development-generated traffic emissions have a significant impact on local air quality. It is, therefore, not considered necessary to propose mitigation measures for this development.

9.7 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). The local air quality action plan that LBRuT is required to produce in order to address limit value exceedances in its area will also help to improve air quality.

Air Quality Neutral

9.8 While the development itself has no adverse impact on local air quality, the transport emissions predicted in the air quality neutral assessment exceed the benchmark derived for an average development of this nature in Outer London. Developments that exceed the benchmarks are required to implement on-site or off-site mitigation to offset the excess emissions (GLA, 2014a). The London Plan (GLA, 2021) states the following regarding offsetting of emissions:

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

9.9 Appropriate mitigation measures to offset the excess transport emissions will need to be agreed with the LBRuT during determination of the planning application.

9.10 It should be noted however, that although the TEB is exceeded for the proposed development, a suite of measures have been included within the design of the development to minimise transport emissions as far as practicably possible, including:

- provision of both long- and short-stay cycle parking spaces for both the residential and commercial elements of the proposed development, in line with the London Plan requirements;
- the provision of substantial new landscaped public realm, catering for new pedestrian routes and providing access to each of the development buildings. The pedestrian environment will

be of high quality with the provision of attractive public open spaces, well-maintained and legible routes, lighting, signage and the use of quality materials;

- good pedestrian access to a range of public transport options, alongside local amenities and services to minimise car trips by future residents and users. Specifically:
    - Twickenham Station via Marsh Farm Road at 15 minutes walking distance (1.28 km);
    - Twickenham Green bus stop (Stop GL) via Norcutt Rd and A305 at 7 minutes walking distance (640 m) and Twickenham Station bus stop via Marsh Farm Rd at 16 minutes walking distance (1.28km);
    - Strawberry Hill Railway Station is around a 16-minute walk (1.28 km) from the site to the south of the site;
    - the site is also within cycle distance of the Strawberry Hill, Twickenham Green and Heath Road areas, all of which provide access to a range of local amenities and services;
    - The site benefits from a number of bus routes in the area, with the closest bus routes situated along Twickenham Green (stops GC, GL, GT and GM), all of which are situated within a 6-minute walk to the south of the site. There are additional stops on Heath Road Grove Avenue (Stop GS) (an 8-minute walk) to the southeast of the site providing services towards Hounslow, Fulwell, Tolworth and Heathrow Airport; and
    - the closest railway station to the site is Strawberry Hill, situated a 13-minute walk (1.1 km) to the south of the site. Twickenham Railway Station, located approximately 1.6 km to the east of the site along Station Road, provides more train services;
- all parking associated with the proposed development will be provided on-site and will be available to residents only. There will be no visitor parking provision as part of the development. Visitor cycle parking will be provided within the public realm, encouraging active sustainable travel to/from the site for visitors of the residential and commercial uses;
- all parking spaces will be provided with passive provision for electric vehicle charging which can be implemented when demand requires. In line with London Plan requirements, 20% of the parking spaces will be fitted with an electric vehicle charging point at the time of completion of the development;
- the developer will work with local car club providers including Zipcar and Enterprise with an aim to provide a designated car club space for local residents;

- all residential dwellings within the development will be broadband ready, providing residents with the opportunity to sign up to an internet service provider. This will provide opportunities for both home working and home shopping, reducing the need to travel;
- residents will be provided with welcome packs, which will include instructions for providing the correct address for deliveries. This will seek to prevent deliveries to individual doors and encourage consolidation through the implementation of a Delivery and Servicing Plan;
- residents will also be provided with a Travel Pack upon occupation which will include:
    - promotion of local, sustainable travel networks;
    - links to relevant public transport travel information websites (such as the TfL journey planner);
    - promotion of local amenities, including the locations of many of the nearby key amenities to encourage trips by foot;
    - promotion of the provided cycle parking facilities and routes;
    - promotion of membership to the London Cycling Campaign (LCC);
    - promotion of the health benefits associated with alternative modes of transport;
    - details of carbon foot printing; and
    - promotion of key services and facilities;
- employment of a Travel Plan Coordinator (TPC) who will be available to provide personalised travel planning advice to residents of the development. The TPC will be able to identify routes to public transport services for residents travelling to work, schools and other key facilities.

10 Residual Impacts

Construction

10.1 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 9 and Appendix A8 are based on the GLA guidance. With these measures in place and effectively implemented the residual effects are judged to be 'not significant'.

10.2 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'.

Road Traffic Impacts

10.3 The residual impacts will be the same as those identified in Section 7. The overall effects of the proposed development will be 'not significant'.

11 Conclusions

11.1 The assessment has considered the impacts of the proposed development on local air quality in terms of dust and particulate matter emissions during construction and emissions from road traffic generated by the completed and occupied development. It has also identified the air quality conditions that future residents will experience and whether or not the proposed development is air quality neutral (as required by the London Plan). The assessment has been based on measurements made during 2019, and pre-pandemic activity and emissions forecasts, to ensure a worst-case assessment that does not take into account temporary reductions in pollutant concentrations as a result of reduced activity levels during the Covid-19 pandemic.

Construction Impacts

11.2 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. Appropriate measures have been recommended and, with these measures in place, it is expected that any residual effects will be 'not significant'.

Operational Impacts

11.3 Air quality conditions for future residents of the proposed development have been shown to be acceptable, with concentrations well below the air quality objectives throughout the site. The effects of emissions from locomotives on the adjacent rail line have been shown to be 'not significant'.

11.4 The assessment has demonstrated that pollutant concentrations will be well below the objectives at all existing receptors in 2026 (representing the proposed year of opening of the development), with or without the proposed development, and that the emissions from the additional traffic generated by the proposed development, will have a *negligible* impact on air quality conditions at all existing receptors along the local road network.

11.5 The overall operational air quality effects of the proposed development are judged to be 'not significant'.

Air Quality Neutral

11.6 The proposed development will have no adverse effects on local air quality conditions, and does not introduce new exposure within an area of poor air quality, thus no mitigation is necessary to address any operational impacts.

11.7 However, the road traffic generation of the proposed development exceeds the air quality neutral benchmark derived for an average development in Outer London, so mitigation will be required to account for the excess transport emissions above the air quality neutral benchmark. The air quality

neutral policy is intended to minimise the cumulative impacts of many developments throughout London. Mitigation measures to offset the excess transport emissions will need to be agreed with the LBRuT.

11.8 A suite of transport mitigation measures has been proposed to minimise private car use, and overall transport emissions.

Policy Implications

11.9 Taking into account these conclusions, it is judged that the proposed development is consistent with Paragraph 185 of the NPPF, being appropriate for its location both in terms of its effects on the local air quality environment and the air quality conditions for future residents. It is also consistent with Paragraph 186, as it will not affect compliance with relevant limit values or national objectives. The proposed development is compliant with Policy SI 1 of the London Plan in the following ways:

- it will not lead to further deterioration of existing poor air quality;
- it will not cause or extend any exceedances of legal air quality limits;
- it will not create new exposure to poor air quality; and
- has mitigation in place to minimise its air quality impacts as far as practicable.

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13 Glossary

AADT	Annual Average Daily Traffic
ADMS-Roads	Atmospheric Dispersion Modelling System model for Roads
AQAL	Air Quality Assessment Level
AQC	Air Quality Consultants
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
BEB	Building Emissions Benchmark
CAZ	Clean Air Zone
CEMP	Construction Environmental Management Plan
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMP	Dust Management Plan
EFT	Emission Factor Toolkit
EPUK	Environmental Protection UK
EU	European Union
EV	Electric Vehicle
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
Focus Area	Location that not only exceeds the 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
HMSO	Her Majesty's Stationery Office
IAQM	Institute of Air Quality Management
JAQU	Joint Air Quality Unit
kph	Kilometres Per hour

LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LB	London Borough
LDV	Light Duty Vehicles (<3.5 tonnes)
LEZ	Low Emission Zone
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
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
WHO	World Health Organisation
ZEC	Zero Emission Capable

14 Appendices

A1 London-Specific Policies and Measures

London Plan

Design-led Approach

A1.1 Policy D3 on optimising site capacity through the design-led approach states that *"development proposals should…help prevent or mitigate the impacts of noise and poor air quality"*. The explanatory text around this Policy states the following:

"Measures to design out exposure to poor air quality and noise from both external and internal sources should be integral to development proposals and be considered early in the design process. Characteristics that increase pollutant or noise levels, such as poorly-located emission sources, street canyons and noise sources should also be designed out wherever possible. Optimising site layout and building design can also reduce the risk of overheating as well as minimising carbon emissions by reducing energy demand".

Development Plans

A1.2 Policy SI1 of the London Plan (GLA, 2021) states the following regarding strategic development plans:

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.

Preliminary Air Quality Assessment

A1.3 The London Plan sets out expectations around the consideration of air quality in the design of all major developments:

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

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

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

Electric Vehicle Charging

A1.4 To support the uptake of zero tailpipe emission vehicles, Policy T6.1 of the London Plan states:

"All residential car parking spaces must provide infrastructure for electric or Ultra-Low Emission vehicles. At least 20 per cent of spaces should have active charging facilities, with passive provision for all remaining spaces".

London Environment Strategy

A1.5 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"*

A1.6 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)

A1.7 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 diesel-engined lorries, buses, coaches, large vans, minibuses and other specialist vehicles derived from lorries and vans. Since 1 March 2021, a standard of Euro VI has applied for HGVs, buses and coaches, while a standard of Euro 3 has applied for large vans, minibuses and other specialist diesel vehicles since 2012.

Ultra Low Emission Zone (ULEZ)

A1.8 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 and minibuses are required 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 and Euro 6 for diesel cars, vans and minibuses. The ULEZ does not include any requirements relating to heavy vehicle (HGV, coach and bus) emissions, as these are addressed by the amendments to the LEZ described in Paragraph A1.7.

A1.9 Since 25 October 2021, the ULEZ covers the entire area within the North and South Circular roads, applying the emissions standards set out in Paragraph A1.8.

Other Measures

A1.10 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.

A1.11 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 A8.

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 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.

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.

A3.16 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.

A3.17 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.

A3.18 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 A4.

A4 Professional Experience

Laurence Caird, MEarthSci CSci MIEnvSc MIAQM

Mr Caird is a Technical Director with AQC, with 16 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.

Samantha Barber, MChem (Hons) AMIEnvSc AMIAQM

Miss Barber is a Senior Consultant with AQC, having joined the company in November 2017. She has carried out assessments of air quality impacts for a range of projects, including EIA schemes, residential, commercial and mixed-use schemes, energy centres and power generation schemes. Miss Barber has also prepared construction dust risk assessments, Air Quality Neutral assessments, local authority Annual Status Reports (ASRs) and odour assessments. She has carried out numerous passive nitrogen dioxide monitoring surveys, and construction dust monitoring, at sites across Greater London.

Isabel Stanley, MSci (Hons)

Miss Stanley is a Consultant with AQC, having joined the company in October 2019. Prior to joining AQC she completed an MSci degree in Geology at the University of Bristol, where her studies included modules focusing on GIS, dispersion modelling and environmental geochemistry. She has undertaken numerous air quality assessments, including road traffic and plant emissions modelling, as well as indoor air quality plans and construction dust risk assessments.

A5 Modelling Methodology

Road Traffic

Model Inputs

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, street canyon width, street canyon height and porosity, where applicable). Vehicle emissions have been calculated based on vehicle flow, composition and speed data using the EFT (Version 10.1) published by Defra (2022d). Model input parameters are summarised in Table A5.1 and, where considered necessary, discussed further below.

Table A5.1: Summary of Model Inputs

Model Parameter	Value Used
Terrain Effects Modelled?	No
Variable Surface Roughness File Used?	No
Urban Canopy Flow Used?	No
Advanced Street Canyons Modelled?	Yes
Noise Barriers Modelled?	No
Meteorological Monitoring Site	Teddington
Meteorological Data Year	2019
Dispersion Site Surface Roughness Length (m)	1
Dispersion Site Minimum MO Length (m)	75
Met Site Surface Roughness Length (m)	0.3
Met Site Minimum MO Length (m)	75
Gradients?	No

A5.2 AADT flows, diurnal flow profiles, speeds, and vehicle fleet composition data have been provided by Velocity Transport Planning, who have undertaken the transport assessment work for the proposed development. Traffic speeds have been estimated based on those provided by Velocity Transport Planning and supplemented by 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 A5.2. Diurnal and monthly flow profiles for the traffic have been derived from the national profiles published by DfT (2020). The 2022 AADT flows have been back-factored to 2019 using a growth factor of 1.0291, derived using the TEMPro System v7.2 (DfT, 2017).

Table A5.2: Summary of Traffic Data Provided by the Transport Consultant (AADT Flows)

Road Link	2022		2026 (Without Scheme)		Proposed Development Traffic		2026 (With Scheme)	
	AADT	%HDV	AADT	%HDV	AADT	%HDV	AADT	%HDV
Gould Road	456	2%	470	2%	324	1%	794	2%
May Road	238	3%	246	3%	25	0%	271	3%
Crane Road	486	2%	501	2%	25	0%	526	2%
Edwin Road	490	3%	505	3%	310	1%	815	2%
Colne Road	922	2%	950	2%	40	0%	990	2%
Meadway	4,918	2%	5,069	2%	249	3%	5,318	2%
Whitton Road	9,529	4%	9,823	4%	24	0%	9,847	4%
London Road	12,096	4%	12,468	4%	36	0%	12,504	4%
York Street	13,294	6%	13,704	6%	60	0%	13,764	6%
Heath Road	14,602	4%	15,052	4%	2	0%	15,054	4%
Cross Deep	17,261	4%	17,793	4%	40	0%	17,833	4%
Hampton Road	8,833	9%	9,105	9%	30	0%	9,136	9%
Staines Road	11,410	4%	11,762	4%	50	0%	11,812	4%
Meadway	3,202	3%	3,300	3%	28	13%	3,329	3%
Andover Road	972	2%	1,002	2%	270	1%	1,272	2%
A316 Chertsey Road	45,122	5%	46,511	5%	124	3%	46,636	5%
A316 Chertsey Road	32,559	3%	33,562	3%	66	6%	33,628	3%

A5.3 The proposed development is predicted to generated more than 100 LDVs as an AADT on a number of the roads in the local area (highlighted grey in Table A5.2). The dispersion modelling of road traffic emissions undertaken in this assessment has been defined by these roads where development traffic exceeds this threshold, in accordance with the EPUK/IAQM guidance described in Paragraph A3.9. All roads where proposed development-generated traffic flows are below the thresholds have been excluded from the assessment as the air quality impacts will be not significant.

A5.4 A summary of the traffic data used in the ADMS-Roads dispersion modelling is presented in Table A5.3.

Table A5.3: Summary of Traffic Data Used in the Assessment (AADT Flows)

Road Link	2019 [a]		2026 (Without Scheme)		2026 (With Scheme)	
	AADT	%HDV	AADT	%HDV	AADT	%HDV
1 - A316 Chertsey Road	43,846	4.7	46,511	4.7	46,636	4.7
2 - A316 Chertsey Road	43,846	4.7	46,511	4.7	46,636	4.7
3 - A316 Chertsey Road	43,846	4.7	46,511	4.7	46,636	4.7
4 - Hampton Road	8,584	8.6	9,105	8.6	9,136	8.5
5 - Gould Road	443	2.0	470	2.0	794	1.7
6 - Andover Road	945	2.3	1,002	2.3	1,272	2.1
7 - Andover Road	945	2.3	1,002	2.3	1,272	2.1
8 - Meadway	3,111	2.6	3,300	2.6	3,329	2.7
9 - Staines Road	11,088	3.9	11,762	3.9	11,812	3.9
10 - Meadway	4,779	2.2	5,069	2.2	5,318	2.2
11 - May Road	232	2.9	246	2.9	271	2.6
12 - Crane Road	472	2.1	501	2.1	526	2.0
13 - Edwin Road	476	2.9	505	2.9	815	2.2
14 - Colne Road	896	1.8	950	1.8	990	1.7

[a] 2019 baseline flows have been estimated from the 2022 baseline data provided by Velocity shown in Table A5.2, adjusted using a TEMPro factor of 1.0291 as described in Paragraph A5.2.

A5.5 Figure A5.1 shows the road network included within the model, along with the speed at which each link was modelled and shows which sections of road have been modelled as canyons.

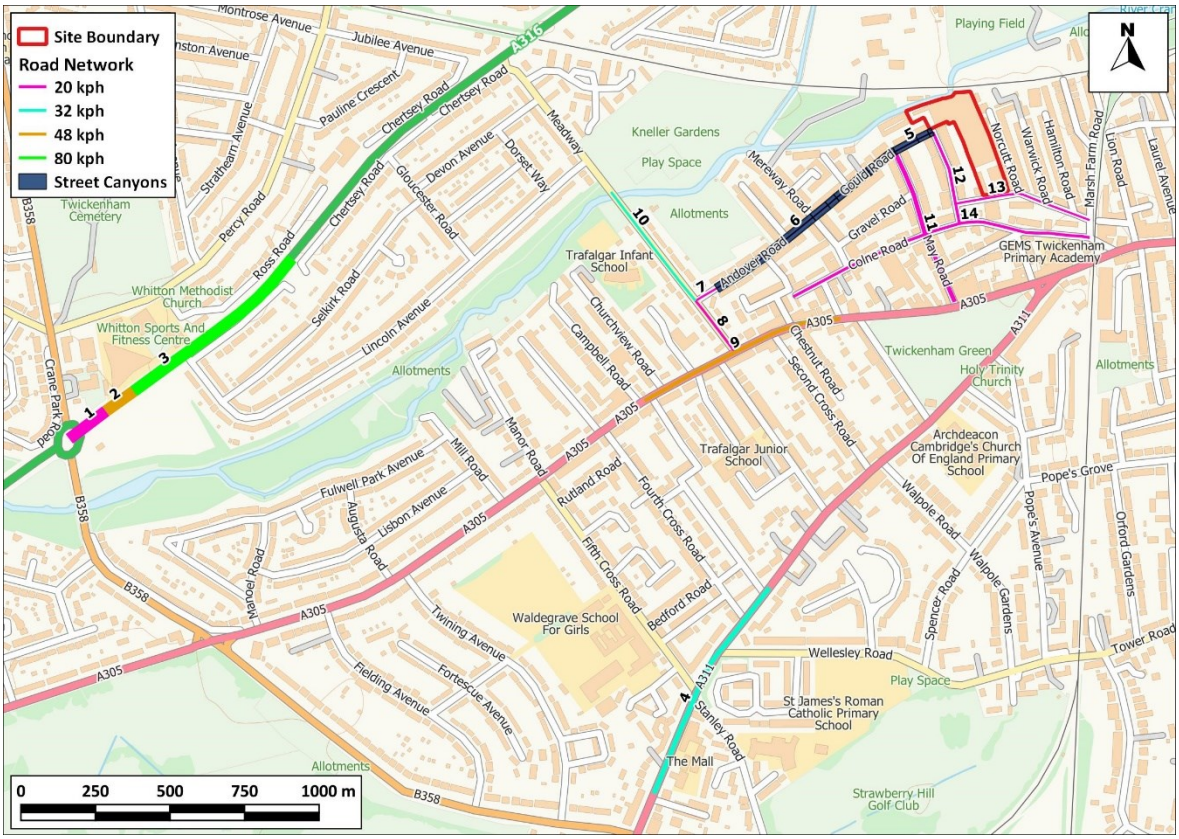

Figure A5.1: Modelled Road Network, Speed & Street Canyons

A5.6 For the purposes of modelling, it has been assumed that receptors along Gould Road and Andover Road are within a street canyon formed by the terraced buildings. These roads have a number of canyon-like features, which reduce dispersion of traffic emissions, and can lead to concentrations of pollutants being higher here than they would be in areas with greater dispersion. These roads have, therefore, been modelled as street canyons using ADMS-Roads' advanced canyon module, with appropriate input parameters determined from plans, on-site measurements, local mapping and photographs. The modelled canyons are shown in Figure A5.1.

A5.7 Hourly sequential meteorological data in sectors of 10 degrees from Teddington for 2019 have been used in the model. The Teddington meteorological monitoring station is located approximately 2.5 km to the south of the proposed development. Both the application site and the Teddington meteorological monitoring station are located in the southwest of London where they will be influenced by the effects of inland meteorology over urban topography. The topography of the model domain is similar to that around the meteorological monitoring station and measurements from this site are considered to provide the most robust basis to predict meteorology within the model domain.

A wind rose for the site for the year 2019 is provided in Figure A5.2. 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.

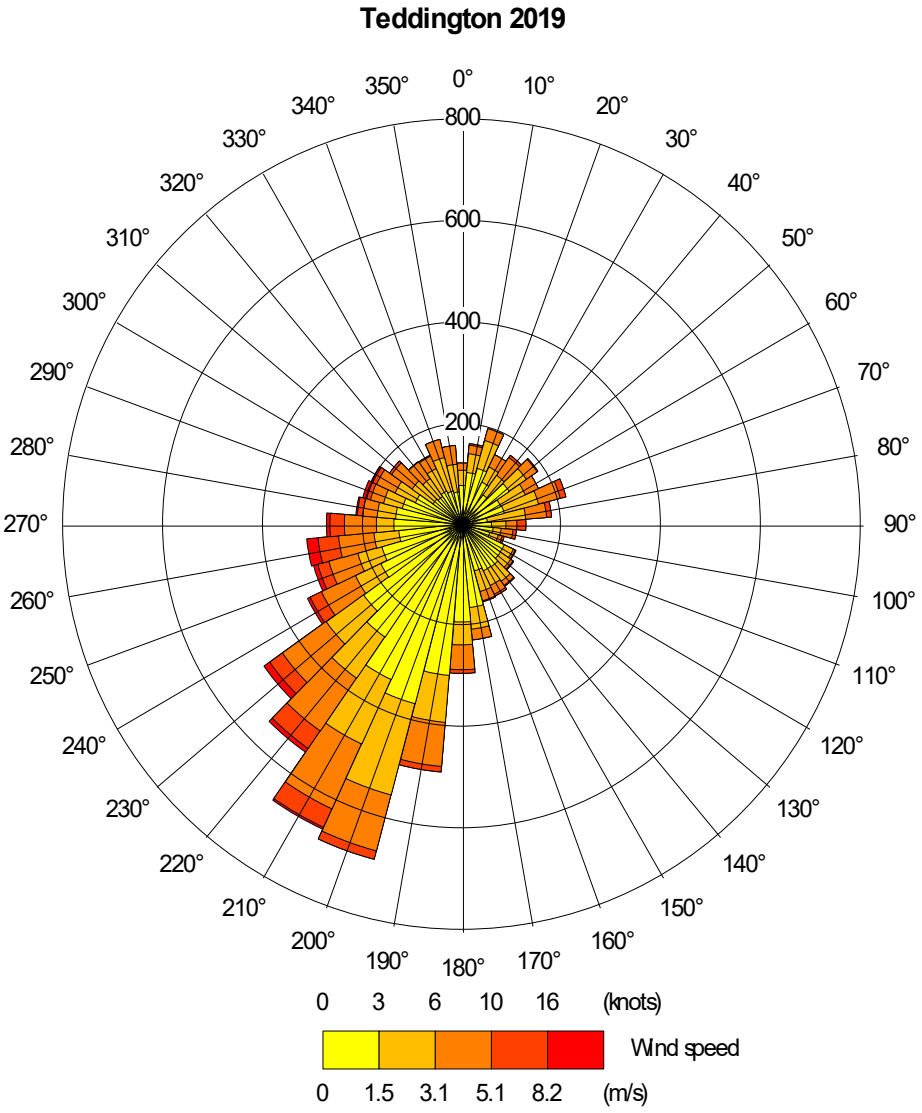

Figure A5.2: Wind Rose from Teddington (2019)

Model Verification

A5.8 Evidence collected over many years has shown that, in most urban areas, dispersion modelling relying upon Defra's EFT has tended to systematically under-predict roadside NO_2 concentrations. To account for this, it is necessary to adjust the model against local measurements. The model has been run to predict annual mean NO_2 concentrations during 2019 at the diffusion tube monitoring sites '9' and '57'. These sites have been selected because they are in roadside locations adjacent to roads for which traffic data are available. Sites '32', '33', '61', '65' and 'Rut01' have been excluded from the model verification due to being located close to junctions within Twickenham town centre,

where pollutant concentrations are elevated; this is not considered to be representative of conditions within the study area.

NO_2

A5.9 Most 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).

A5.10 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 (Defra, 2022d).

A5.11 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 1.406 has been applied to the modelled road-NOx concentration for each receptor to provide adjusted modelled road-NOx concentrations.

A5.12 The total NO_2 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 reasonable agreement.

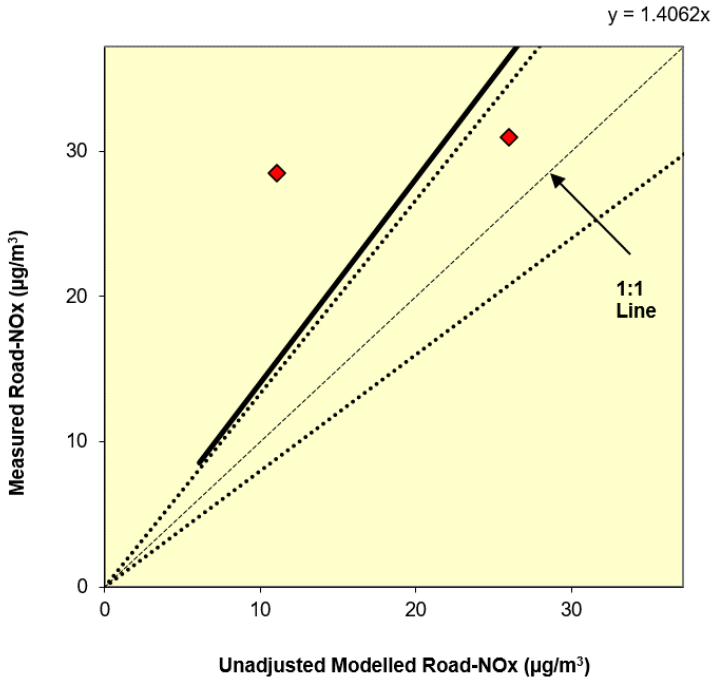

Figure A5.3: Comparison of Measured Road NOx to Unadjusted Modelled Road NOx Concentrations. The dashed lines show ± 25%.

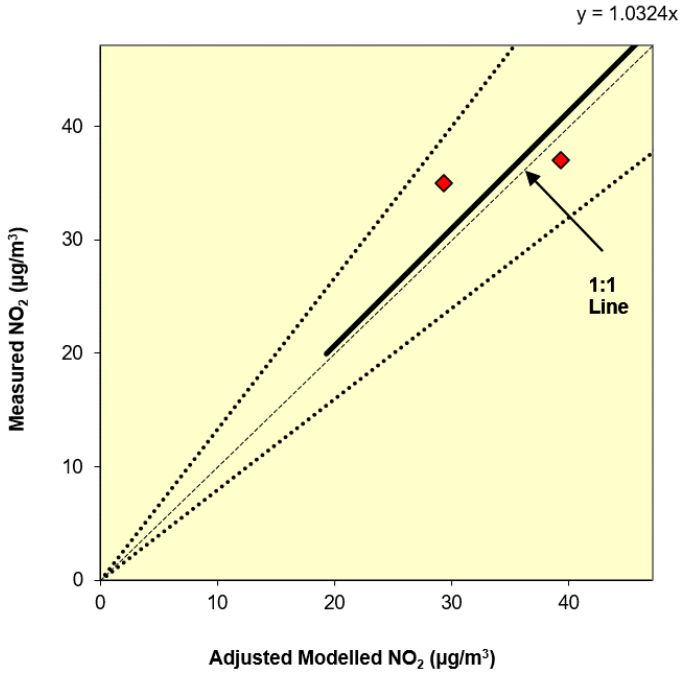

Figure A5.4: Comparison of Measured Total NO_2 to Final Adjusted Modelled Total NO_2 Concentrations. The dashed lines show ± 25%.

PM_{10} and $PM_{2.5}$

A5.13 The approach described above for NOx and NO_2 determines the road increment of concentrations by subtracting the predicted local background from the roadside measurements. This works well for NOx because the differences between roadside and background concentrations typically represent a large proportion of the total measured value. The same is not true for PM_{10} and $PM_{2.5}$ concentrations, which are dominated by non-road emissions, even at the roadside. In practice, the influence of a local road on concentrations can often be smaller than the uncertainty in the mapped background concentration. As an example of this, 31% of all roadside and kerbside sites in London which measured $PM_{2.5}$ in 2019 with >75% data capture, recorded an annual mean concentration lower than the equivalent Defra mapped background value. Using measured background concentrations does not provide any significant benefit, owing largely to the spatial resolution of available measurements, but also because of measurement uncertainty. For example, hourly-mean $PM_{2.5}$ concentrations measured at roadside sites are often lower than those measured at nearby urban background sites, while concentrations at urban background sites are often lower than those measured at rural sites.

A5.14 For these reasons, it is not appropriate to calculate the annual mean road-increment to PM_{10} and $PM_{2.5}$ concentrations by subtracting either the mapped background or a local measured background concentration. This, in turn, means that the approach to model adjustment which is described for NOx and NO_2 is not appropriate for PM_{10} and $PM_{2.5}$. Historically, many studies have derived a model adjustment factor for NOx and applied this to PM_{10} and $PM_{2.5}$. This is also not appropriate, since there is no reason to expect the same bias in emissions of NOx, PM_{10} and $PM_{2.5}$.

A5.15 While there is very strong evidence that EFT-based models have consistently under-predicted road-NOx concentrations in urban areas, there is no equivalent evidence for PM_{10} and $PM_{2.5}$. There is currently no strong basis for applying any adjustment to the model outputs. Predicted concentrations of PM_{10} and $PM_{2.5}$ have thus not been adjusted.

Post-processing

A5.16 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, 2022d). 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.

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 A1.7 and A1.9. 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 NO_2 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, 2020b) 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.

A6.5 As outlined in Paragraph 4.19, 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 NO_2 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

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.

A7 'Air Quality Neutral'

A7.1 The GLA's SPG on Sustainable Design and Construction (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.

A7.2 The benchmarks for heating and energy plant (termed 'Building Emissions Benchmarks' or 'BEBs') are set out in Table A7.1, while the 'Transport Emissions Benchmarks' ('TEBs') are set out in Table A7.2. 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 A7.3 and Table A7.4 (upon which the TEBs are based) is used. Similarly, the information in Table A7.5 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 A7.6 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. As noted in Paragraph 4.25, the air quality neutral benchmarks are based around old planning use classes.

Table A7.1: 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 A7.2: Transport Emissions Benchmarks

Land use	Central Activity Zone	Inner [a]	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] Inner London and Outer London as defined in the LAEI (GLA, 2019).

Table A7.3: 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 A7.4: 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 A7.5: 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 A7.6: Average Number of Trips per Annum for Different Development Categories

Land use	Number of Trips (trips/m^2/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

A8 Construction Mitigation

A8.1 Table A8.1 presents a set of best-practice measures from the GLA guidance (2014b) that should be incorporated into the specification for the works. These measures should be written into a DMP. 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 DMP.

Table A8.1: Best-Practice Mitigation Measures Recommended for the Works

Measure	Desirable	Highly Recommended
Site Management		
Develop and implement a stakeholder communications plan that includes community engagement before work commences on site		✓
Develop a 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		✓
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		✓
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 NRMM comply with London's NRMM emission standards. Currently, NRMM used on any site within Greater London are required to meet Stage IIIB of EU Directive 97/68/EC (The European Parliament and the Council of the European Union, 1997) and its subsequent amendments as a minimum, while NRMM used on any site within the Central Activity Zone, Canary Wharf or one of London's Opportunity Areas are required to meet Stage IV of the Directive as a minimum. The proposed development is not within an area where this stricter requirement applies. From January 2025, NRMM used anywhere in London will be required to meet stage IV, while from January 2030 the stage V standard will apply. From January 2040 only zero emission machinery will be allowed.		✓
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		✓
Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials		✓
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 non-potable 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		✓

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		✓
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		✓
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		✓
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	✓	
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		✓
Apply dust suppressants to locations where a large volume of vehicles enter and exit the construction site	✓	