

75-81 George Street, Richmond



Air Quality Assessment

Air Quality Consultants Limited

7/12/2019



Air Quality Assessment:
75-81 George Street,
Richmond upon Thames

July 2019



Experts in air quality
management & assessment

Document Control

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Executive Summary

The air quality impacts associated with the proposed commercial development at 75-81 George Street, Richmond upon Thames, have been assessed. The development will involve a change of use from retail to offices above ground floor level and the construction of an additional storey, also for office use.

The proposed development will lead to a change in 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.

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

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

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1 Introduction

- 1.1 This report describes the potential air quality impacts associated with the proposed commercial development at 75-81 George Street, Richmond upon Thames. The assessment has been carried out by Air Quality Consultants Ltd on behalf of Canadian and Arcadia Ltd.
- 1.2 The proposed development will involve the erection of an additional storey at fourth floor level (with associated roof terrace) and a plant room above, a second floor rear extension, replacement of the roof of the adjacent existing single storey extension at the rear to include a roof light, an enclosed staircase to the rear, terraces to the rear and associated plant. Other elevational alterations include removal of the canopy to 80 George Street, new shopfronts to 4 Paved Court, Golden Court entrance, and King Street and George Street frontages, new fenestration throughout and new canopies. It will involve the change of use of 80 George Street from A1 (retail) to mixed use comprising: Class B1 to the existing floors 2 and 3 and the new fourth floor, Flexible Class A1 and Class B1 (existing floor 1), Class A1 (existing ground floor), Flexible Class A1 and Class D2 (existing basement), and Change of use of 16 Paved Court/20 King Street to Class B1 (existing floors 1, 2).
- 1.3 The proposed development lies within a borough-wide Air Quality Management Area (AQMA) declared by the London Borough of Richmond for exceedances of the annual mean nitrogen dioxide (NO₂) objective and the annual and 24-hour mean particulate matter (PM₁₀) objectives. The development will lead to changes in vehicle flows on local roads, which may impact on air quality at existing residential properties. The main air pollutants of concern related to road traffic emissions are nitrogen dioxide (NO₂) and fine particulate matter (PM₁₀ and PM_{2.5}).
- 1.4 The Greater London Authority's (GLA's) London Plan (GLA, 2016a) requires new developments to be air quality neutral. The air quality neutrality of the proposed development has, therefore, been assessed following the methodology provided in the Greater London Authority's (GLA's) Supplementary Planning Guidance (SPG) on Sustainable Design and Construction (GLA, 2014a).
- 1.5 The GLA has also released Supplementary Planning Guidance on the Control of Dust and Emissions from Construction and Demolition (GLA, 2014b). The SPG outlines a risk assessment approach for construction dust assessment and helps determine the mitigation measures that will need to be applied. A construction dust assessment has been undertaken and the appropriate mitigation has been set out.
- 1.6 This report describes existing local air quality conditions (base year 2017), and the predicted air quality in the future. The assessment of construction dust impacts focuses on the anticipated duration of the works.

This report has been prepared taking into account all relevant local and national guidance and regulations.

2 Policy Context and Assessment Criteria

Air Quality Strategy

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

Clean Air Strategy 2019

- 2.2 The Clean Air Strategy (Defra, 2019a) 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.

Planning Policy

National Policies

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

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

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

“Planning policies and decisions should contribute to and enhance the natural and local environment by...preventing new and existing development from contributing to, being put at unacceptable risk

from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air quality”.

and

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

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

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

2.6 The NPPF is supported by Planning Practice Guidance (PPG) (Ministry of Housing, Communities & Local Government, 2019b), which includes guiding principles on how planning can take account of the impacts of new development on air quality. The PPG states that *“Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values”* and *“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”*. The role of the local authorities is covered by the LAQM regime, with the PPG stating that local authority Air Quality Action Plans *“identify measures that will be introduced in pursuit of the objectives”*. 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”*.

2.7 The PPG states that:

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

- 2.8 The PPG sets out the information that may be required in an air quality assessment, making clear that “Assessments should be proportionate to the nature and scale of development proposed and the level of concern about air quality”. It 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 where necessary, will depend on the proposed development and should be proportionate to the likely impact”.

London-Specific Policies

The London Plan

- 2.9 The London Plan (GLA, 2016a) sets out the spatial development strategy for London consolidated with alterations made to the original plan since 2011. It brings together all relevant strategies, including those relating to air quality.
- 2.10 Policy 7.14, ‘Improving Air Quality’, addresses the spatial implications of the Mayor’s Air Quality Strategy and how development and land use can help achieve its objectives. It recognises that Boroughs should have policies in place to reduce pollutant concentrations, having regard to the Mayor’s Air Quality Strategy.
- 2.11 Policy 7.14B(c), requires that development proposals should be “at least ‘air quality neutral’ and not lead to further deterioration of existing poor air quality (such as designated Air Quality Management Areas (AQMAs))”. Further details of the London Plan in relation to planning decisions are provided in Appendix A1.
- 2.12 Consultation on a draft new London Plan (GLA, 2017) closed on 2 March 2018, with an examination in public to follow. The current timescale is that the new London Plan will be adopted in Autumn 2019. However, the draft London Plan is a material consideration in planning decisions, which will gain more weight as it moves through the process to adoption. Policy SI1 on ‘Improving Air Quality’ states that “London’s air quality should be significantly improved and exposure to poor air quality, especially for vulnerable people, should be reduced”. It goes on to detail that development proposals should not:
- “lead to further deterioration of existing poor air quality
 - create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits
 - reduce air quality benefits that result from the Mayor’s or boroughs’ activities to improve air quality
 - create unacceptable risk of high levels of exposure to poor air quality”.

- 2.13 It also states that “*the development of large-scale redevelopment areas, such as Opportunity Areas and those subject to an Environmental Impact Assessment should propose methods of achieving an Air Quality Positive approach through the new development. All other developments should be at least Air Quality Neutral*”.

London Environment Strategy

- 2.14 The London Environment Strategy was published in May 2018 (GLA, 2018a). The strategy considers air quality in Chapter 4; the Mayor’s main objective is to create a “*zero emission London by 2050*”. Policy 4.2.1 aims to “*reduce emissions from London’s road transport network by phasing out fossil fuelled vehicles, prioritising action on diesel, and enabling Londoners to switch to more sustainable forms of transport*”. An implementation plan for the strategy has also been published which sets out what the Mayor will do between 2018 and 2023 to help achieve the ambitions in the strategy.

Mayor’s Transport Strategy

- 2.15 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*”.

The Mayor’s Air Quality Strategy

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

GLA SPG: Sustainable Design and Construction

- 2.17 The GLA’s SPG on Sustainable Design and Construction (GLA, 2014a) provides details on delivering some of the priorities in the London Plan. Section 4.3 covers Air Pollution. It defines when developers will be required to submit an air quality assessment, explains how location and transport measures can minimise emissions to air, and provides emission standards for gas-fired boilers, Combined Heat and Power (CHP) and biomass plant. It also sets out, for the first time, guidance on how Policy 7.14B(c) of the London Plan relating to ‘air quality neutral’ (see Paragraph 2.11, above) should be implemented.

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

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

Air Quality Focus Areas

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

Local Policies

- 2.20 The London Borough of Richmond Local Plan (London Borough of Richmond upon Thames, 2018a) was adopted in July 2018, and within this Policy LP 10 on Local Environmental Impacts, Pollution and Land Contamination refers to Air Quality and states that:

"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."*

Air Quality Action Plans

National Air Quality Plan

2.21 Defra has produced an Air Quality Plan to tackle roadside nitrogen dioxide concentrations in the UK (Defra, 2017a). Alongside a package of national measures, the Plan requires those English Local Authorities (or the GLA in the case of London Authorities) that are predicted to have exceedances of the limit values beyond 2020 to have produced local action plans by December 2018. These plans must have 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 practical way to take account of the effects of the national Plan in this assessment; however, consideration has been given to whether there is currently, or is likely to be in the future, a limit value exceedance in the vicinity of the proposed development. This assessment has principally been carried out in relation to the air quality objectives, rather than the EU limit values that are the focus of the Air Quality Plan.

Local Air Quality Action Plan

2.22 The London Borough of Richmond declared a borough-wide AQMA for nitrogen dioxide and PM₁₀ in 2000. The Council has since developed an Air Quality Action Plan, which sets out measures to improve air quality at the Londonwide, Boroughwide and local scales (London Borough of Richmond upon Thames, 2014).

Assessment Criteria

Health Criteria

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

2.24 The objectives for nitrogen dioxide and PM₁₀ were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. The PM_{2.5} objective is to be achieved by 2020. Measurements across the UK have shown that the 1-hour nitrogen dioxide objective is unlikely to be exceeded at roadside locations where the annual mean concentration is below 60 µg/m³ (Defra, 2018). Therefore, 1-hour nitrogen dioxide concentrations will only be considered if the annual mean concentration is above this level.

- 2.25 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. Defra explains where these objectives will apply in its Local Air Quality Management Technical Guidance (Defra, 2018). The annual mean objectives for nitrogen dioxide and PM₁₀ 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 PM₁₀ is considered to apply at the same locations as the annual mean objective, as well as in gardens of residential properties and at hotels. The 1-hour mean objective for nitrogen dioxide applies wherever members of the public might regularly spend 1-hour or more, including outdoor eating locations and pavements of busy shopping streets.
- 2.26 The European Union has also set limit values for nitrogen dioxide, PM₁₀ and PM_{2.5} (The European Parliament and the Council of the European Union, 2008). The limit values for nitrogen dioxide are the same numerical concentrations as the UK objectives, but achievement of these values is a national obligation rather than a local one. In the UK, only monitoring and modelling carried out by UK Central Government meets the specification required to assess compliance with the limit values. Central Government does not recognise local authority monitoring or local modelling studies when determining the likelihood of the limit values being exceeded.
- 2.27 The relevant air quality criteria for this assessment are provided in Table 1.

Table 1: Air Quality Criteria for Nitrogen Dioxide, PM₁₀ and PM_{2.5}

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

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

Construction Dust Criteria

- 2.28 There are no formal assessment criteria for dust. In the absence of formal criteria, the approach developed by the IAQM¹ (2016) has been used (the GLA's SPG (GLA, 2014b) recommends that the assessment be based on the latest version of the IAQM guidance). Full details of this approach are provided in Appendix A2.

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

Screening Criteria for Road Traffic Assessments

- 2.29 Environmental Protection UK (EPUK) and the IAQM recommend a two-stage screening approach (Moorcroft and Barrowcliffe et al, 2017) to determine whether emissions from road traffic generated by a development have the potential for significant air quality impacts. The approach, as described in Appendix A3, first considers the size and parking provision of a development; if the development is residential and is for fewer than ten homes or covers less than 0.5 ha, or is non-residential and will provide less than 1,000 m² of floor space or cover a site area of less than 1 ha, and will provide ten or fewer parking spaces, then there is no need to progress to a detailed assessment. The second stage then compares the changes in vehicle flows on local roads that a development will lead to against specified screening criteria. Where these criteria are exceeded, a detailed assessment is required, although the guidance advises that *“the criteria provided are precautionary and should be treated as indicative”*, and *“it may be appropriate to amend them on the basis of professional judgement”*.

Descriptors for Air Quality Impacts and Assessment of Significance

Construction Dust Significance

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

Operational Significance

- 2.31 There is no official guidance in the UK in relation to development control on how to describe air quality impacts, nor how to assess their significance. The approach developed jointly by EPUK and the IAQM (Moorcroft and Barrowcliffe et al, 2017) has therefore been used. Full details of the EPUK/IAQM approach are provided in Appendix A3. The approach includes elements of professional judgement, and the experience of the consultants preparing the report is set out in Appendix A4.

3 Assessment Approach

Existing Conditions

- 3.1 Existing sources of emissions within the study area have been defined using a number of approaches. Industrial and waste management sources that may affect the area have been identified using Defra's Pollutant Release and Transfer Register (Defra, 2019b). Local sources have also been identified through examination of the Council's Air Quality Review and Assessment reports.
- 3.2 Information on existing air quality has been obtained by collating the results of monitoring carried out by the local authority. Background concentrations have been defined using the national pollution maps published by Defra (2019c). These cover the whole of the UK on a 1x1 km grid.
- 3.3 Exceedances of the annual mean EU limit value for nitrogen dioxide in the study area have been identified using the maps of roadside concentrations published by Defra (2017b) as part of its 2017 Air Quality Plan for the baseline year 2015 and for the future years 2017 to 2030. These maps are used by the UK Government, together with the results from national Automatic Urban and Rural Network (AURN) monitoring sites that operate to EU data quality standards, to report exceedances of the limit value to the EU. The national maps of roadside PM₁₀ and PM_{2.5} concentrations (Defra, 2019d), which are available for the years 2009 to 2015, show no exceedances of the limit values anywhere in the UK in 2015.

Construction Impacts

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

Road Traffic Impacts

- 3.5 The first step in considering the road traffic impacts of the proposed development has been to screen the development and its traffic generation against the criteria set out in the EPUK/IAQM guidance (Moorcroft and Barrowcliffe et al, 2017), as described in Paragraph 2.29 and detailed further in

Appendix A3. Where impacts can be screened out there is no need to progress to a more detailed assessment.

‘Air Quality Neutral’

- 3.6 The guidance relating to air quality neutral follows a tiered approach, such that all developments are expected to comply with minimum standards for gas and biomass boilers and for CHP plant (GLA, 2014a). Compliance with ‘air quality neutral’ is then founded on emissions benchmarks that have been derived for both building (energy) use and road transport in different areas of London. Developments that exceed the benchmarks are required to implement on-site or off-site mitigation to offset the excess emissions (GLA, 2014a).
- 3.7 Appendix A5 sets out the emissions benchmarks. The approach has been to calculate the emissions from the development and to compare them with these benchmarks.

4 Site Description and Baseline Conditions

- 4.1 The proposed development site is located approximately 500 m to the south west of Richmond Railway Station. The site is bounded by George Street, King Street, Paved Court and Golden Court, as well as by a small number of commercial properties. It currently consists of a department store.

Industrial sources

- 4.2 A search of the UK Pollutant Release and Transfer Register (Defra, 2019b) has not identified any significant industrial or waste management sources that are likely to affect the proposed development, in terms of air quality.

Air Quality Management Areas

- 4.3 The London Borough of Richmond has investigated air quality within its area as part of its responsibilities under the LAQM regime. In December 2000 an AQMA was declared covering the whole borough for exceedances of the annual mean nitrogen dioxide objective and the annual mean and 24-hour mean PM₁₀ objectives.

Air Quality Focus Areas

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

Local Air Quality Monitoring

- 4.5 Richmond Council operates four automatic monitoring stations within its area. The closest of these is located on Chertsey Road, approximately 2.5 km south west of the proposed development site. The Council also operates a number of nitrogen dioxide monitoring sites using diffusion tubes prepared and analysed by Gradko (using the 50% TEA in acetone method). Results for the years 2012 to 2017 are summarised in Table 2 and the monitoring locations are shown in Figure 1.

Table 2: Summary of Nitrogen Dioxide (NO₂) Monitoring (2012-2017) ^{a,b}

Site No.	Site Type	Location	2012	2013	2014	2015	2016	2017
Automatic Monitor - Annual Mean (µg/m³) ^a								
RHG	Roadside	Chertsey Road	44	43	42	- ^c	- ^c	37
Objective			40					
Automatic Monitor - No. of Hours > 200 µg/m³								
RHG	Roadside	Chertsey Road	0	0	0	- ^c	- ^c	0
Objective			18					
Diffusion Tubes - Annual Mean (µg/m³)								
17	Kerbside	Red Lion Street	<u>70</u>	<u>68</u>	<u>68</u>	<u>63</u>	<u>69</u>	<u>60</u>
43	Kerbside	Hill Street	<u>78</u>	<u>87</u>	<u>80</u>	<u>80</u>	<u>85</u>	<u>78</u>
Rut 02	Kerbside	George Street	<u>95</u>	<u>94</u>	<u>88</u>	<u>88</u>	<u>96</u>	<u>82</u>
Objective			40					

^a Exceedances of the objectives are shown in bold. Annual means in excess of 60 µg/m³, indicating a potential exceedance of the hourly mean objective, are shown in bold and underlined.

^b Results have been taken from the 2017 Annual Status Report (London Borough of Richmond upon Thames, 2018b).

^c Site RHG uses a mobile air quality monitoring unit, which was stationed at three different sites during each of 2015 and 2016. Results are thus not presented for these years.

4.6 The annual mean objective was exceeded at the Chertsey Road site from 2012 to 2014 and at every diffusion tube site located in close proximity to the proposed development in every year for which data are presented. Furthermore, with the exception of the Red Lion Street site in 2017, the annual mean concentrations at the diffusion tube sites have exceeded 60 µg/m³, indicating a potential exceedance of the hourly mean objective. There are no clear trends in monitoring results over the past six years.

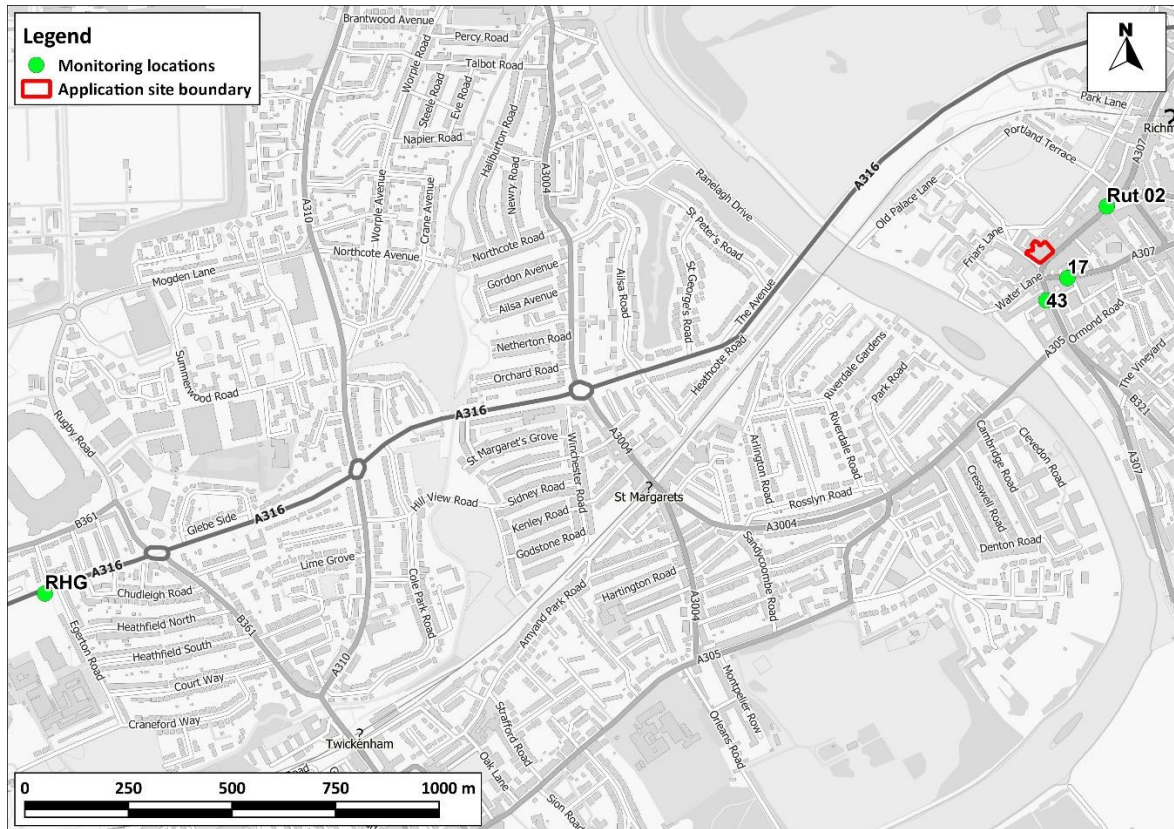


Figure 1: Monitoring Locations

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4.7 The Chertsey Road automatic monitoring station also measures PM₁₀ concentrations. Results for the years 2012 to 2017 are summarised in Table 3. There have been no measured exceedances of the PM₁₀ objectives at the Chertsey Road automatic monitoring station. There are no monitors measuring PM_{2.5} concentrations close to the proposed development.

Table 3: Summary of PM₁₀ Automatic Monitoring (2012-2017)

Site No.	Site Type	Location	2012	2013	2014	2015	2016	2017
PM₁₀ Annual Mean (µg/m³)								
RHG	Roadside	Chertsey Road	24	25	-	-	-	18
Objective			40					
PM₁₀ No. Days >50 µg/m³								
RHG	Roadside	Chertsey Road	10	8	-	-	-	1
Objective			35					

Exceedances of EU Limit Value

- 4.8 There are several AURN monitoring sites within the Greater London Urban Area that have measured exceedances of the annual mean nitrogen dioxide limit value. Furthermore, Defra's roadside annual mean nitrogen dioxide concentrations (Defra, 2017b), which are used to report exceedances of the limit value to the EU, and which have been updated to support the 2017 Air Quality Plan, identify exceedances of this limit value in 2015 along many roads in London, including the A305 and A316 near to the proposed development. The Greater London Urban Area has thus been reported to the EU as exceeding the limit value for annual mean nitrogen dioxide concentrations. Defra's predicted concentrations for 2020, presented for three scenarios ('baseline', 'with CAZs' and 'with CAZs and additional actions' – the latter two taking account of the measures contained in its 2017 Air Quality Plan (Defra, 2017a)), identify continued exceedances of the limit value along the A316 within 1 km of the proposed development.
- 4.9 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 comes, 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 Mayors Transport Strategy.

Background Concentrations

- 4.10 Estimated background concentrations at the proposed development have been determined for 2017 and the opening year of 2020 using Defra's background maps (Defra, 2019c). The background pollutant concentrations across the study area have been defined using the national pollution maps published by Defra (2019c). These cover the whole of the UK on a 1x1 km grid and are published for each year from 2015 until 2030. The background annual mean nitrogen oxides and nitrogen dioxide maps for 2017 have been calibrated against concurrent measurements from national monitoring sites (AQC, 2018). The calibration factor calculated has also been applied to future year backgrounds. This has resulted in slightly higher predicted nitrogen oxides and nitrogen dioxide

concentrations for the future assessment year than those derived from the Defra maps. The background concentrations are set out in Table 4 and are all well below the objectives.

Table 4: Estimated Annual Mean Background Pollutant Concentrations in 2017 and 2020 ($\mu\text{g}/\text{m}^3$)

Year	NO ₂	PM ₁₀	PM _{2.5}
2017	25.4	16.3	10.5
2020	22.2	15.8	10.1
Objectives	40	40	25 ^a

N/A = not applicable. The range of values is for the different 1x1 km grid squares covering the study area.

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

5 Construction Phase Impact Assessment

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

Potential Dust Emission Magnitude

Demolition

- 5.2 There will be a requirement to demolish an external staircase, paving and lighting. Based on the example definitions set out in Table A2.1 in Appendix A2, the dust emission class for demolition is considered to be *small*.

Earthworks

- 5.3 The characteristics of the soil at the development site have been defined using the British Geological Survey's UK Soil Observatory website (British Geological Survey, 2019), as set out in Table 5. Overall, it is considered that, when dry, this soil has the potential to be slightly dusty.

Table 5: Summary of Soil Characteristics

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

^a grain size 0.06 – 2.0 mm.

^b grain size > 2.0 mm.

^c a loam is composed mostly of sand and silt.

- 5.4 An area of the site will be subject to earthworks, including removal of the foundations of the demolished structures. Dust will arise mainly 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 *small*.

Construction

- 5.5 Construction will involve a rooftop extension to provide additional office space, with a total volume of around 3,400 m³. Dust will arise from the handling and storage of dusty materials, and from the

cutting of concrete. Based on the example definitions set out in Table A2.1 in Appendix A2, the dust emission class for construction is considered to be *small*.

Trackout

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

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

Table 6: Summary of Dust Emission Magnitude

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

Sensitivity of the Area

5.8 This assessment step combines the sensitivity of individual receptors to dust effects with the number of receptors in the area and their proximity to the site. It also considers additional site-specific factors such as topography and screening, and in the case of sensitivity to human health effects, baseline PM₁₀ concentrations.

Sensitivity of the Area to Effects from Dust Soiling

5.9 The IAQM guidance, upon which the GLA's guidance is based, explains that residential properties are 'high' sensitivity receptors to dust soiling, while workplaces are 'medium' sensitivity receptors (Table A2.2 in Appendix A2). There are approximately 5 residential properties within 20 m and 25 residential properties within 50 m of the site (see Figure 2). Using the matrix set out in Table A2.3 in Appendix A2, the area surrounding the onsite works is of 'medium' sensitivity to dust soiling.

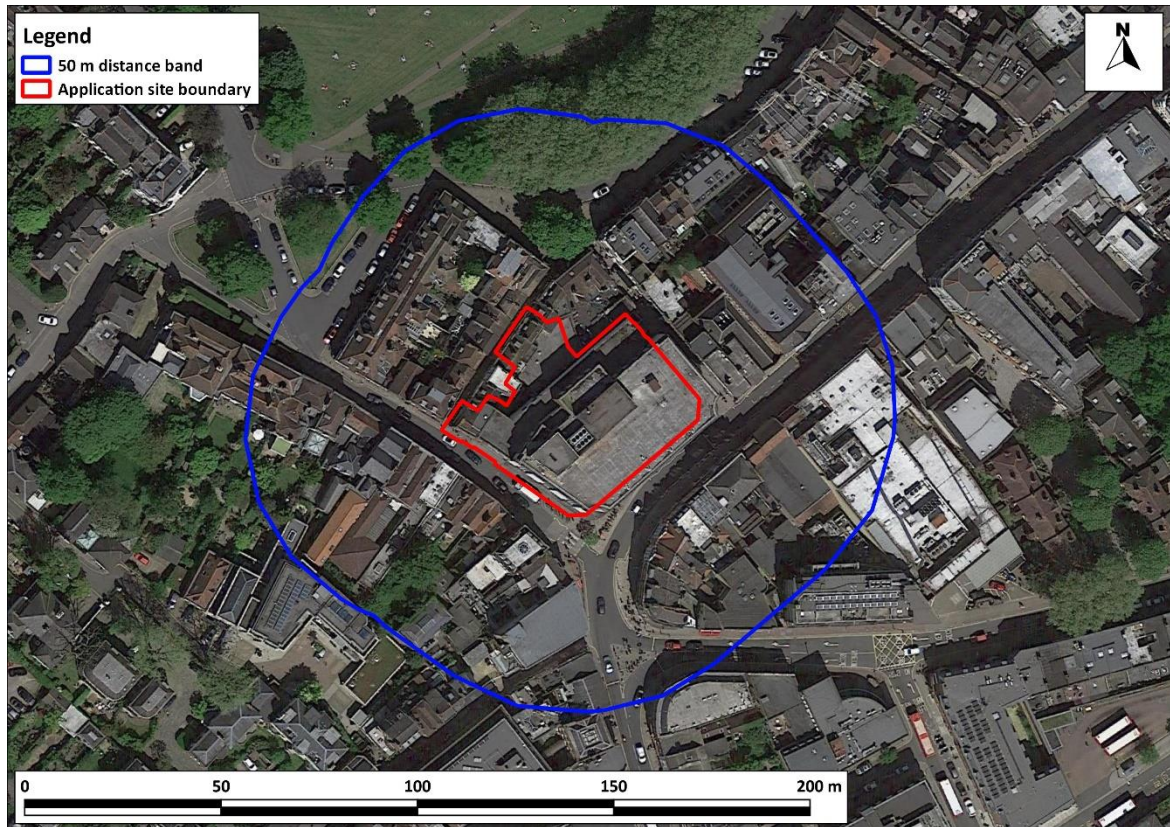


Figure 2: 50 m Distance Band around Site Boundary

Imagery ©2019 Google.

- 5.10 Table 6 shows that the dust emission magnitude for trackout is *small* and Table A2.3 in Appendix A2 thus explains that there is a risk of material being tracked 50 m from the site exit. Construction vehicles leaving the site will travel northwest along King Street and around Richmond Green towards the A316 Twickenham Road. There are approximately 9 residential properties within 20 m and 20 residential properties within 50 m of the roads along which material could be tracked (see Figure 3), and Table A2.3 in Appendix A2 thus indicates that the area is of 'medium' sensitivity to dust soiling due to trackout.

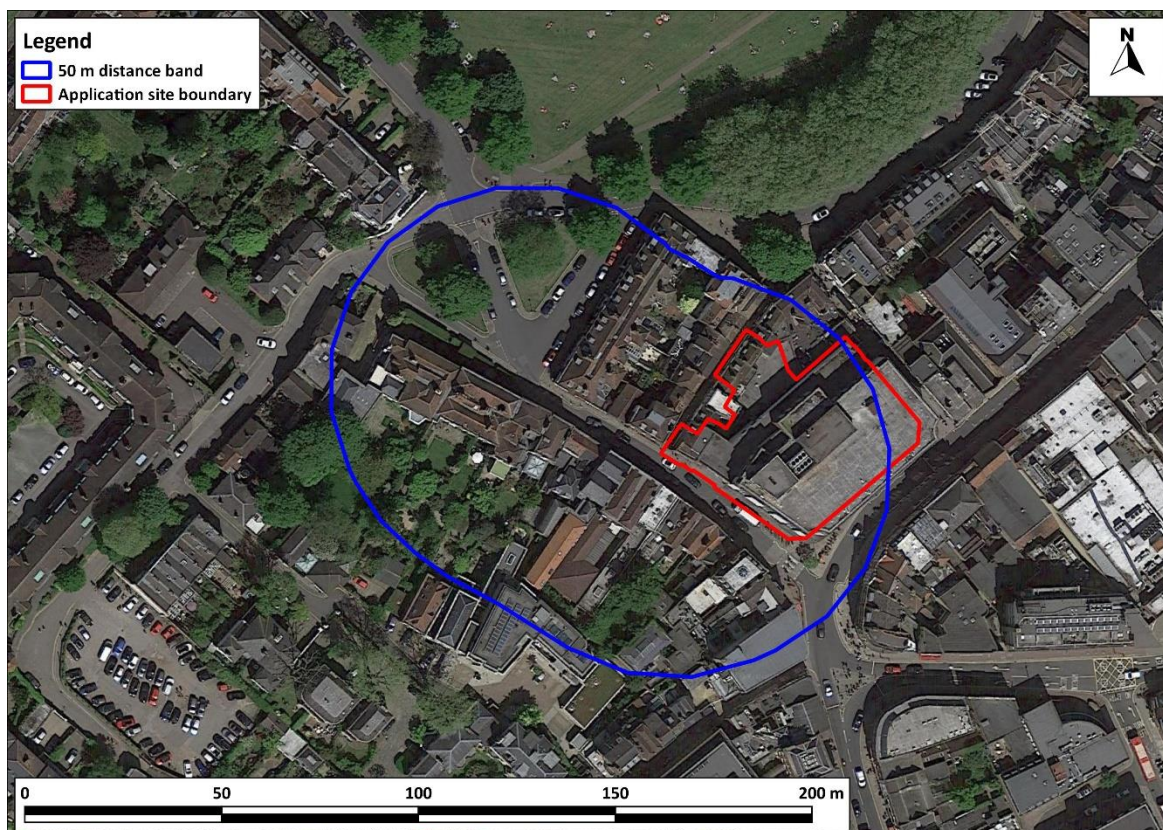


Figure 3: 50 m Distance Band around Roads Used by Construction Traffic Within 50 m of the Site Exit

Imagery ©2019 Google.

Sensitivity of the Area to any Human Health Effects

- 5.11 Residential properties are also classified as being of 'high' sensitivity to human health effects, while places of work are classified as being of 'medium' sensitivity. The matrix in Table A2.4 in Appendix A2 requires information on the baseline annual mean PM₁₀ concentration in the area. It is considered that the measured PM₁₀ concentration at the Chertsey Road automatic monitoring station will best represent conditions near to the site, this being 18 µg/m³ (see Table 3). Using the matrix in Table A2.4 in Appendix A2, the area surrounding the onsite works is of 'low' sensitivity to human health effects, as is the area surrounding roads along which material may be tracked from the site.

Sensitivity of the Area to any Ecological Effects

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

Summary of the Area Sensitivity

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

Table 7: Summary of the Area Sensitivity

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

Risk and Significance

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

Table 8: Summary of Risk of Impacts Without Mitigation

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

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

6 Operational Phase Impact Assessment

Impacts at Existing Receptors

- 6.1 The Proposed Development will not include any car parking spaces. WYG, who have undertaken the transport assessment for the proposed development, have advised that the development will lead to a reduction in servicing trips of 8 trips a day. It has not been possible to quantify the number of car trips generated by the current use of the site, however the Proposed Development will generate a maximum of 28 car trips a day. This number is well below the relevant screening threshold of 100 LDVs for use within an AQMA, set out in the EPUK/IAQM guidance (Moorcroft and Barrowcliffe et al, 2017) (see Paragraphs A3.7 to A3.10 in Appendix A3)). Therefore, there is no requirement for a detailed assessment of road traffic impacts at existing receptors.

Significance of Operational Air Quality Effects

- 6.2 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. More specifically, the judgement that the air quality effects will be 'not significant' without mitigation takes account of the assessment that the proposed development will not generate sufficient traffic to have a significant impact on air quality.

7 'Air Quality Neutral'

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

Building Emissions

- 7.2 Colliers International has advised that the proposed development will not include any centralised boiler or CHP plant and there will thus be no significant emissions from the proposed building. It can therefore be expected that the building emissions generated by the development will be below the Building Emissions Benchmarks (BEBs) and that the Proposed Development is better than air quality neutral in terms of building emissions.

Road Transport Emissions

- 7.3 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. However, the guidance (AQC, 2014) only provides trip lengths and emission rates for A1, B1 and C3 uses, thus a TEB cannot be calculated for the Leisure (D2) element of the proposed development. The guidance does provide an alternative methodology, based on trip rates only, and this has been followed in considering the air quality neutrality of the proposed development in terms of transport emissions.
- 7.4 Table A5.6 in Appendix A5 provides default trip rates for different development categories. This information has been used to calculate a benchmark trip rate for the proposed development in Table 9. This has then been compared with the actual trip rate of the development.
- 7.5 WYG has advised that the proposed development is expected to generate a maximum of 10,220 car trips per year. This assumes that trips associated with the retail element will be linked trips to and from the town centre, while trips associated with the office element will be new trips. As a worst case, it has been assumed that all predicted car driver and car passenger trips generated by the site will be separate trips, without taking car sharing into account.

Table 9: Calculation of Trip Rate Benchmark for the Development

Description		Value	Reference
Retail (A1)			
A	Gross Internal Floor Area (m²)	2,374	Colliers International
B	Benchmark Trip Rate (trips/m²/annum)	131	Table A5.6
C	Benchmark Trip Rate (trips/annum)	310,994	A x B
Office (B1)			
D	Gross Internal Floor Area (m²)	5,777	Colliers International
E	Benchmark Trip Rate (trips/m²/annum)	18	Table A5.6
F	Benchmark Trip Rate (trips/annum)	103,986	D x E
Leisure (D2)			
G	Gross Internal Floor Area (m²)	1,197	Colliers International
H	Benchmark Trip Rate (trips/m²/annum)	49	Table A5.6
I	Benchmark Trip Rate (trips/annum)	58,653	G x H
Entire Development			
Total Trip Rate Benchmark (trips/annum)		473,633	C + F + I

7.6 The Total Trip Rate is less than the Total Trip Rate Benchmark. The proposed development is thus better than air quality neutral in terms of transport emissions.

8 Mitigation

Mitigation Included by Design

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

- no car parking provision, to discourage the use of private vehicles to access the proposed development;
- provision of a framework travel plan setting out measures to encourage sustainable means of transport (public, cycling and walking); and
- provision of pedestrian and cycle access to the new development, including cycle parking, showers and changing facilities.

Recommended Mitigation

Construction Impacts

- 8.2 Measures to mitigate dust emissions will be required during the construction phase of the development in order to minimise effects upon nearby sensitive receptors.
- 8.3 The site has been identified as a *Low Risk* site during demolition, earthworks and construction, and *Negligible Risk* for trackout, as set out in Table 8. The GLA's SPG on *The Control of Dust and Emissions During Construction and Demolition* (GLA, 2014b) describes measures that should be employed, as appropriate, to reduce the impacts, along with guidance on what monitoring should be undertaken during the construction phase. This reflects best practice experience and has been used, together with the professional experience of the consultant who has undertaken the dust impact assessment and the findings of the assessment, to draw up a set of measures that should be incorporated into the specification for the works. These measures are described in Appendix A6.
- 8.4 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.

9 Residual Impacts

- 9.1 The IAQM guidance, on which the GLA's guidance is based, is clear that, with appropriate mitigation in place, the residual effects will normally be 'not significant'. The mitigation measures set out in Section 8 and Appendix A6 are based on the GLA guidance. With these measures in place and effectively implemented the residual effects are judged to be 'not significant'.
- 9.2 The IAQM guidance does, however, recognise that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all of the time, for instance under adverse weather conditions. During these events, short-term dust annoyance may occur, however, the scale of this would not normally be considered sufficient to change the conclusion that overall the effects will be 'not significant'.

10 Conclusions

- 10.1 The construction works have the potential to create dust. During construction it will therefore be necessary to apply a package of mitigation measures to minimise dust emissions. With these measures in place, it is expected that any residual effects will be 'not significant'.
- 10.2 The operational impacts of increased traffic emissions arising from the additional traffic on local roads, due to the development, have been assessed by comparison against published screening criteria and shown to be insignificant.
- 10.3 The building and transport related emissions associated with the proposed development are both below the relevant benchmarks. The proposed development therefore complies with the requirement that all new developments in London should be at least air quality neutral.
- 10.4 The overall operational air quality effects of the development are judged to be 'not significant'.

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12 Glossary

AADT	Annual Average Daily Traffic
AQC	Air Quality Consultants
AQAL	Air Quality Assessment Level
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
BEB	Building Emissions Benchmark
CAZ	Clean Air Zone
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EPUK	Environmental Protection UK
Exceedance	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
EU	European Union
EV	Electric Vehicle
Focus Area	Location that not only exceeds the EU annual mean limit value for NO ₂ but also has a high level of human exposure
GIA	Gross Internal Floor Area
GLA	Greater London Authority
HDV	Heavy Duty Vehicles (> 3.5 tonnes)
HMSO	Her Majesty's Stationery Office
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LDV	Light Duty Vehicles (<3.5 tonnes)
LEZ	Low Emission Zone
LGV	Light Goods Vehicle
µg/m³	Microgrammes per cubic metre

MAQS	Mayor's Air Quality Strategy
NO	Nitric oxide
NO₂	Nitrogen dioxide
NO_x	Nitrogen oxides (taken to be NO ₂ + NO)
NPPF	National Planning Policy Framework
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
OLEV	Office for Low Emission Vehicles
PHV	Private Hire Vehicle
PM₁₀	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
SPG	Supplementary Planning Guidance
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
TfL	Transport for London
TRAVL	Trip Rate Assessment Valid for London
ULEZ	Ultra Low Emission Zone
ZEC	Zero Emission Capable

13 Appendices

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A1 London-Specific Policies and Measures

London Plan

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

“Development proposals should:

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

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

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

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

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

The Mayor’s Air Quality Strategy (MAQS)

A1.2 The 2010 MAQS commits to the continuation of measures identified in the 2002 MAQS, and sets out a series of additional measures, including:

Policy 1 – Encouraging smarter choices and sustainable travel;

- Measures to reduce emissions from idling vehicles focusing on buses, taxis, coaches, taxis, PHVs and delivery vehicles;*
- Using spatial planning powers to support a shift to public transport;*
- Supporting car free developments.*

Policy 2 – Promoting technological change and cleaner vehicles:

- *Supporting the uptake of cleaner vehicles.*

Policy 4 – Reducing emissions from public transport:

- *Introducing age limits for taxis and PHVs.*

Policy 5 – Schemes that control emissions to air:

- *Implementing Phases 3 and 4 of the LEZ from January 2012*
- *Introducing a NOx emissions standard (Euro IV) into the LEZ for Heavy Goods Vehicles (HGVs), buses and coaches, from 2015.*

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

- *Minimising increased exposure to poor air quality, particularly within AQMAs or where a development is likely to be used by a large number of people who are particularly vulnerable to air quality;*
- *Ensuring air quality benefits are realised through planning conditions and section 106 agreements and Community Infrastructure Levy.*

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

- *Applying emissions limits for biomass boilers across London;*
- *Requiring an emissions assessment to be included at the planning application stage.*

Low Emission Zone (LEZ)

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

A1.4 The Mayor of London confirmed in June 2018 that the LEZ will be amended such that a Euro VI standard will apply for heavy vehicles from 26 October 2020. Requirements relating to larger vans, minibuses and other specialist diesel vehicles will not change.

Ultra Low Emission Zone (ULEZ)

- A1.5 London's ULEZ was introduced on 8 April 2019. The ULEZ currently operates 24 hours a day, 7 days a week in the same area as the current Congestion Charging zone. All cars, motorcycles, vans, minibuses and Heavy Goods Vehicles will need to meet exhaust emission standards (ULEZ standards) or pay an additional daily charge to travel within the zone. The ULEZ standards are Euro 3 for motorcycles; Euro 4 for petrol cars, vans and minibuses; Euro 6 for diesel cars, vans and minibuses; and Euro VI for HGVs, buses and coaches.
- A1.6 The Mayor of London confirmed in June 2018 that, from 25 October 2021, the ULEZ will cover the entire area within the North and South Circular roads, applying the emissions standards set out in Paragraph A1.5 for light vehicles. The ULEZ will not include any requirements relating to heavy vehicle emissions beyond 26 October 2020, as these will be addressed by the amendments to the LEZ described in Paragraph A1.4.

Other Measures

- A1.7 From 2018 all taxis presented for licencing for the first time must be zero emission capable (ZEC). This means they must be able to travel a certain distance in a mode which produces no air pollutants. From 2018 all private hire vehicles (PHVs) presented for licensing for the first time must meet Euro 6 emissions standards. From 1 January 2020, all newly manufactured PHVs presented for licensing for the first time must be ZEC (with a minimum zero emission range of 10 miles). The Mayor's aim is that the entire taxi and PHV fleet will be made up of ZEC vehicles by 2033.
- A1.8 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 PM₁₀, 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 A6.

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 PM₁₀		
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 ²

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

² 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, 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 ²

Receptor Sensitivity	Annual Mean PM ₁₀	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m ³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m ³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m ³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m ³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 µg/m ³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m ³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m ³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m ³	>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 ²

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 m² 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 m² 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 mgNO_x/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 mgNO_x/Nm³;
 - Compression ignition engine: 400 mgNO_x/Nm³;
 - Gas turbine: 50 mgNO_x/Nm³.
- 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 mgNO_x/Nm³ and 25 mgPM/Nm³.

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 m² 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 NO_x 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 NO_x gas boiler or a 30kW CHP unit operating at <95mg/Nm³.

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 assess the significance of air quality impacts. The approach within the EPUK/IAQM guidance has, therefore, been used in this assessment. The guidance is 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. 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.

A3.16 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.

A3.17 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

Dr Denise Evans, BSc (Hons) PhD MEnvSc MIAQM

Dr Evans is an Associate Director with AQC, with more than 19 years' relevant experience. She has prepared air quality review and assessment reports for local authorities and has appraised local authority air quality assessments on behalf of the UK governments, and provided support to the Review and Assessment helpdesk. She has carried out numerous assessments for new residential and commercial developments, including the negotiation of mitigation measures where relevant. She has carried out BREEAM assessments covering air quality for new developments. She is a Member of the Institute of Air Quality Management.

Dr Imogen Heard, BSc (Hons) MSc PhD MInstPhys

Dr Heard is a Senior Consultant with AQC, having joined the company in 2013. Prior to joining she worked as a scientist in the Atmospheric Dispersion and Air Quality area at the UK Met Office for four years, modelling the dispersion of a range of pollutants over varying spatial and temporal scales. She now works in the field of air quality assessment and has been involved in numerous development projects including road schemes, energy from waste facilities, urban extensions and energy centres. These have included the use of ADMS-5 and ADMS-Roads dispersion models to study the impacts of a variety of pollutants, including nitrogen dioxide, PM₁₀ and PM_{2.5}, and the preparation of air quality assessment reports and air quality chapters for Environmental Statements. She also has experience in undertaking construction dust risk assessments and Air Quality Neutral assessments, as well as in preparing local authority reports.

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

A5 'Air Quality Neutral'

- A5.1 The GLA's SPG on Sustainable Design and Construction (GLA, 2014a), and its accompanying Air Quality Neutral methodology report (AQC, 2014), provide an approach to assessing whether a development is air quality neutral. The approach is to compare the expected emissions from the building energy use and the car use associated with the proposed development against defined emissions benchmarks for buildings and transport in London.
- A5.2 The benchmarks for heating and energy plant (termed 'Building Emissions Benchmarks' or 'BEBs') are set out in Table A5.1, while the 'Transport Emissions Benchmarks' ('TEBs') are set out in Table A5.2. 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 A5.3 and Table A5.4 (upon which the TEBs are based) is used. Similarly, the information in Table A5.5 may be used if site-specific information are not available (AQC, 2014). For use classes other than A1, B1 and B3, trip lengths and average emissions per vehicle are not provided, thus the trip rates in Table A5.6 alone may be used to consider the air quality neutrality of a development. These have been derived from the Trip Rate Assessment Valid for London (TRAVL) database.

Table A5.1: Building Emissions Benchmarks (g/m² 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 A5.2: Transport Emissions Benchmarks

Land use	CAZ ^a	Inner ^b	Outer ^b
NOx (g/m²/annum)			
Retail (A1)	169	219	249
Office (B1)	1.27	11.4	68.5
NOx (g/dwelling/annum)			
Residential (C3)	234	558	1553
PM₁₀ (g/m²/annum)			
Retail (A1)	29.3	39.3	42.9
Office (B1)	0.22	2.05	11.8
PM₁₀ (g/dwelling/annum)			
Residential (C3,C4)	40.7	100	267

^a Central Activity Zone.

^b Inner London and Outer London as defined in the LAEI (GLA, 2016b).

Table A5.3: Average Distance Travelled by Car per Trip

Land use	Distance (km)		
	CAZ	Inner	Outer
Retail (A1)	9.3	5.9	5.4
Office (B1)	3.0	7.7	10.8
Residential (C3)	4.3	3.7	11.4

Table A5.4: Average Road Traffic Emission Factors in London in 2010

Pollutant	g/vehicle-km		
	CAZ	Inner	Outer
NO _x	0.4224	0.370	0.353
PM ₁₀	0.0733	0.0665	0.0606

Table A5.5: Average Emissions from Heating and Cooling Plant in Buildings in London in 2010

	Gas (kg/kWh)		Oil (kg/kWh)	
	NO _x	PM ₁₀	NO _x	PM ₁₀
Domestic	0.0000785	0.00000181	0.000369	0.000080
Industrial/Commercial	0.000194	0.00000314	0.000369	0.000080

Table A5.6: Average Number of Trips per Annum for Different Development Categories

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

A6 Construction Mitigation

A6.1 The following is a set of best-practice measures from the GLA guidance (GLA, 2014b) that should be incorporated into the specification for the works. These measures should be written into a Dust Management Plan. Some of the measures may only be necessary during specific phases of work, or during activities with a high potential to produce dust, and the list should be refined and expanded upon in liaison with the construction contractor when producing the Dust Management Plan.

Site Management

- 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; and
- 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; and
- avoid site runoff of water or mud.

Operating Vehicle/Machinery and Sustainable Travel

- Ensure all on-road vehicles comply with the requirements of the London LEZ;
- ensure all Non-road Mobile Machinery (NRMM) comply with the standards set within the GLA's Control of Dust and Emissions During Construction and Demolition SPG. This outlines that, from 1 September 2015, all NRMM of net power 37 kW to 560 kW used on

the site of a major development in Greater London must meet Stage IIIA of EU Directive 97/68/EC (The European Parliament and the Council of the European Union, 1997) and its subsequent amendments as a minimum. From 1 September 2020 NRMM used on any site within Greater London will be required to meet Stage IIIB of the Directive as a minimum;

- ensure all vehicles switch off engines when stationary – no idling vehicles;
- avoid the use of diesel- or petrol-powered generators and use mains electricity or battery-powered equipment where practicable; and
- implement a Travel Plan that supports and encourages sustainable staff travel (public transport, cycling, walking, and car-sharing).

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using recycled water where possible and appropriate;
- use enclosed chutes, conveyors and covered skips; and
- minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.

Waste Management

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

Measures Specific to Demolition

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