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1 Introduction

1.1. Proposed Development

- 1.1.1 Air Quality Assessments Ltd (AQA) has been commissioned by MHA Heathrow Ltd to undertake an air quality assessment for a proposed development at Land Adjacent to Building 2, Status Park, Nobel Drive, Harlington, Hayes UB3 5EY. The proposed development will consist of a six storey hotel with around 140 beds and associated parking.

1.2. Scope of Assessment

- 1.2.1 This report describes the existing air quality conditions in proximity to the site, and considers the effect of the development on local air quality and of existing air quality on new receptors at the development. The main air pollutants of concern related to road traffic are nitrogen dioxide (NO₂) and fine particulate matter (PM₁₀ and PM_{2.5}).
- 1.2.2 The proposed development will include combined heat and power (CHP) plant, with associated boilers; however, the system is at the design stage and an assessment of the potential effects due to air emissions will be completed once the energy plant have been specified.
- 1.2.1 There is the potential for construction activities to impact upon existing properties. The main pollutants of concern related to construction activities are dust and PM₁₀.
- 1.2.2 The assessment also considers the cumulative effect of the proposed development on air quality in London through an air quality neutral assessment.
- 1.2.3 The assessment has been prepared taking into account all relevant local and national guidance and regulations.
- 1.2.4 The references and a glossary of common air quality terminology used in this assessment are shown in **Section 10** and **Section 11** respectively.

2 Air Quality Legislation and Policy

2.1. EU Limit Values

- 2.1.1 The European Union's Directive on ambient air quality and cleaner air for Europe (European Parliament, Council of the European Union, 2008) set legally binding limit values for NO₂, PM₁₀ and PM_{2.5}. The Air Quality Standards Regulations 2010 (The Stationary Office, 2010) implement the EU Directive limit values in English legislation. Achievement of the limit values is a national obligation rather than a local one.
- 2.1.2 The limit values are the same as the objective values (see **Table 1**); however, the compliance dates differ, and the limit values apply at all locations (apart from where the public does not have access, where health and safety at work provisions apply and on the road carriageway). The PM₁₀ and NO₂ limit value applied from 2005 and 2010 respectively, whereas the PM_{2.5} limit value applied from 2015.

2.2. The Air Quality Strategy

- 2.2.1 Part IV of The Environment Act 1995 required the UK Government to prepare an Air Quality Strategy. The Air Quality Strategy (Defra, 2007), provides an overview and outline of ambient air quality policy in the UK and the devolved administrations. The strategy sets out air quality standards and objectives intended to protect human health and the environment.
- 2.2.2 Standards are the concentrations of pollutants in the atmosphere, below which there is a minimum risk of health effects or ecosystem damage; they are set with regard to scientific and medical evidence. Objectives are the policy targets set by the Government, taking account of economic efficiency, practicability, technical feasibility and timescale, where the standards are expected to be achieved by a certain date.
- 2.2.3 The Air Quality Strategy also describes the system of Local Air Quality Management (LAQM), introduced in Part IV of the Environment Act 1995, which requires every local authority to carry out regular review and assessments of air quality in its area. Where an objective has not been, or is unlikely to be achieved, the local authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which sets out appropriate measures to be introduced in pursuit of the objectives.
- 2.2.4 The objectives for NO₂ and PM₁₀, as prescribed by the Air Quality (England) Regulations 2000 and the Air Quality (England) (Amendment) Regulations 2002 (The Stationary Office, 2000; The Stationary Office, 2002), are shown in **Table 1**. The objectives for PM₁₀ and NO₂ were to have been achieved by 2004 and 2005 respectively, and continue to apply in all future years thereafter. The PM_{2.5} objective, also shown in **Table 1**, is to be achieved by 2020; however, although local authorities in London have a flexible role in working towards reducing emissions and concentrations of PM_{2.5}, there is no obligation for local authorities to try to meet the PM_{2.5} objective, and it is not included in the Regulations.

Table 1: The Objectives for NO₂, PM₁₀ and PM_{2.5}

Pollutant	Concentration Measured As	Objective
NO ₂	1-hour Mean	200 µg/m ³ not to be exceeded more than 18 times a year
	Annual Mean	40 µg/m ³
PM ₁₀	24-hour Mean	50 µg/m ³ not to be exceeded more than 35 times a year
	Annual Mean	40 µg/m ³
PM _{2.5}	Annual Mean	25 µg/m ³

2.2.5 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the objective. Examples of where the objectives should apply are provided in the London Local Air Quality Management Technical Guidance (Mayor of London, 2016). The annual mean NO₂ and PM₁₀ objectives should apply at the building façades of residential properties, schools, hospitals, care homes etc.; they should not apply at the building façades of places of work, hotels, gardens or kerbside sites. The 24-hour mean PM₁₀ objective should apply at all locations where the annual mean objective applies, as well as the gardens of residential properties and hotels. The 1-hour mean NO₂ objective should apply at all locations where the annual and 24-hour mean objectives apply, as well as at kerbside sites where the public have regular access, e.g. the pavements of busy shopping streets.

2.3. Planning Policy

National Policies

2.3.1 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these should be applied (Ministry of Housing, Communities & Local Government, 2018). It provides a framework within which locally-prepared plans for development can be produced. It states that the purpose of the planning system is to contribute to the achievement of sustainable development and includes an overarching 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."

2.3.2 The NPPF states that:

"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.”

2.3.3 With specific reference to air quality, the NPPF states 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.”

2.3.4 The NPPF is supported by Planning Practice Guidance (PPG) (DCLG, 2014). 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. It is important that the potential impact of new development on air quality is taken into account in planning where the national assessment indicates that relevant limits have been exceeded or are near the limit.”

2.3.5 The PPG goes on to state 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 (including that applicable to wildlife).”

2.3.6 The PPG makes clear that:

“... dust can also be a planning concern, for example, because of the effect on local amenity.”

2.3.7 The PPG also sets out the information that may be required in an air quality assessment, stating that:

“Assessments should be proportional to the nature and scale of development proposed and the level of concern about air quality.”

2.3.8 It also provides guidance on options for mitigating air quality impacts, and makes clear that:

“Mitigation options where necessary, will depend on the proposed development and should be proportionate to the likely impact.”

Regional Policies and Guidance

- 2.3.9 The London Plan (GLA, 2016a) sets out the spatial development strategy for London and presents a London-wide policy framework, including Policy 7.14 Improving Air Quality, which states that development proposals should:

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

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

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

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.”

- 2.3.10 The Mayor’s London Environment Strategy sets out objectives, policies and proposals that will improve air quality in London, with the aim of reducing exposure of Londoners to harmful pollution, achieving compliance with the EU limit values as soon as possible and establishing and achieving tighter air quality targets (GLA, 2018). Proposals include improving information about air quality, encouraging new developments to take into account local air quality, maintaining the LAEI and monitoring networks, promoting and prioritising sustainable transport modes, phasing out the use of fossil fuels with the aim of a zero emissions transport system, tackling unnecessary idling, and reducing emissions from engines and plant.

Local Policies

- 2.3.11 Policy EM8: Land, Water, Air and Noise of the Hillingdon Local Plan Part 1 states (Hillingdon Council, 2012):

“All development should not cause deterioration in the local air quality levels and should ensure the protection of both existing and new sensitive receptors.

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

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

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

Air Quality Action Plan

- 2.3.12 Hillingdon Council have published an Air Quality Action Plan (Hillingdon Council, 2004). The action plan aims to achieve its objectives through a range of measures, such as encouraging the use of sustainable transport modes, reducing idling engines, increased energy efficiency, controls on energy plant.

3 Methodology

3.1. Existing Conditions

3.1.1 Information on existing air quality within the study area has been collated from the following sources:

- The results of monitoring and the LAQM review and assessment reports undertaken by Hillingdon Council (Hillingdon Council, 2018);
- Maps of roadside concentrations published by Defra used to identify where current exceedences of the annual mean NO₂ EU limit value have been predicted (Defra, 2018a)¹;
- Background pollutant concentration maps published by Defra (Defra, 2018b); and
- Defra's Pollutant Release and Transfer Register used to screen for local industrial and waste management sources (Defra, 2018c).

3.2. Construction Impacts

3.2.1 A construction dust risk assessment has been undertaken following the guidance in the London Plan SPG on The Control of Dust and Emissions During Construction and Demolition (GLA, 2014), which utilises the methodology in the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2014).

3.2.2 The guidance divides activities on construction sites into four main types: demolition, earthworks, construction and trackout. The methodology is based on a sequence of steps. Step 1 screens the requirement for more detailed assessment; if there are no receptors within 50 m of the site boundary, or within 50 m of roads used by construction vehicles, then there is no need for further assessment. Step 2 assesses the risk of dust impacts from each of the four activities, considering the scale and magnitude of the works (Step 2A), and the sensitivity of the area (Step 2B). Site-specific mitigation for each of the four activities is then determined based on a dust risk category defined at Step 2C. **Appendix A1** sets out the construction dust assessment methodology in more detail.

3.3. Road Traffic Impacts

Sensitive Locations

3.3.1 Receptors have been identified at locations where members of the public are likely to be regularly present over the averaging period of the objectives. These receptors have been located on the façades of properties closest to the road sources, paying particular attention to those located close to junctions, where traffic may become congested, and there is a combined effect from several road links.

3.3.2 Additional receptors have been identified within the proposed development, where the impact from existing sources is likely to be greatest. The receptors are described in **Table 2** and are shown in **Figure 1**.

¹ There are no exceedences of the PM₁₀ limit values.

Table 2: Description of Receptors

Receptor	Name	x	y	z (m)
Existing Receptors				
R1	38 Bath Road	509704.7	176986.3	1.5
R2	90 Bath Road	509480.3	176958.1	1.5
R3	1 Dorton Villas	507368.0	176966.7	1.5
Proposed Receptors				
R4	Ground Floor Façade	509149.4	176932.9	1.5
R5	Ground Floor Façade	509167.1	176932.6	1.5
R6	Ground Floor Façade	509188.8	176932.4	1.5
R7	Ground Floor Façade	509194.0	176938.8	1.5

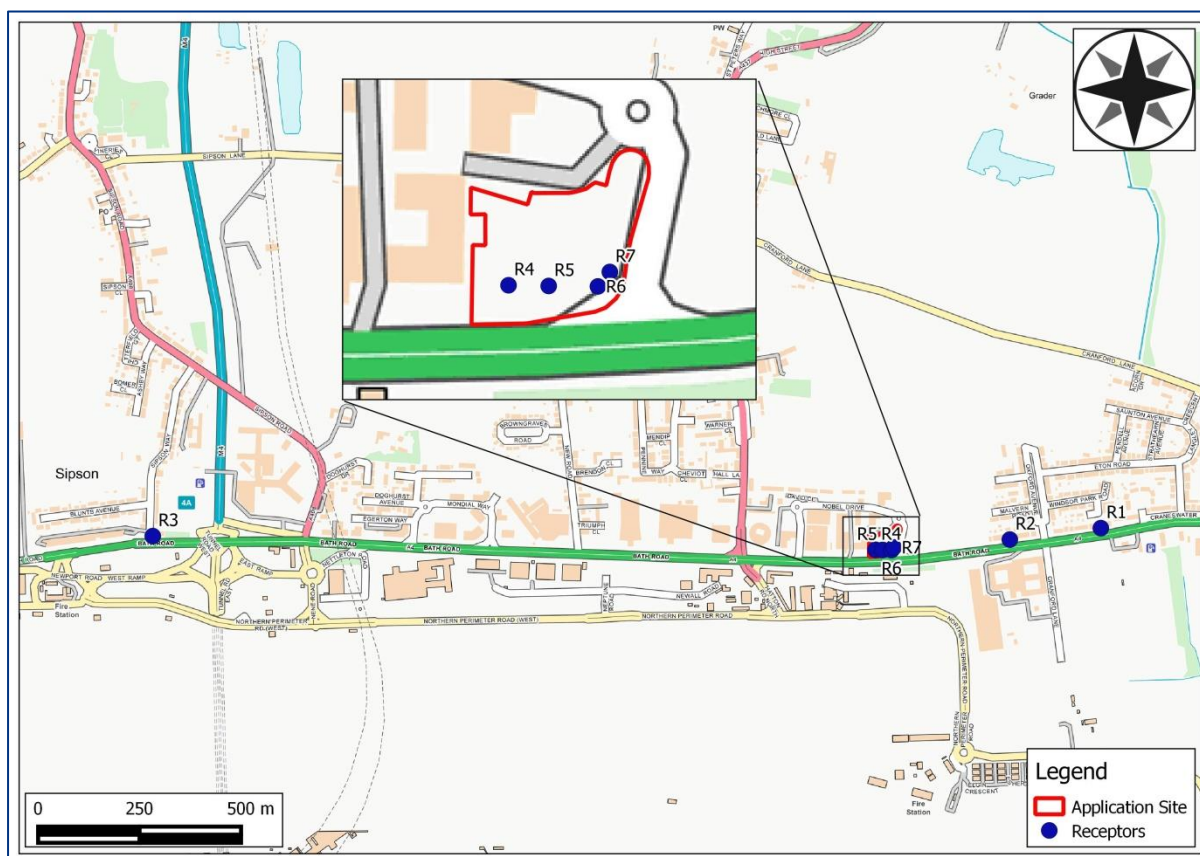


Figure 1: Location of Receptors

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Assessment Scenarios

3.3.3 Concentrations of NO₂, PM₁₀ and PM_{2.5} have been predicted at the receptors for the following scenarios:

- Model verification year (2017);
 - Future year without the proposed development (2020); and
 - Future year with the proposed development (2020).
- 3.3.4 The proposed development is expected to open in January 2021; however, to provide a conservative assessment, 2020 has been used for the future assessment year.
- 3.3.5 In addition to predictions using emissions data published by Defra, a sensitivity analysis has been undertaken that assumes higher NO_x emissions from diesel vehicles. This sensitivity analysis provides a worst-case assessment of future impacts (see **Section 3.4** on uncertainty below).

Modelling Methodology

- 3.3.6 Concentrations have been predicted using the ADMS Roads 4 (v4.1.1.0) dispersion model. The model requires the input of a range of data, details of which are provided in **Appendix A2**, along with details of the model verification calculations.

3.4. Uncertainty

- 3.4.1 There are many factors that contribute to uncertainty when predicting pollutant concentrations. The emission factors utilised in the air quality model are dependent on traffic data, which have inherent uncertainties associated with them. There are also uncertainties associated with the model itself, which simplifies real world conditions into a series of algorithms. The model verification process, as described in **Appendix A2**, minimises the uncertainties; however, future year predictions use projected traffic data, emissions data, and background concentrations. The most recent emission factors and background data have been used in this assessment; however, there are still uncertainties associated with this data.
- 3.4.2 Past analysis has shown a disparity between historical monitoring data and the projected background concentrations published by Defra (Carslaw et al., 2011). Overall, there has been little evidence of the consistent downward trend in NO₂ and NO_x concentrations suggested by previous emission inventory estimates.
- 3.4.3 This disparity is believed to have arisen due to the actual on-road performance of diesel vehicles when compared with emissions calculations based on the Euro standards and published in the Emissions Factor Toolkit (EFT) used for modelling.
- 3.4.4 Air Quality Consultants Ltd (AQC) have produced the Calculator Using Realistic Emissions for Diesels (CURED) tool that applies adjustments to diesel emission factors from the EFT for use by consultants when undertaking sensitivity analysis of future air quality impacts (AQC, 2018a). The report describing the development of CURED V3A explains that emissions from the most recent EFT v8.0.1 reflect the adjusted emissions used in earlier versions of CURED and that the EFT emissions for the current vehicle fleet are now appropriate (AQC, 2018b). However, as there is no published real-world emissions test results for Euro 6c and Euro 6d vehicles, CURED V3A takes a conservative approach with regard to emissions from future Euro 6d diesel vehicles and assumes no benefit over those of Euro 6c. Therefore, a

sensitivity analysis with regard to emissions has been undertaken for the future assessment year of 2020.

3.5. Assessment Criteria and Significance

Construction Dust

- 3.5.1 The London Plan SPG on The Control of Dust and Emissions During Construction and Demolition (GLA, 2014) is clear that the primary aim of the risk assessment is to identify site specific mitigation that, once adopted, will ensure that there will be no significant effect. Therefore, the assessment has been used to determine an appropriate level of mitigation for the construction phase.

Health Criteria

- 3.5.2 There is no official guidance in the UK on how to describe air quality impacts, nor how to assess their significance. The approach suggested by Environmental Protection UK (EPUK) and the IAQM in guidance on Land-Use Planning & Development Control: Planning for Air Quality has been used for this assessment (EPUK and IAQM, 2017). The air quality impacts have been described at each receptor by determining the percentage change in concentrations relative to an air quality assessment level (AQAL) and comparing this with the total long-term average concentration, as set out in **Table 3**.

Table 3: Impact Descriptors for Individual Receptors

Long-term Average Concentration at Receptor in Assessment Year ^b	% Change in Concentration Relative to AQAL ^a			
	1	2-5	6-10	>10
≤ 75% of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
≥ 110% of AQAL	Moderate	Substantial	Substantial	Substantial

a The % change rounded to a whole number. Changes of 0%, i.e. less than 0.5%, are described as negligible. The AQAL for NO₂ is 40 µg/m³, the AQAL for PM₁₀ is 32 µg/m³ and the AQAL for PM_{2.5} is 25 µg/m³.

b The without scheme concentration where there is a decrease in predicted concentrations, and the with scheme concentration where there is an increase in predicted concentrations.

- 3.5.3 For impacts on existing receptors, the AQALs for NO₂ and PM_{2.5} are based on the annual mean objectives (as shown in **Table 1**). The AQAL for PM₁₀ is an annual mean concentration of 32 µg/m³ as measured data show that the 24-hour PM₁₀ objective could be exceeded where annual mean concentrations are above 32 µg/m³ (Mayor of London, 2016).
- 3.5.4 For impacts on the new receptors at the proposed development, a predicted exceedence of an AQAL will be considered as significant, unless provision is made to

reduce the exposure by some other means. Predicted concentrations below the AQAL will be considered as insignificant. As the proposed development is a hotel, there is no relevant exposure with regard to the annual mean objectives (see **Paragraph 2.2.5**); therefore, the AQALs are based on the 1-hour objective for NO₂ and the 24-hour objective for PM₁₀. The NO₂ AQAL for new receptors is 60 µg/m³ as measured data show that the 1-hour objective for NO₂ could be exceeded where annual mean concentrations are above 60 µg/m³ (Mayor of London, 2016). The PM₁₀ AQAL for new receptors is an annual mean concentration of 32 µg/m³.

Significance

- 3.5.5 The air quality impact, i.e. the change in concentrations as a result of the proposed development, may have an effect on human health, dependent on the severity of the impact and other factors.
- 3.5.6 The IAQM guidance advises that the overall effect of the air quality impacts should be judged as either significant or not significant taking account of:
- The descriptions of the predicted impacts;
 - 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, i.e. several slight impacts taken together could have a significant effect, or a moderate or substantial effect confined to a small area and not obviously a cause of harm to human health could be described as not significant; and
 - The consequences of the impacts, i.e. will the impacts have an effect on human health that can be considered significant? The impacts from an individual development would usually not be large enough to result in a measurable change in health outcomes regarded as significant by healthcare professionals, and therefore the impact on local air quality is used as a proxy for assessing effects on health.
- 3.5.7 The judgement of significance should be made by a competent, suitably qualified professional, and the professional experience of the consultant preparing the report is set out in **Appendix A3**.

3.6. Air Quality Neutral Assessment

- 3.6.1 To enable the implementation of the air quality neutral policy of the London Plan, emission benchmarks have been developed for buildings and transport, which are dependent on the area of London that the development is in. Developers are required to calculate emissions due to buildings operation and transport, and to compare these emissions with the benchmarks, which are set out in **Appendix A5**.
- 3.6.2 Where the developments emissions exceed the benchmarks, on-site mitigation is required. Where emissions continue to exceed the benchmarks after appropriate on-site mitigation, the excess emissions need to be off-set off-site through agreement with the local planning authority.

- 3.6.3 Guidance on the application of the air quality neutral policy has been followed for this assessment (AQC, 2014), and details of the assessment methodology are provided in **Appendix A5**.

4 Baseline Conditions

4.1. Site Description

- 4.1.1 The application site is located adjacent to Bath Road (A4) to the north of Heathrow Airport (see **Figure 2**). The application site currently consists of a car park.

4.2. Industrial Sources

- 4.2.1 The search of the UK Pollutant Release and Transfer Register did not identify any significant industrial or waste management sources that are likely to affect air quality at the application site.

4.3. EU Limit Values

- 4.3.1 The London Harlington AURN automatic monitoring site is located approximately 1.2km to the northwest of the application site. No exceedences of the EU limit value were measured at the London Harlington monitoring site between 2013 and 2017 (see **Table 4** and
- 4.3.2 **Table 5**). Bath Road adjacent to the application site is included in modelling undertaken by Defra and the annual mean NO₂ limit value is exceeded, with concentrations of 42.5 µg/m³ predicted in 2015.

4.4. LAQM Review and Assessment

- 4.4.1 Hillingdon Council has declared an AQMA for exceedances of the annual mean NO₂ objective that covers the entire southern part of the borough south of the A40 corridor and the application site lies within this area.
- 4.4.2 In terms of PM₁₀, Hillingdon Council has concluded that there are no exceedences of the objectives; therefore, it is highly unlikely concentrations in the vicinity of the application site exceed the objectives (Hillingdon Council, 2018).

4.5. Local Air Quality Monitoring

- 4.5.1 Hillingdon Council operates eleven automatic monitoring sites, which include the London Harlington AURN site, a background site approximately 1.8km west of the application site, a roadside site approximately 340m east of the application site and a site measuring concentrations at Heathrow Airport, approximately 580m to the southwest of the application site. Hillingdon Council also operates a number of diffusion tube monitoring sites and annual mean data from monitoring sites within the study area presented in **Table 4**. The monitoring site locations are shown in **Figure 2**.
- 4.5.2 Measured NO₂ concentrations have exceeded the annual mean objective at Heathrow Airport, Oxford Avenue (in 2016 only) and at diffusion tube monitoring sites HD58 and HD213 with concentrations in the study area ranging from 29.1-48 µg/m³ between 2013 and 2017. There have been no exceedences of the 1-hour objective at the automatic monitoring sites (see **Table 5**).
- 4.5.3 There are no clear trends in monitoring results for the past five years. This contrasts with the expected decline due to the progressive introduction of new vehicles

operating to more stringent standards. The implications of this are discussed in **Section 3.4** of this report.

- 4.5.1 Concentrations of PM₁₀ are also measured at three of the automatic monitoring sites. Results from the years 2013 to 2017 are shown in **Table 6**. There have been no exceedences of the PM₁₀ objectives.

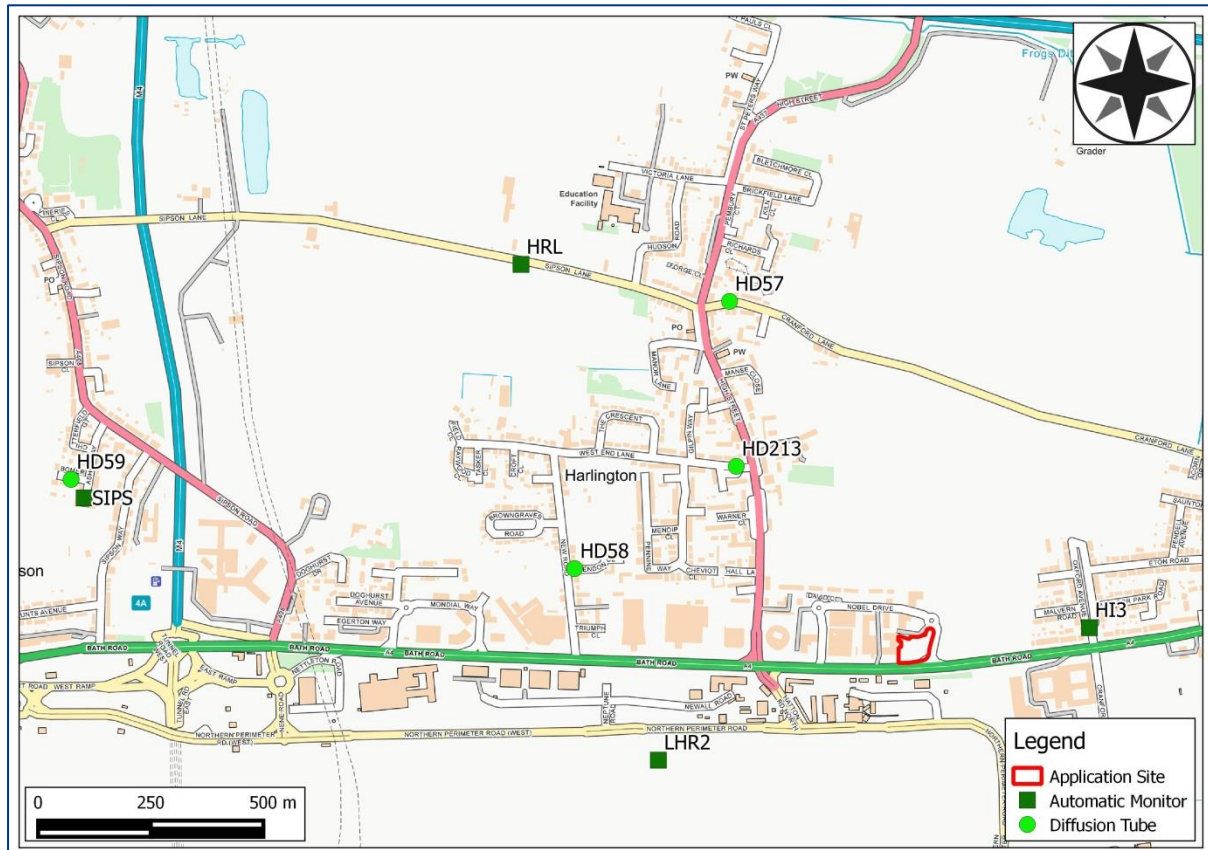


Figure 2: Air Quality Monitoring Sites

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Table 4: Measured NO₂ Concentrations (2013 to 2017)

Site ID	Location	Site Type	Annual Mean (µg/m ³)				
			2013	2014	2015	2016	2017
Automatic Monitors							
LHR2	London Heathrow	Airport	47.9	46.4	44.2	47.0	48
HI3	Oxford Avenue	R	39.2	36.7	34.5	41.9	35.4
HRL	London Harlington (AURN)	UI	37.1	36.5	32.0	34.0	31.5
SIPS	Hillingdon Sipson	UB	36.5	36.6	33.7	35.2	34.3
Diffusion Tubes							
HD57	25 Cranford Lane	R	37.9	39.9	35.6	35.5	39.4
HD58	Brendan Close	R	38.4	42.1	37.2	34.2	47.5
HD59	Bomber Close	R	35.5	33.6	29.1	30.3	32.6
HD213	10 West End Lane	UB	40.5	39.8	37.0	37.4	45.6
Objective			40				

a Exceedences are shown in bold. R = roadside, UI = urban industrial, UB = urban background.

Table 5: Exceedence Statistics for the 1-hour Mean NO₂ Objective (2013 to 2017) ^a

Site ID	Location	Site Type	Number of Hours > 200 µg/m ³				
			2013	2014	2015	2016	2017
Automatic Monitor							
LHR2	London Heathrow	Airport	3	0	2	8	12
HI3	Oxford Avenue	R	1	0	2	0	1
HRL	London Harlington (AURN)	UI	5	0	0	0	0
SIPS	Hillingdon Sipson	UB	0	0	3	0	0
Objective			18				

Table 6: Summary of PM₁₀ Monitoring Data (2013 to 2017) ^a

Site ID	Location	Annual Mean (µg/m ³)					Number of Days > 50 µg/m ³				
		2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
LHR2	London Heathrow	24.6	18.6	13	15	15	12	6	3	3	7
HI3	Oxford Avenue	21	21.5	21	20	19	6	6	3	11	4
HRL	London Harlington (AURN)	20	19.6	16	15	15	9	6	3	5	3
Objective		40					35				

4.6. Background Concentrations

4.6.1 Estimated background concentrations at the application site are shown in **Table 7**. The background concentrations have been derived from data in the national maps published by Defra.

Table 7: Estimated Annual Mean Background Concentrations in 2017 and 2020 (µg/m³)

Year	NO _x	NO ₂	PM ₁₀	PM _{2.5}
2017	67.2	37.5	15.2	10.2
2020	62.2	35.4	14.7	9.7
Objective	-	40	40	25

4.7. Predicted Baseline Concentrations

4.7.1 Baseline concentrations of NO₂, PM₁₀ and PM_{2.5} have been modelled at each of the existing receptor locations (see **Figure 1** and **Table 2**). The results are shown in **Table 8**.

4.7.2 Predicted annual mean NO₂ concentrations are high and the AQAL is exceeded at all receptor locations in 2017. By 2020, the annual mean NO₂ objective is achieved at receptors R1 and R2; however, annual mean concentrations remain above the objective at receptor R3.

4.7.3 Predicted annual mean concentrations of PM₁₀ and PM_{2.5} are below the AQALs in 2017 and 2020.

Table 8: Predicted Baseline Concentrations in 2017 and 2020 ^a

Receptor	Annual Mean ($\mu\text{g}/\text{m}^3$)						
	NO ₂			PM ₁₀		PM _{2.5}	
	2017	2020		2017	2020	2017	2020
		EFT	CURED				
R1	40.5	38.8	38.9	21.0	20.8	13.0	12.8
R2	40.7	38.9	39.0	20.6	20.4	12.8	12.6
R3	42.3	40.4	40.5	21.8	21.5	13.5	13.2
AQAL	40			32		25	

^a Exceedences are shown in bold.

5 Impact Assessment

5.1. Construction Phase

- 5.1.1 Without mitigation, there is a risk that the construction phase of the development will lead to dust soiling and elevated concentrations of PM₁₀. These impacts may occur during demolition, earthworks and construction, as well as from trackout of dust onto the public highway, as vehicles leave the construction site.

Screening

- 5.1.2 There are human receptors within 350 m of the applications site to the north, east, south and west. There are also receptors within 50 m of the route used by construction vehicles on the public highway, up to 500 m from the site entrance. Therefore, further assessment of the construction phase impacts on human receptors is necessary. There are no ecological receptors within 50 m of the application site boundary, and the effects of construction on ecology will not be considered further.

Risk of Dust Impacts

Potential Dust Emission Magnitude

- 5.1.3 No demolition is required at the application site; therefore, the effects due to demolition during the construction phase are not considered further.
- 5.1.4 The application site has an area of approximately 4,000 m² and earthworks will take place across much of this area. Data from the UK Soil Observatory (NERC, 2018) have been used to determine that the soil at the site is medium to light (silty) to heavy with a clay to clayey loam texture, which may be prone to suspension when dry. Based on the example definitions in **Table A1** of **Appendix A1**, the dust emission class for earthworks is considered to be medium.
- 5.1.5 The proposed development involves the construction of a building with a total volume of around 16,000 m³. Based on the example definitions in **Table A1** of **Appendix A1**, the dust emission class for construction is considered to be small.
- 5.1.6 Given the small scale of the construction site, the number of daily outward heavy duty vehicle (HDV) movements from the application site during the construction phase is estimated to be less than 10. Based on the example definitions in **Table A1** of **Appendix A1**, the dust emission class for trackout is considered to be small.
- 5.1.7 A summary of the likely dust emission magnitudes is shown in **Table 9**.

Table 9: Likely Dust Emission Magnitudes

Source	Dust Emission Magnitude
Earthworks	Medium
Construction	Small
Trackout	Small

Sensitivity of the Area

- 5.1.8 The sensitivity of the area depends on the specific sensitivities of local receptors, the proximity and number of receptors, local PM₁₀ background concentrations and other site specific factors, e.g. natural screening by trees.

Sensitivity of the Area to Dust Soiling

- 5.1.9 The neighbouring offices and commercial use are considered to be 'medium' sensitivity receptors to dust soiling (see **Table A2** of **Appendix A1**).
- 5.1.10 There are offices within 20 m of the application site boundary to the west and north; therefore, with reference to **Table A5** of **Appendix A1**, the area is considered to be of medium sensitivity to dust soiling.
- 5.1.11 **Table 9** shows that the dust emission magnitude for trackout is small, therefore there is a risk of material being tracked up to 50 m from the site exit. There are offices within 20 m of the roads along which material could be tracked; therefore, with reference to **Table A5** **Appendix A1**, the area is considered to be of medium sensitivity to dust soiling from trackout.

Sensitivity of the Area to the Health Effects of PM₁₀

- 5.1.12 Office workers are considered to be 'medium' sensitivity receptors to the health effects of PM₁₀ (see **Table A3** of **Appendix A1**).
- 5.1.13 A maximum annual mean PM₁₀ concentration of 19.8 µg/m³ has been predicted at the application site in 2017, and similar concentrations are likely at neighbouring offices. With reference to **Table A6** of **Appendix A1**, the area is thus described to be of low sensitivity to the health effects of PM₁₀ during on-site works and from trackout.
- 5.1.14 A summary of the sensitivity of the area to the effects of the construction works is shown in **Table 10**.

Table 10: Summary of the Area Sensitivity

Potential Effect	Sensitivity of the Area	
	On-site Works	Trackout
Dust Soiling	Medium	Medium
Health	Low	Low

Risk of Impact and Significance

- 5.1.15 The dust emission magnitudes in **Table 9** have been combined with the area sensitivities in **Table 10** and a risk category has been assigned to each construction activity using the matrix in **Table A8** of **Appendix A1**. The resultant risk categories, shown in **Table 11**, have then been used to determine the appropriate level of mitigation necessary for a residual effect that is likely to be 'not significant'.

Table 11: Summary of the Risk of Impacts Without Mitigation

Construction Activity	Dust Soiling	Health
Earthworks	Medium	Low
Construction	Low	Negligible
Trackout	Negligible	Negligible

5.2. Operational Phase

Existing Receptors

NO₂ – EFT Emissions

- 5.2.1 Predicted annual mean NO₂ concentrations and the impact descriptors assuming EFT emissions are shown in **Table 12**. Annual mean NO₂ concentrations are below the AQAL at receptors R1 and R2, but above the AQAL at receptor R3 both without and with the proposed development. The change in concentration relative to the AQAL is 0% at all receptors, and the impacts are described as negligible.

Table 12: Predicted NO₂ Impacts in 2020 – EFT Emissions

Receptor	Annual Mean (µg/m ³)		% Change in Concentration Relative to AQAL	Total Concentration as % of AQAL	Impact Descriptor
	WO	W			
R1	38.8	38.9	0	97	Negligible
R2	38.9	39.0	0	97	Negligible
R3	40.4	40.4	0	101	Negligible
AQAL	40		-		

a Exceedences of the AQAL are shown in bold. WO = without scheme, W = with scheme.

NO₂ – CURED Emissions

- 5.2.2 Predicted annual mean NO₂ concentrations and the impact descriptors assuming CURED emissions are shown in **Table 13**. Annual mean NO₂ concentrations are below the AQAL at receptors R1 and R2, but above the AQAL at receptor R3 both without and with the proposed development. The change in concentration relative to the AQAL is 0% at all receptors, and the impacts are described as negligible.

Table 13: Predicted NO₂ Impacts in 2020 – CURED Emissions

Receptor	Annual Mean (µg/m ³)		% Change in Concentration Relative to AQAL	Total Concentration as % of AQAL	Impact Descriptor
	WO	W			
R1	38.9	39.0	0	97	Negligible
R2	39.0	39.1	0	98	Negligible
R3	40.5	40.5	0	101	Negligible
AQAL	40		-		

a Exceedences of the AQAL are shown in bold. WO = without scheme, W = with scheme.

PM₁₀

5.2.3 Predicted annual mean PM₁₀ concentrations and the impact descriptors are shown in **Table 14**. Annual mean PM₁₀ concentrations are well below the AQAL both without and with the proposed development and as the change in concentration relative to the AQAL is 0% at all receptors, the impacts are described as negligible.

Table 14: Predicted PM₁₀ Impacts in 2020

Receptor	Annual Mean (µg/m ³)		% Change in Concentration Relative to AQAL	Total Concentration as % of AQAL	Impact Descriptor
	WO	W			
R1	20.8	20.8	0	59	Negligible
R2	20.4	20.4	0	58	Negligible
R3	21.5	21.5	0	62	Negligible
AQAL	32		-		

a Exceedences of the AQAL are shown in bold. WO = without scheme, W = with scheme.

PM_{2.5}

5.2.4 Predicted annual mean PM_{2.5} concentrations and the impact descriptors are shown in **Table 15**. Annual mean PM_{2.5} concentrations are well below the AQAL both without and with the proposed development and as the change in concentration relative to the AQAL is 0% at all receptors, the impacts are described as negligible.

Table 15: Predicted PM_{2.5} Impacts in 2020

Receptor	Annual Mean ($\mu\text{g}/\text{m}^3$)		% Change in Concentration Relative to AQAL	Total Concentration as % of AQAL	Impact Descriptor
	WO	W			
R1	12.8	12.8	0	37	Negligible
R2	12.6	12.6	0	36	Negligible
R3	13.2	13.2	0	38	Negligible
AQAL	25		-		

a Exceedences of the AQAL are shown in bold. WO = without scheme, W = with scheme.

Impacts on the Development

5.2.5 Predicted concentrations at the new receptors within the proposed development are shown in **Table 16**. All the values are below the AQALs; therefore, air quality for future customers at the proposed hotel will be acceptable.

Table 16: Predicted Impacts on the Development in 2020

Receptor	Annual Mean ($\mu\text{g}/\text{m}^3$)		
	NO ₂		PM ₁₀
	EFT	CURED	
R1	38.2	38.3	19.1
R2	38.6	38.7	19.3
R3	39.1	39.2	19.6
R4	38.0	38.1	18.8
AQAL	60		32

5.3. Air Quality Neutral Assessment

Building Emissions

5.3.1 The data required to calculate the total building emissions (TBE) is not currently available; therefore, the proposed development will be assessed against the building emissions benchmark (BEB) once the energy plant at the proposed development has been specified.

Transport Emissions

5.3.1 No data is available to calculate transport emission benchmarks for hotels (land use class C1); therefore the trips generated by the proposed development have been compared with the benchmark trip rates in **Table A15** in **Appendix A5**. The

proposed development will generate approximately 20.9 trips/m²/year, assuming a gross internal floor area of 4,870 m². The benchmark trip rate for class C1 in Outer London is 6.9 trips/m²/year. As the number of trips generated by the proposed development is more than the benchmark, the proposed development is not air quality neutral with regard to transport emissions.

6 Mitigation

6.1. Construction Phase

- 6.1.1 The application site has been identified as a low-medium risk site during earthworks, and a negligible-low risk site during the construction phase, as set out in **Table 11**. The dust risk category has been used, along with the professional judgement of the consultant, to determine the appropriate level of mitigation at the site. The mitigation measures, taken from the London Plan SPG on The Control of Dust and Emissions During Construction and Demolition (GLA, 2014), are described in **Appendix A4**.
- 6.1.2 The mitigation measures will be included in an Air Quality and Dust Management Plan (AQDMP), which should be submitted to the local planning authority for approval prior to commencement of work on site.

6.2. Operational Phase

- 6.2.1 The assessment has demonstrated that the scheme will not cause any exceedences of the air quality objectives, nor will the scheme introduce receptors into an area where the AQALs will be exceeded.
- 6.2.2 Mitigation measures to reduce pollutant emissions from road traffic are principally being delivered in the longer term by the introduction of more stringent emissions standards, largely via European legislation. It is not considered appropriate to propose further mitigation measures for this scheme.

6.3. Air Quality Neutral

- 6.3.1 The air quality neutral benchmark for transport has not been met. Data is not available to calculate the excess emissions due to traffic from a C1 land use; therefore, the method used to calculate the level of mitigation required would need to be agreed with the local planning authority. The London Plan Sustainable Design and Construction SPG states that:

“Developers of schemes which do not meet the ‘air quality neutral’ benchmark for buildings or transport (considered separately) after appropriate onsite mitigation measures have been incorporated will be required to off-set any excess in emissions. The developer should investigate options for providing NO_x and PM abatement measures offsite in the vicinity of the development. This will involve working with the relevant planning authority or nearby property owners to identify suitable mitigation measures. Measures could include:

- *green planting/walls and screens, with special consideration given to planting that absorbs or suppresses pollutants;*
- *upgrade or abatement work to combustion plant;*
- *retro-fitting abatement technology for vehicles and flue; and*
- *exposure reduction.*

For the purpose of this policy air quality monitoring is not eligible for funding as it is not considered to contribute to actual air quality improvements.

Measures could be provided in whole or part directly by the developer or by making a contribution to an existing project. Measures should be secured by condition or s106, as appropriate. However, any agreement for off-site measures, including financial contribution, need to consider any restrictions imposed by the CIL Regulations.”

7 Residual Impacts

7.1. Construction Phase

- 7.1.1 The London Plan SPG is clear that, with appropriate mitigation in place, the residual effect will normally be 'not significant'. With the implementation of the mitigation measures set out in **Appendix A4**, the residual effects are judged to be *insignificant*.
- 7.1.2 During adverse weather conditions, or where there is an interruption to the water supply, there may be occasional, short-term dust annoyance; however, the likely scale and duration of these effects would not change the conclusion that the residual effects are *insignificant*.

7.2. Operational Phase

- 7.2.1 The residual impacts will be the same as those identified in **Section 5.2**.

8 Conclusions

- 8.1.1 The construction phase will have the potential to create dust. It will therefore be necessary to implement mitigation measures to minimise dust emission. With these measures in place, it is expected that any residual effects will be not significant.
- 8.1.2 The operational impacts due increased traffic emissions as a result of the proposed development have been assessed. In the case of NO₂, predicted annual mean concentrations at existing receptors remain above the AQAL at one receptor in 2020 whether the scheme is developed or not, and whether or not a reduction in vehicle emissions of nitrogen oxides is assumed. However, the change in concentration relative to the AQAL is 0% at all receptors, and the impacts are described as negligible.
- 8.1.3 Predicted PM₁₀ and PM_{2.5} annual mean concentrations are below the AQALs whether the scheme is developed or not and the change in concentration relative to the AQAL is 0% at all receptors; therefore, the impacts are described as negligible.
- 8.1.4 The impacts of local traffic on the air quality for customers of the proposed hotel have been shown to be acceptable at the worst-case locations assessed, with concentrations being below the relevant air quality objectives.
- 8.1.5 The overall operational air quality impacts of the development are judged to be *insignificant*. This conclusion, which takes account of the uncertainties in future projections, in particular for nitrogen dioxide, is based on:
- The impacts being described as negligible at all existing receptors; and
 - predicted concentrations being well below the objectives at all new receptors.
- 8.1.6 The development is not air quality neutral with regard to transport emissions. Mitigation will need to be agreed with the council to off-set the excess transport emissions and minimise the cumulative air quality impact of the proposed development.
- 8.1.7 With mitigation during the construction phase and off-setting of the excess transport emissions, there should be no constraints to the development of the site as a hotel with regard to air quality as the proposed development is consistent with:
- The NPPF;
 - The London Plan and supporting SPG's; and
 - Policy EM8 of the Hillingdon Local Plan Part 1.

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10 Glossary

AADT	Annual Average Daily Traffic
ADMS-Roads	Atmospheric Dispersion Modelling System
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMP	Dust Management Plan
EFT	Emissions Factor Toolkit
EPUK	Environmental Protection UK
Exceedence	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
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LEZ	Low Emission Zone
µg/m³	Microgrammes per cubic metre
MAQS	Mayor's Air Quality Strategy
NAEI	National Atmospheric Emissions Inventory
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
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
SPG	Supplementary Planning Guidance
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal

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A1 Construction Dust Risk Assessment Methodology

A1.1. Introduction

A1.1.1 The London Plan SPG on the Control of Dust and Emissions During Construction and Demolition (GLA, 2014) divides activities on construction sites into four types to reflect their different potential impacts:

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

A1.1.2 A series of steps then consider the potential impact due to:

- the risk of health effects from an increase in exposure to PM₁₀ and PM_{2.5};
- annoyance due to the deposition of dust;
- harm to the natural environment.

A1.2. Step 1: Screen the Need for a Detailed Assessment

A1.2.1 An assessment is required where there is a human receptor within 50 m of the site boundary, 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 site boundary, 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).

A1.2.2 Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is negligible, and any effects will be not significant.

A1.3. Step 2: Assess the Risk of Dust Impacts

A1.3.1 A site is allocated to a risk category based on two factors:

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

A1.3.2 These two factors are combined at Step 2C to determine the risk of dust impacts from each type of construction activity, with no mitigation applied.

Step 2A: Potential Dust Emissions Magnitude

A1.3.3 The dust emission magnitude is classified as small, medium or large. Examples of how the potential dust emission magnitude for each activity can be defined are shown in **Table A1**.

Table A1: Examples of How the Dust Emission Magnitude can be Defined

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

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

Step 2B: Define the Sensitivity of the Area

A1.3.4 The sensitivity of the area takes account of:

- the specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of PM₁₀, the local background concentrations; and
- site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

A1.3.5 The specific sensitivities of different types of receptor to dust soiling and PM₁₀ are shown in **Table A2**, **Table A3** and **Table A4**. Professional judgement should be used to identify where on the spectrum of sensitivity a receptor lies, taking account of specific circumstances, i.e. the first occupants of residential units on a phased development may be expected to be less sensitive to dust soiling.

A1.3.6 The sensitivity of the area is then determined from the specific sensitivities of the receptors using the matrices set out in **Table A5**, **Table A6** (amended to take account of updates in the IAQM construction dust guidance) and **Table A7**. Professional judgement should be used to determine the final sensitivity of the area, taking account of:

- any history of dust generating activities in the area;
- the likelihood of concurrent dust generating activity on nearby sites;
- any pre-existing screening between source and receptors;
- any conclusions drawn from analysing local meteorological data which accurately represents the area; and if relevant, the season during which the works will take place;
- any conclusions drawn from local topography;
- duration of the potential impact, as a receptor may become more sensitive over time; and
- any other known specific receptor sensitivities.

Step 2C: Define the Risk of Impacts

A1.3.7 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 level of risk for each activity is determined using the matrix in **Table A8**.

A1.4. Determine Site Specific Mitigation

A1.4.1 The dust risk category determined at Step 2C has been used, along with the professional judgement of the consultant, to determine the appropriate level of mitigation at the site. The highly recommended and desirable mitigation measures set out in the London Plan SPG form the basis of the mitigation set out in **Appendix A4**.

A1.4.2 The mitigation measures will inform an Air Quality and Dust Management Plan (AQDMP), which will be submitted to the local authority for approval prior to works commencing on-site.

A1.4.3 The London Plan SPG is clear that the primary aim of the risk assessment is to identify site specific mitigation that, once adopted, will ensure that there will be no significant effect.

Table A2: Sensitivities of People to Dust Soiling

Class	Principles	Examples
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 property 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.

Table A3: Sensitivities of People to PM₁₀

Class	Principles	Examples
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.	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.

Table A4: Sensitivities of Receptors to Ecological Effects

Class	Principles	Examples
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 (SAC) 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 (SSSI) 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 A5: 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

Table A6: 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

² For demolition, earthworks and construction, the distances are measured from the dust source, or the application site boundary. For trackout, the distances are measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, 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 or the road.

Receptor Sensitivity	Annual Mean PM ₁₀	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
	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 A7: 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 A8: 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	Low 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

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

A2 Modelling Methodology

A2.1. Model Inputs

Traffic Data

- A2.1.1 The baseline AADT flows, vehicle fleet composition data and average traffic speeds for roads within 200m of receptors and verification sites have been derived from the 2013 and 2020 data in the London Atmospheric Emissions Inventory (LAEI) (GLA, 2016b). The development flows have been provided by Royal Haskoning DHV. The proposed development will generate a total of 279 daily trips, which will distribute onto Bath Road (A4) as follows; 37.3% will travel west and 62.7% will travel east. It has been assumed that all of the development traffic will remain on Bath Road as it travels west and east. The development flows have been added to the relevant 2020 LAEI data to provide the with development scenario. The traffic data are shown in **Table A9**. The modelled road network is shown in **Figure 3**. Diurnal flow profiles for the traffic have been derived from the national diurnal profiles published by the DfT (DfT, 2018).

Emissions

- A2.1.2 Emissions have been calculated using the most recent version of the Emissions Factor Toolkit (EFT) v8.0.1 (Defra, 2018b). The traffic data were entered into the EFT in order to calculate a combined emission rate for each of the road links in the modelled network.
- A2.1.3 The road traffic emissions for the sensitivity analysis have been calculated using the Calculator Using Realistic Emissions for Diesels (CURED) tool (V3A) (AQC, 2018a).

Meteorological Data

- A2.1.4 The model has been run using the full year of meteorological data that corresponds with the most recent set of nitrogen dioxide monitoring data (2017). The meteorological data has been taken from the monitoring station located at Heathrow Airport, which is considered suitable for the area.

A2.2. Background Concentrations

- A2.2.1 Background concentrations have been assumed to be the same as those measured at the London Harlington monitoring site in 2017, with no reduction in concentrations between 2017 and 2020.
- A2.2.2 The Defra background maps usually used to determine background concentrations for use when modelling have been found to overestimate concentrations in the study area. The background maps cover the whole country on a 1 km by 1 km grid and are published for each year from 2015 to 2030 (Defra, 2018b). The current maps have been verified against measurements undertaken during 2015. The estimated Defra background NO₂ concentration for the grid within which the application site and the HI3 automatic monitoring site are located is an annual mean of 35.4 µg/m³, whereas the HI3 automatic monitor measured an annual

mean NO₂ concentration of 35.4/m³ at the roadside, which is the same as the estimated background concentration.

Table A9: Summary of Traffic Data used in the Assessment ^a

LAEI Object ID	AADT	Fleet Composition (%)								Speed (km/h)
		Petrol Car	Diesel Car	Taxi	LGV	Rigid HGV	Artic HGV	Bus	MC	
2017										
35587	11,070	45.8	33.7	1.2	6.5	2.7	0.3	9.1	0.6	61.0
36096	10,504	46.9	34.4	1.0	7.9	2.0	0.4	6.1	1.3	56.9
44096	10,682	46.7	34.3	1.0	5.9	3.1	0.8	6.9	1.4	56.6
37686	11,070	45.8	33.7	1.2	6.5	2.7	0.3	9.1	0.6	44.7
37687	11,070	45.8	33.7	1.2	6.5	2.7	0.3	9.1	0.6	62.5
37688	11,070	45.8	33.7	1.2	6.5	2.7	0.3	9.1	0.6	40.1
34913	10,683	46.7	34.3	1.0	5.9	3.1	0.8	6.9	1.4	37.2
34914	10,682	46.7	34.3	1.0	5.9	3.1	0.8	6.9	1.4	55.1
40717	3,061	44.5	32.7	1.7	8.6	8.4	1.8	0.9	1.5	7.2
35581	16,398	48.5	35.6	1.0	7.5	3.0	0.2	3.2	1.1	30.9
36092	10,681	46.7	34.3	1.0	5.9	3.1	0.8	6.9	1.4	51.5
36094	10,682	46.7	34.3	1.0	5.9	3.1	0.8	6.9	1.4	56.3
36095	10,682	46.7	34.3	1.0	5.9	3.1	0.8	6.9	1.4	56.0
41750	10,681	46.7	34.3	1.0	5.9	3.1	0.8	6.9	1.4	34.4
41758	10,682	46.7	34.3	1.0	5.9	3.1	0.8	6.9	1.4	58.4
40706	11,785	43.4	31.9	0.9	10.3	3.6	0.7	9.1	0.1	39.8
40709	1,612	42.3	31.0	1.6	8.2	8.0	1.7	5.9	1.4	38.3
40711	1,612	42.3	31.0	1.6	8.2	8.0	1.7	5.9	1.4	43.8
44080	10,681	46.7	34.3	1.0	5.9	3.1	0.8	6.9	1.4	53.9
43306	16,398	48.5	35.6	1.0	7.5	3.0	0.2	3.2	1.1	34.7
45452	31,580	39.3	28.9	15.2	6.6	1.3	0.2	7.7	0.9	43.8
45789	1,612	42.3	31.0	1.6	8.2	8.0	1.7	5.9	1.4	44.7
43315	11,069	45.9	33.7	1.2	6.5	2.7	0.3	9.1	0.6	46.7
43316	11,069	45.9	33.7	1.2	6.5	2.7	0.3	9.1	0.6	48.8
43318	11,785	43.4	31.9	0.9	10.3	3.6	0.7	9.1	0.1	39.8
43323	1,612	42.3	31.0	1.6	8.2	8.0	1.7	5.9	1.4	34.1
393389	29,073	51.0	37.4	5.9	2.2	1.0	0.0	2.1	0.3	50.1
393390	29,073	51.0	37.4	5.9	2.2	1.0	0.0	2.1	0.3	24.0
398813	11,785	43.4	31.9	0.9	10.3	3.6	0.7	9.1	0.1	39.8
398871	11,785	43.4	31.9	0.9	10.3	3.6	0.7	9.1	0.1	39.8
399078	10,682	46.7	34.3	1.0	5.9	3.1	0.8	6.9	1.4	41.3
398951	11,714	43.7	32.1	0.9	10.4	3.6	0.7	8.6	0.1	39.8
414548	16,112	38.5	28.3	14.9	6.4	1.2	0.2	9.5	0.8	43.8
414591	21,540	47.1	34.6	1.2	6.7	2.8	0.3	6.6	0.6	46.0
433757	11,785	43.4	31.9	0.9	10.3	3.6	0.7	9.1	0.1	39.8

LAEI Object ID	AADT	Fleet Composition (%)								Speed (km/h)
		Petrol Car	Diesel Car	Taxi	LGV	Rigid HGV	Artic HGV	Bus	MC	
455526	11,785	43.4	31.9	0.9	10.3	3.6	0.7	9.1	0.1	39.8
450061	16,112	38.5	28.3	14.9	6.4	1.2	0.2	9.5	0.8	43.8
455222	11,785	43.4	31.9	0.9	10.3	3.6	0.7	9.1	0.1	39.8
477214	10,432	46.8	34.4	1.0	7.9	2.0	0.4	6.2	1.3	44.7
492239	16,398	48.5	35.6	1.0	7.5	3.0	0.2	3.2	1.1	44.2
498550	16,097	38.6	28.3	14.9	6.5	1.2	0.2	9.5	0.9	8.0
498424	10,682	46.7	34.3	1.0	5.9	3.1	0.8	6.9	1.4	43.6
498551	16,097	38.6	28.3	14.9	6.5	1.2	0.2	9.5	0.9	8.0
498552	32,220	38.5	28.3	14.9	6.4	1.2	0.2	9.5	0.8	34.8
2020 Without Development										
35587	11,300	43.1	36.7	1.1	6.5	2.6	0.3	9.0	0.6	60.3
36096	10,728	44.0	37.5	1.0	7.9	2.0	0.4	6.0	1.3	56.3
44096	10,907	43.8	37.3	1.0	5.9	3.1	0.8	6.8	1.4	55.9
37686	11,300	43.1	36.7	1.1	6.5	2.6	0.3	9.0	0.6	44.3
37687	11,300	43.1	36.7	1.1	6.5	2.6	0.3	9.0	0.6	61.9
37688	11,300	43.1	36.7	1.1	6.5	2.6	0.3	9.0	0.6	39.7
34913	10,908	43.8	37.3	1.0	5.8	3.1	0.8	6.8	1.4	36.8
34914	10,907	43.8	37.3	1.0	5.9	3.1	0.8	6.8	1.4	54.5
40717	3,109	41.7	35.6	1.7	8.6	8.3	1.8	0.9	1.5	7.1
35581	16,674	45.4	38.7	1.0	7.5	3.0	0.2	3.1	1.1	30.7
36092	10,906	43.8	37.3	1.0	5.9	3.1	0.8	6.8	1.4	51.0
36094	10,907	43.8	37.3	1.0	5.9	3.1	0.8	6.8	1.4	55.7
36095	10,907	43.8	37.3	1.0	5.9	3.1	0.8	6.8	1.4	55.4
41750	10,906	43.8	37.3	1.0	5.9	3.1	0.8	6.8	1.4	34.1
41758	10,907	43.8	37.3	1.0	5.9	3.1	0.8	6.8	1.4	57.8
40706	11,971	40.7	34.7	0.9	10.3	3.6	0.7	9.1	0.1	39.6
40709	1,636	39.7	33.8	1.6	8.2	7.9	1.7	5.8	1.4	38.1
40711	1,636	39.7	33.8	1.6	8.2	7.9	1.7	5.8	1.4	43.6
44080	10,906	43.8	37.3	1.0	5.9	3.1	0.8	6.8	1.4	53.3
43306	16,674	45.4	38.7	1.0	7.5	3.0	0.2	3.1	1.1	34.5
45452	32,102	36.8	31.4	15.2	6.6	1.2	0.2	7.6	0.9	43.7
45789	1,636	39.7	33.8	1.6	8.2	7.9	1.7	5.8	1.4	44.6
43315	11,299	43.1	36.7	1.1	6.5	2.6	0.3	9.0	0.6	46.2
43316	11,299	43.1	36.7	1.1	6.5	2.6	0.3	9.0	0.6	48.3
43318	11,971	40.7	34.7	0.9	10.3	3.6	0.7	9.1	0.1	39.6
43323	1,636	39.7	33.8	1.6	8.2	7.9	1.7	5.8	1.4	33.9
393389	29,647	47.8	40.7	5.9	2.1	1.0	0.0	2.1	0.3	49.4
393390	29,647	47.8	40.7	5.9	2.1	1.0	0.0	2.1	0.3	23.6
398813	11,971	40.7	34.7	0.9	10.3	3.6	0.7	9.1	0.1	39.6

LAEI Object ID	AADT	Fleet Composition (%)								Speed (km/h)
		Petrol Car	Diesel Car	Taxi	LGV	Rigid HGV	Artic HGV	Bus	MC	
398871	11,971	40.7	34.7	0.9	10.3	3.6	0.7	9.1	0.1	39.6
399078	10,907	43.8	37.3	1.0	5.9	3.1	0.8	6.8	1.4	40.9
398951	11,899	41.0	34.9	0.9	10.4	3.6	0.7	8.5	0.1	39.6
414548	16,376	36.1	30.8	14.9	6.5	1.2	0.2	9.5	0.9	43.7
414591	21,995	44.2	37.7	1.2	6.7	2.7	0.3	6.5	0.6	45.5
433757	11,971	40.7	34.7	0.9	10.3	3.6	0.7	9.1	0.1	39.6
455526	11,971	40.7	34.7	0.9	10.3	3.6	0.7	9.1	0.1	39.6
450061	16,376	36.1	30.8	14.9	6.5	1.2	0.2	9.5	0.9	43.7
455222	11,971	40.7	34.7	0.9	10.3	3.6	0.7	9.1	0.1	39.6
477214	10,602	43.9	37.4	1.0	7.9	2.0	0.4	6.1	1.3	44.3
492239	16,674	45.4	38.7	1.0	7.5	3.0	0.2	3.1	1.1	44.0
498550	16,361	36.1	30.8	15.0	6.5	1.2	0.2	9.4	0.9	8.0
498424	10,907	43.8	37.3	1.0	5.9	3.1	0.8	6.8	1.4	43.1
498551	16,361	36.1	30.8	15.0	6.5	1.2	0.2	9.4	0.9	8.0
498552	32,748	36.1	30.8	14.9	6.5	1.2	0.2	9.4	0.9	34.7
2020 With Development										
35587	11,352	43.1	36.7	1.2	6.5	2.6	0.3	9.0	0.6	60.3
36096	10,815	44.0	37.5	1.0	7.8	2.0	0.4	6.0	1.3	56.3
44096	10,995	43.8	37.3	1.0	5.8	3.1	0.8	6.8	1.4	55.9
37686	11,352	43.1	36.7	1.2	6.5	2.6	0.3	9.0	0.6	44.3
37687	11,352	43.1	36.7	1.2	6.5	2.6	0.3	9.0	0.6	61.9
37688	11,352	43.1	36.7	1.2	6.5	2.6	0.3	9.0	0.6	39.7
34913	10,960	43.8	37.3	1.0	5.8	3.1	0.8	6.8	1.4	36.8
34914	10,995	43.8	37.3	1.0	5.8	3.1	0.8	6.8	1.4	54.5
40717	3,109	41.7	35.6	1.7	8.6	8.3	1.8	0.9	1.5	7.1
35581	16,674	45.4	38.7	1.0	7.5	3.0	0.2	3.1	1.1	30.7
36092	10,958	43.8	37.3	1.0	5.8	3.1	0.8	6.8	1.4	51.0
36094	10,995	43.8	37.3	1.0	5.8	3.1	0.8	6.8	1.4	55.7
36095	10,995	43.8	37.3	1.0	5.8	3.1	0.8	6.8	1.4	55.4
41750	10,958	43.8	37.3	1.0	5.8	3.1	0.8	6.8	1.4	34.1
41758	10,995	43.8	37.3	1.0	5.8	3.1	0.8	6.8	1.4	57.8
40706	11,971	40.7	34.7	0.9	10.3	3.6	0.7	9.1	0.1	39.6
40709	1,636	39.7	33.8	1.6	8.2	7.9	1.7	5.8	1.4	38.1
40711	1,636	39.7	33.8	1.6	8.2	7.9	1.7	5.8	1.4	43.6
44080	10,958	43.8	37.3	1.0	5.8	3.1	0.8	6.8	1.4	53.3
43306	16,674	45.4	38.7	1.0	7.5	3.0	0.2	3.1	1.1	34.5
45452	32,102	36.8	31.4	15.2	6.6	1.2	0.2	7.6	0.9	43.7
45789	1,636	39.7	33.8	1.6	8.2	7.9	1.7	5.8	1.4	44.6
43315	11,351	43.1	36.7	1.2	6.5	2.6	0.3	9.0	0.6	46.2

LAEI Object ID	AADT	Fleet Composition (%)								Speed (km/h)
		Petrol Car	Diesel Car	Taxi	LGV	Rigid HGV	Artic HGV	Bus	MC	
43316	11,351	43.1	36.7	1.2	6.5	2.6	0.3	9.0	0.6	48.3
43318	11,971	40.7	34.7	0.9	10.3	3.6	0.7	9.1	0.1	39.6
43323	1,636	39.7	33.8	1.6	8.2	7.9	1.7	5.8	1.4	33.9
393389	29,647	47.8	40.7	5.9	2.1	1.0	0.0	2.1	0.3	49.4
393390	29,647	47.8	40.7	5.9	2.1	1.0	0.0	2.1	0.3	23.6
398813	11,971	40.7	34.7	0.9	10.3	3.6	0.7	9.1	0.1	39.6
398871	11,971	40.7	34.7	0.9	10.3	3.6	0.7	9.1	0.1	39.6
399078	10,995	43.8	37.3	1.0	5.8	3.1	0.8	6.8	1.4	40.9
398951	11,899	41.0	34.9	0.9	10.4	3.6	0.7	8.5	0.1	39.6
414548	16,376	36.1	30.8	14.9	6.5	1.2	0.2	9.5	0.9	43.7
414591	22,099	44.3	37.7	1.2	6.7	2.7	0.3	6.5	0.6	45.5
433757	11,971	40.7	34.7	0.9	10.3	3.6	0.7	9.1	0.1	39.6
455526	11,971	40.7	34.7	0.9	10.3	3.6	0.7	9.1	0.1	39.6
450061	16,376	36.1	30.8	14.9	6.5	1.2	0.2	9.5	0.9	43.7
455222	11,971	40.7	34.7	0.9	10.3	3.6	0.7	9.1	0.1	39.6
477214	10,690	43.9	37.4	1.0	7.9	2.0	0.4	6.1	1.3	44.3
492239	16,674	45.4	38.7	1.0	7.5	3.0	0.2	3.1	1.1	44.0
498550	16,361	36.1	30.8	15.0	6.5	1.2	0.2	9.4	0.9	8.0
498424	10,995	43.8	37.3	1.0	5.8	3.1	0.8	6.8	1.4	43.1
498551	16,361	36.1	30.8	15.0	6.5	1.2	0.2	9.4	0.9	8.0
498552	32,748	36.1	30.8	14.9	6.5	1.2	0.2	9.4	0.9	34.7

a LGV=light goods vehicle, HGV=heavy goods vehicle, MC=motorcycle.

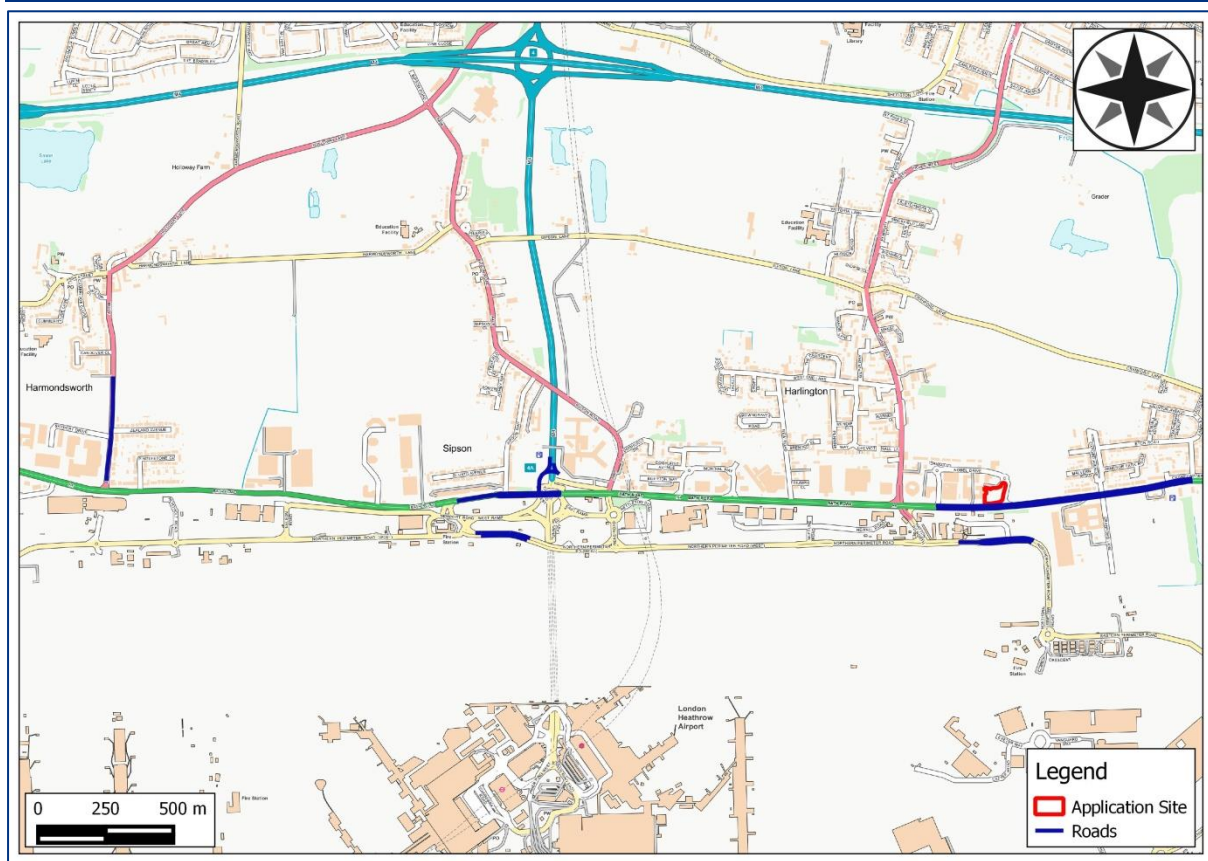


Figure 3: Modelled Roads

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A2.3. Verification

A2.3.1 The verification process seeks to minimise uncertainties associated with the air quality model by comparing the model output with locally measured concentrations. Data from the HI3 automatic monitoring site and the HD200 diffusion tube monitoring site have been used. The verification methodology is described below.

NO₂

A2.3.2 Most NO₂ is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NO_x = NO + NO₂). The model has been run to predict the 2016 annual mean NO_x concentrations at the monitoring sites.

A2.3.3 The model output of road-NO_x has been compared with the 'measured' road-NO_x, calculated from the measured annual mean NO₂ concentrations and the background concentrations using the NO_x from NO₂ calculator v6.1 published by Defra (Defra, 2018b).

A2.3.4 The slope of the best-fit line between the 'measured' road-NO_x contribution and the model derived road-NO_x contribution, forced through zero, has been used to determine the adjustment factor (**Figure 4**). The adjustment factor of 2.51 has been applied to the modelled road-NO_x concentration for each receptor to provide

adjusted modelled road-NO_x concentrations. The NO_x to NO₂ calculator has then been used to determine total NO₂ concentrations from the adjusted modelled road-NO_x concentrations and the background NO₂ concentrations.

A2.3.5 A comparison of the final adjusted modelled total NO₂ at each monitoring site to the measured total NO₂ shows close agreement (**Figure 5**). The results imply that the model has under-predicted the road-NO_x contribution. This is a common experience with this and most other models.

PM₁₀ and PM_{2.5}

A2.3.6 PM₁₀ is measured at the HI3 automatic monitoring site and an adjustment factor for PM has been calculated as follows:

- Measured PM₁₀ : 19.4 µg/m³
- Background PM₁₀ : 14.7 µg/m³
- 'Measured' road-PM₁₀ : 4.67 µg/m³
- Modelled road-PM₁₀ = 0.52 µg/m³
- Road-PM adjustment factor: 4.67/0.52 = **9.02**

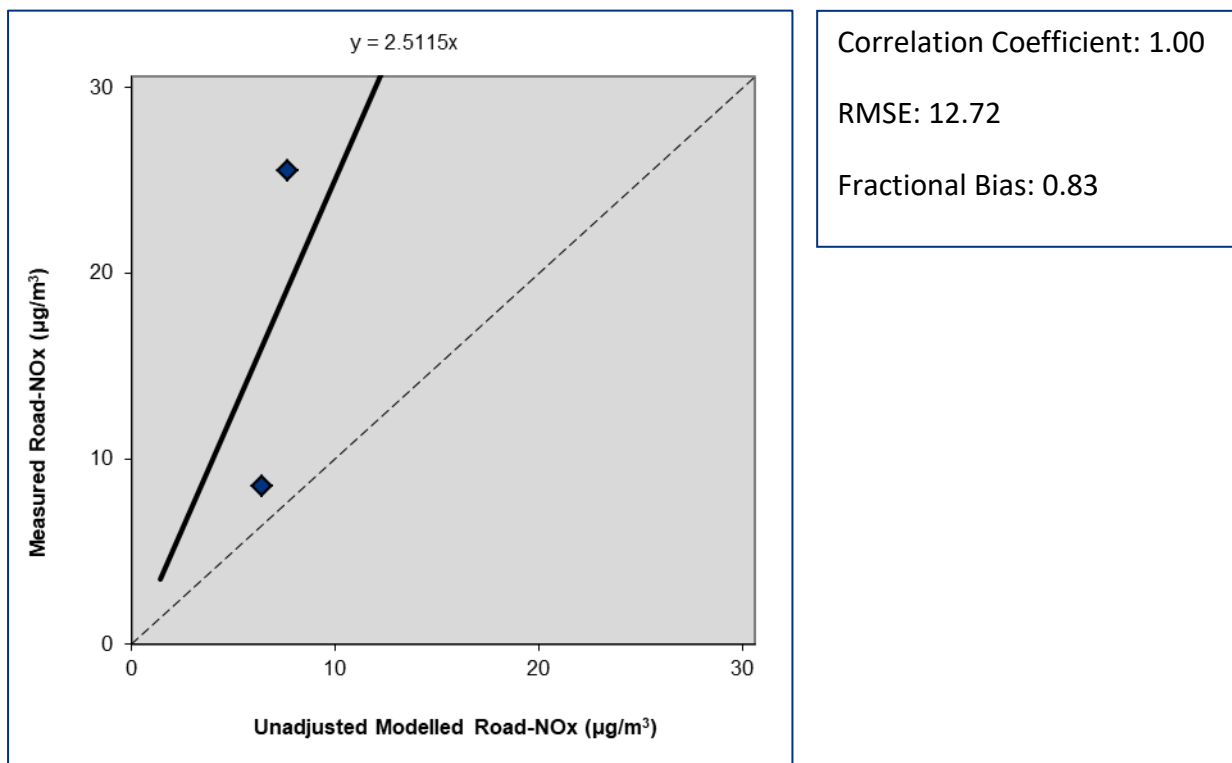


Figure 4: Comparison of Measured Road NO_x to Unadjusted Modelled Road NO_x Concentrations.

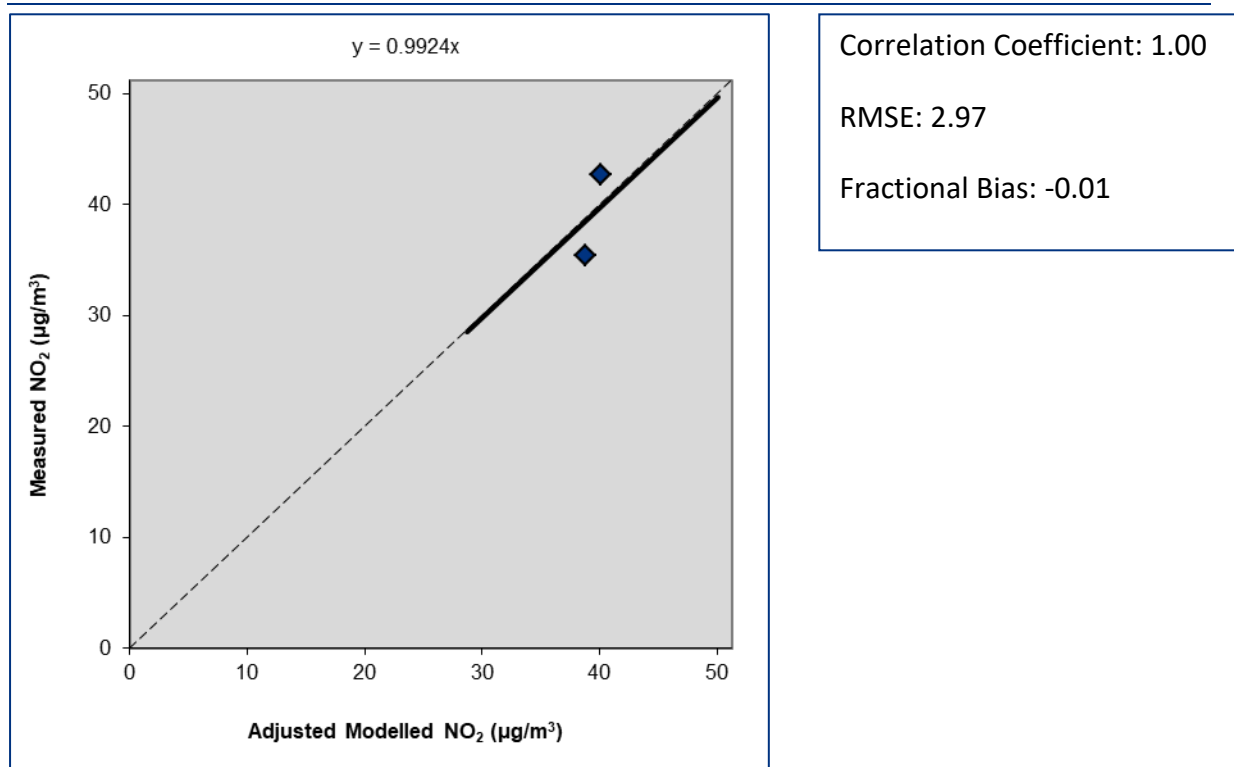


Figure 5: Comparison of Measured Total NO₂ to Primary Adjusted Modelled Total NO₂ Concentrations.

A2.4. Model Post-processing

NO₂

- A2.4.1 The NO_x to NO₂ calculator v6.1 published by Defra has been used to convert the modelled, verified road-NO_x output for each receptor to road-NO₂. The background NO₂ concentrations have then been added to the predicted road-NO₂ concentrations to give the final predicted concentrations.

PM₁₀ and PM_{2.5}

- A2.4.2 The verified road-PM outputs need no further processing, and have been added to the background concentrations to give the final predicted concentrations.

A3 Professional Experience

Bob Thomas, BSc (Hons) PgDip MSc MEnvSc MIAQM CSci

Bob Thomas is a Director at AQA, with over eleven years' experience in the field of air quality management and assessment. He has carried out air quality assessments for a wide range of developments, including residential, commercial, industrial, minerals and waste developments. He has been responsible for air quality projects that include ambient air quality monitoring of nitrogen dioxide, dust and PM₁₀, the assessment of nuisance odours and dust, and the preparation of Review and Assessment reports for local authorities. He has extensive dispersion modelling experience for road traffic, energy centre and industrial sources, and has completed many stand-alone reports and chapters for inclusion within an Environmental Statement. Bob has worked with a variety of clients to provide expert air quality services and advice, including local authorities, planners, developers, architects and process operators, and has provided expert witness services at public inquiry. He is a Chartered Scientist, a Member of the Institute of Air Quality Management and a Member of the Institution of Environmental Sciences.

A full CV for Bob Thomas is available at <http://aqassessments.co.uk/about>

A4 Construction Mitigation

A4.1.1 The following is a set of measures that should be incorporated into the Air Quality and Dust Management Plan for the works:

A4.2. 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 and dust 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 the action taken to resolve the situation in the log book.

A4.3. Preparing and Maintaining the Site

- Plan the site layout: machinery and dust-causing activities should be located away from receptors;
- erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on site;
- avoid site runoff of water or mud;
- keep site fencing, barriers and scaffolding clean using wet methods;
- remove materials from site as soon as possible; and
- cover, seed or fence stockpiles to prevent wind whipping.

A4.4. Operating Vehicle/Machinery and Sustainable Travel

- Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone;
- ensure all non-road mobile machinery (NRMM) comply with the standards set within the London Plan SPG on The Control of Dust and Emissions During Construction and Demolition;
- ensure all vehicles switch off their engines when stationary – no idling vehicles;
- avoid the use of diesel- or petrol-powered generators and use mains electricity or battery-powered equipment where possible; and
- implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).

A4.5. 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 mitigation (using recycled water where possible);
- 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.

A4.6. Waste Management

- Reuse and recycle waste to reduce dust from waste materials; and
- no bonfires or burning of waste materials.

A4.7. Measures Specific to Construction

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.

A4.8. Measures Specific to Trackout

- Avoid dry sweeping of large areas;
- ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport; and
- implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

A5 Air Quality Neutral

A5.1.1 The methodology report that supports the GLA's SPG on Sustainable Design and Construction provides guidance on the application of the air quality neutral policy (AQC, 2014). The developments emissions are compared with the relevant emissions benchmarks to determine whether the development is air quality neutral.

A5.2. Building Emissions

A5.2.1 The building emissions benchmarks (BEB) are shown in **Table A10**.

Table A10: Building Emissions Benchmarks (BEB)

Land Use Class	BEB (g/m ² /annum ^a)	
	NO _x	PM ₁₀
Class A1 (Retail)	22.6	1.29
Class A3 to Class A5 (Restaurants, drinking establishments, hot food takeaway)	75.2	4.32
Class A2 and Class B1 (Financial/professional services/business)	30.8	1.77
Class B2 to Class B7 (General industrial)	36.6	2.95
Class B8 (Storage and distribution)	23.6	1.9
Class C1 (Hotels)	70.9	4.07
Class C2 (Residential institutions)	68.5	5.97
Class C3 (Residential dwellings)	26.2	2.28
Class D1 (a) (Medical and health services)	43	2.47
Class D1 (b) (Crèche, day centres etc.)	75	4.3
Class D1 (c-h) (Schools, libraries etc.)	31	1.78
Class D2 (a-d) (Cinemas, concert halls etc.)	90.3	5.18
Class D2 (e) (Swimming pools, gymnasium etc.)	284	16.3

a The area refers to the Gross Internal Floor Area (GIFA)

A5.2.2 The BEB for the development is calculated by multiplying the gross internal floor area of each land use class by the relevant BEB from **Table A10**, and summing the results.

A5.2.3 The building related emissions (BRE) for each land use category are calculated using the:

- Gross internal floor area of the development (m²);

- On-site emissions of NO_x associated with building use (kg/annum), calculated from energy use (kWh/annum) using default (see **Table A11**) or site specific emission factors (kg/kWh); and
- On-site emissions of PM₁₀ associated with oil or solid fuel use (kg/annum) calculated from energy use (kWh/annum) using default (see **Table A11**) or site specific emission factors (kg/kWh).

Table A11: Default Emission Factors for Buildings

Development	Gas (kg/kWh)	Oil (kg/kWh)	
	NO _x	NO _x	PM ₁₀
Domestic	0.0000785	0.0003690	0.0000800
Industrial/Commercial	0.0001940	0.0003690	0.0000800

A5.2.4 The NO_x and PM₁₀ emissions for each land use class are summed to give the total building emissions (TBE) for the development. If the TBE for the development are less than the BEB for the development, then the development building emissions are deemed to be air quality neutral.

A5.3. Transport Emissions

A5.3.1 The transport emissions benchmarks (TEB) are shown in **Table A12**.

Table A12: Transport Emissions Benchmarks (TEB)

Land use	TEB		
	CAZ ^a	Inner ^b	Outer ^b
NO_x (g/m²/annum)			
Retail (A1)	169	219	249
Office (B1)	1.27	11.4	68.5
NO_x (g/dwelling/annum)			
Residential (C3)	234	558	1,553
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 and Outer London, as defined in the London Atmospheric Emissions Inventory (GLA, 2013)

A5.3.2 The TEB for the development is calculated by multiplying the number of dwellings or the gross internal floor area of each land use class by the relevant TEB from **Table A12**, and summing the results.

A5.3.3 The transport related emissions (TRE) for each land use category are calculated using the:

- Gross internal floor area (m²) of the development (A1-A5, B1), and/or the number of dwellings (C3, C4);
- Development trip rate (trips/m²/annum or trips/dwelling/annum)
- Average distance travelled (km) for each land-use class (see **Table A13**);
- Average road traffic emissions of NO_x and PM₁₀ (see **Table A14**),

Table A13: Average Distance Travelled by Car per Trip

Land use	Distance (km)		
	CAZ ^a	Inner ^b	Outer ^b
Retail (A1)	9.3	5.9	5.4
Office (B1)	3	7.7	10.8
Residential (C3)	4.3	3.7	11.4

a Central Activity Zone

b Inner and Outer London, as defined in the London Atmospheric Emissions Inventory (GLA, 2013)

Table A14: Average Road Traffic Emission Factors

Pollutant	g/vehicle-km		
	CAZ ^a	Inner ^b	Outer ^b
NO _x	0.4224	0.37	0.353
PM ₁₀	0.0733	0.0665	0.0606

a Central Activity Zone

b Inner and Outer London, as defined in the London Atmospheric Emissions Inventory (GLA, 2013)

A5.3.4 The NO_x and PM₁₀ emissions for each land use class are summed to give the total transport emissions (TTE) for the development. If the TTE for the development are less than the TEB for the development, then the development transport emissions are deemed to be Air Quality Neutral.

A5.3.5 It is only possible to calculate TEBs for a limited range of land-use categories. Where it is not possible to calculate a TEB for a specific land use, the scheme-generated trip rate for a particular land-use class should be compared with the benchmark trip rates in **Table A15**. If the scheme-generated trip rate is less than the benchmark trip rate, the scheme is air quality neutral. If the scheme is not air quality neutral, it is not possible to derive excess emissions using this method and the developer would need to suggest an alternative approach.

Table A15: Benchmark Trip Rates

Land Use	Number of Trips (trip/m ² /annum)		
	CAZ ^a	Inner ^b	Outer ^b
A3	153	137	170
A4	2.0	8.0	-
A5	-	32.4	590
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

a Central Activity Zone

b Inner and Outer London, as defined in the London Atmospheric Emissions Inventory (GLA, 2016b)