AIR POLLUTION SERVICES

St Dunstans House, Bedminster Down Road, Bristol, BS13 7AB
Tel: 01179 112434. Email: contact@airpollutionservices.co.uk

Air Quality Assessment: 18 Iron Bridge Close, London

Date: 4 February 2021

Client:	CCP Group	**Contact:**	Dan Pathirana
Reference:	P1005_B_1	**Status:**	Final
Author:	Katya Kaczmarczyk	**Date Published:**	4 February 2021
Approver:	Dr Austin Cogan	**Date Approved:**	4 February 2021

Contact Details

Contact Name:	Katya Kaczmarczyk
Tel:	01179 112434
Email:	contact@airpollutionservices.co.uk

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Experts in Air Quality, Odour and Climate Change

Executive Summary

The air quality impacts associated with the proposed residential development at 18 Iron Bridge Close have been considered and found to be not significant. The development is expected to lead to a slight reduction in vehicle traffic and will have no building-related pollutant emissions; the development is thus expected to result in a marginal improvement in local air quality.

The impacts of existing sources of pollution in the local area upon air quality for future residents has also been considered. Concentrations of nitrogen dioxide and particulate matter associated with background and road traffic have been predicted throughout the proposed development, at both the residential units and outdoor locations. All predicted concentrations are below the objectives, even when taking account of possible congestion on nearby roads.

Consideration has also been given to other local sources of pollution. Two cement batching facilities have been identified in the local area, the effects of which have been assessed. Dust from these sources will not lead to any of the objectives being exceeded at the proposed development and the dust soiling effects will be negligible at the proposed development. The amenity for future residents at indoor and outdoor locations within the application site will thus be acceptable both in terms of dust soiling and air quality.

Overall, the impacts of the development will be 'not significant' and air quality for future residents will be acceptable. It is thus not considered appropriate to propose further mitigation measures for this development.

Contents

1 Introduction

1.1 Air Pollution Services (APS) has been commissioned by CCP Group to assess the air quality impacts associated with the proposed residential development at 18 Iron Bridge Close in the London Borough of Brent (hereafter known as the 'Proposed Development').

1.1 The application site already has planning permission to convert the existing offices onsite at ground and first floor to residential flats.

1.2 The Proposed Development involves the construction of one additional floor comprising two residential flats, on top of the existing building. The Proposed Development site location is shown in Figure 1.

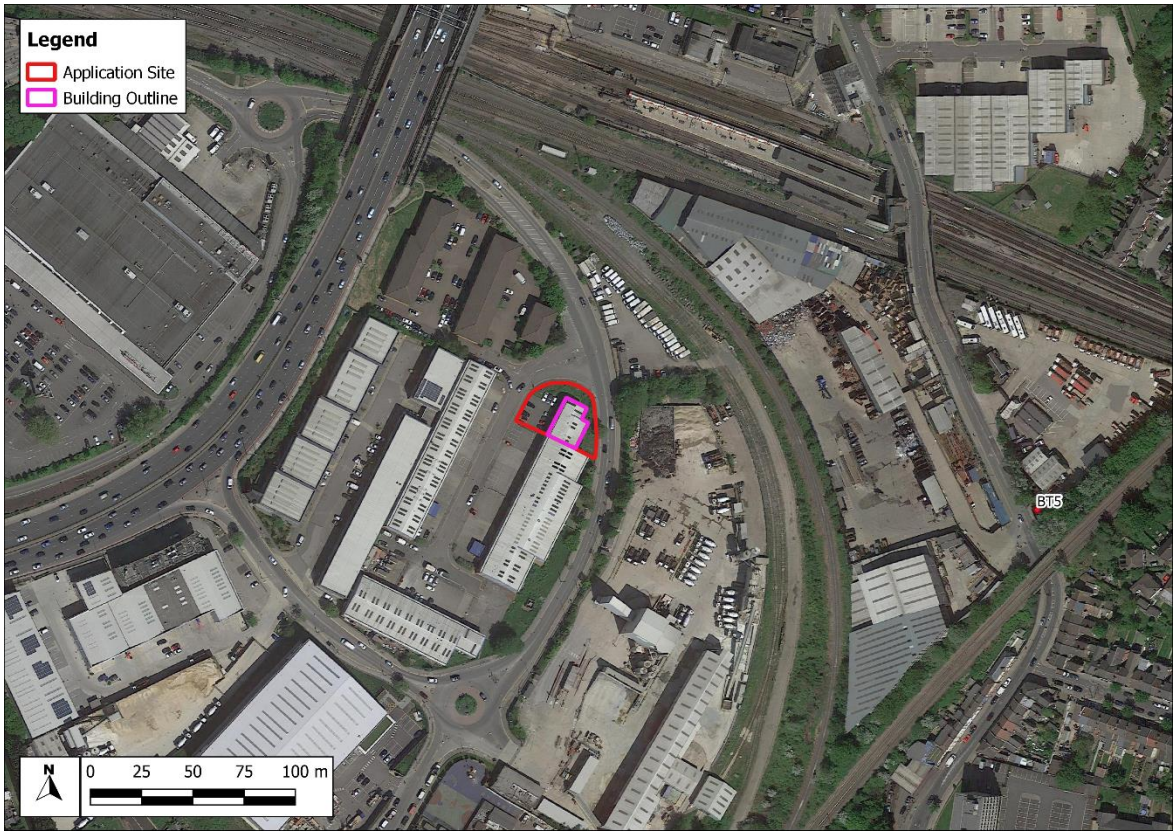

Figure 1: Site location

Imagery ©2019 Google. Map data ©2019.

Scope of assessment

1.2 The assessment approach and methodology were agreed with the London Borough of Brent via a telephone discussion between Dr Austin Cogan (APS) and Emma Tindall (Environmental Health Enforcement Officer at Brent Council) on the 6th August 2019. More recently, Emma Tindall requested on the 19th January 2021 that the assessment should take account of the latest air quality monitoring results available from the Council (these being measured concentrations in 2019).

1.3 It should be noted that the modelling was carried out in 2019 and is therefore based upon best practice modelling approaches, air quality monitoring and traffic flows available at that time. While there has been updates in vehicle emission factors, traffic flows, and modelling software since 2019, the assessment is based upon more conservative factors and thus remains a robust assessment. Further details of this are set out throughout the report.

Scoped into the assessment

1.4 The Proposed Development is in a residential/industrial area close to highly trafficked roads in London. It is located within an Air Quality Management Area (AQMA) declared by the London Borough of Brent and within 150 m of an Air Quality Focus Area declared by the Greater London Authority (GLA). The main concerns relating to air quality are the impact that the Proposed Development might have on sensitive receptors in the local area and the conditions for future residents of the Proposed Development.

1.3 This assessment describes the existing and future air quality at the Proposed Development and in the local area. Consideration has been given to nitrogen dioxide (NO_2) and particulate matter (both PM_{10} and $PM_{2.5}$) as these are the pollutants of most concern.

1.5 It also considers the impact of the Proposed Development upon local air quality, in terms of potential transport and building emissions generated by the Proposed Development.

Scoped out of the assessment

1.6 The London Plan includes Supplementary Planning Guidance on The Control of Dust and Emissions during Construction and Demolition. This involves calculating the risk of dust nuisance and human-health related effects from demolition, earthworks, construction and trackout activities. This guidance only applies to 'major' developments; those involving ten or more residential units. Given that this application is only for two residential units, an assessment of construction dust is not required.

1.7 The GLA's SPG on Sustainable Design and Construction (GLA, 2014) provides details on delivering some of the priorities in the London Plan. Within this, Policy 7.14B(c) states that an assessment of *"air quality neutral"* should be implemented. This also only applies to major developments; an air quality neutral assessment is thus not required.

2 Legislation, Policy and Guidance Documents

2.1 This section sets out the planning policy which is a material consideration in determining planning applications, legislation, guidance documents and other sources of useful information.

Planning Policy

National Planning Policy Framework

2.2 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities & Local Government, 2019a) sets out planning policy for England. It includes advice on when air quality should be a material consideration in development control decisions. Relevant sections are set out below:

Paragraph 170: *"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 and water quality".*

Paragraph 180: *"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".*

Paragraph 181: *"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."*

Paragraph 183: *"The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities."*

Paragraph 54: *"Local planning authorities should consider whether otherwise unacceptable development could be made acceptable through the use of conditions or planning obligations. Planning obligations should only be used where it is not possible to address unacceptable impacts through a planning condition."*

Local Transport Plan

2.3 The 'Brent Long Term Transport Strategy 2015-2035' (London Borough of Brent, 2015) identifies air quality as one of five priority areas to focus on and makes the commitment *"To reduce the overall production of and exposure to, all pollutants from Transport at every opportunity"*. In particular, it sets out opportunities to improve air quality by adopting electric/low emission vehicles, updating freight strategies, providing car clubs and travel plans.

Local Planning Policy

2.4 The London Borough of Brent's preferred options local plan (2018) includes Policy BSU12 on Air Quality, which states that:

"Major developments within Growth Areas and Air Quality Focus Areas will be required to be Air Quality Positive and elsewhere Air Quality Neutral. Where on site delivery of these standards cannot be met, off-site mitigation measures will be required".

2.5 The local plan is supported by development management policies (London Borough of Brent, 2016). This includes Policy DMP1 which states:

"…development will be acceptable provided it is…not unacceptably increasing exposure to flood risk, noise, dust, contamination, smells, waste, light, other forms of pollution and general disturbance or detrimentally impacting on air or water quality".

Local Air Quality Action Plans

2.6 The London Borough of Brent have declared an Air Quality Management Area (AQMA) for exceedences of both nitrogen dioxide PM_{10}. The Council have since published an Air Quality Action Plans (AQAP) that includes measures to improve local air quality (London Borough of Brent, 2017). This sets out a series of 20 actions that the Council will implement to deliver air quality improvements within the borough, which cover the following themes:

1. "Cleaner Transport
2. Public Health and Community Engagement
3. Exposure Reduction Measures
4. Emission from New Developments and Buildings
5. Delivery Servicing and Freight."

Air Quality Standards, Critical Levels/Loads, Limit Values and Air Quality Objectives

2.7 The Environment Act 1995 (HMSO, 1995) sets out the requirements of the Local Air Quality Management (LAQM) regime and the requirement for the Government to produce an Air Quality Strategy including standards and objectives.

2.8 The latest Air Quality Strategy was published in 2007 (Defra, 2007) and sets out the Air Quality Standards (AQS), which considers the effects on human health, and The National Air Quality Objectives (AQOs), which are policy targets for ambient pollution. The AQOs, for use by local authorities when considering human health, were incorporated into UK legislation within the Air Quality (England) Regulations, 2000, Statutory Instrument 928 (2000) and the Air Quality (England) (Amendment) Regulations 2002, Statutory Instrument 3043 (2002).

2.9 The Strategy explains that the AQSs for the protection of human health are defined 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 AQS are set for individual pollutants and are made up of a concentration value and an averaging time over which it is to be measured.

2.10 The AQO's set out the extent to which the Government expects the AQS to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility, and possible timescales. AQO are policy targets often expressed as a maximum ambient concentration not to be exceeded, either without exception or with a permitted number of exceedences, within a specified timescale. An exceedence is a breach of the threshold for the concentration for the specific averaging period. The LAQM regime, introduced by the Environment Act 1995, requires local authorities to review air quality within their boundary and work towards achieving and maintaining the AQO.

2.11 The Strategy describes the Local Air Quality Management (LAQM) regime that has been established by Part IV of the Environment Act 1995, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the AQOs have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an AQMA and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives. The strategy also provides the policy framework for air quality management and assessment in the UK.

2.12 In additional to the AQOs set within the Air Quality Strategy and relevant regulations, the European Union (EU) has also set limit values and target values for the protection of human health. These were transposed into the Air Quality Standards Regulations (HMSO, 2010), which sets out the UK limit values for specific pollutants. Like the AQO, the limit values are set for individual pollutants and are made up of a concentration value, an averaging time over which it is to be measured, the number of exceedences allowed per year (if any) and a date by which it must be achieved. Some pollutants have more than one value covering different dates or averaging times. While the AQO are policy targets, the government has the duty to ensure compliance with the legally binding limit values which is a national obligation rather than a local one.

2.13 The 2019 Clean Air Strategy (Defra, 2019a) includes a commitment to set a *"new, ambitious, long-term target to reduce people's exposure to $PM_{2.5}$"* which the proposed Environment Bill 2019-2021 commits the Secretary of State to setting. The statutory Mayor's London Environment Strategy (published 31 May 2018) also includes a commitment to meet the World Health Organization's

(WHO) recommended guideline limit for $PM_{2.5}$ by 2030. The WHO acknowledges that current evidence suggests no safe level for $PM_{2.5}$. However, the WHO set a guideline limit, which is 10 µg/m^3 as an annual mean and more stringent than the current AQOs, reflects the level at which increased mortality from exposure to $PM_{2.5}$ is likely. Following the UK leaving the EU the Government have drafted a new Environment Bill which is not currently finalised, however, early indication is that the UK Government also intend to benchmark the $PM_{2.5}$ target against the WHO guideline value.

2.14 In addition, the recent coroners court case investigating Ella Abdoo Kissi-Debrah's death in 2013 concluded that air pollution was a significant contributing factor to both the induction of Ella's asthma and the exacerbation of her symptoms, due to exposure in exceedence of WHO guideline values for pollutants. This set a legal precedence to consider WHO guideline values when determining the significance of air quality and has thus been considered when undertaking this assessment.

Useful Sources of Information

2.15 Summaries of relevant documents and useful information have been presented in Appendix A1. The documents cover the following:

- Planning Practice Guidance;
- The Clean Air Strategy;
- The Industrial Strategy;
- The Clean Growth Strategy;
- Road to Zero
- The National Air Quality Action Plans
- The London Plan;
- The draft London Plan;
- London Environment Strategy; and
- Mayor's Transport Strategy.

Guidance Documents

Guidance on Land-Use Planning & Development Control: Planning For Air Quality

2.16 Environmental Protection UK (EPUK) in partnership with The Institute of Air Quality Management (IAQM) have produced guidance on *Land-Use Planning & Development Control: Planning For Air Quality*. EPUK and IAQM have produced this guidance to ensure that air quality is adequately considered in the land-use planning and development control processes. It provides a means of reaching sound decisions, having regard to the air quality implications of development proposals and provides guidance on how air quality considerations of individual schemes may be considered

within the development control process, by suggesting a framework for the assessment of the impacts of developments on local air quality.

LAQM Technical Guidance

2.17 Defra and the devolved administrations have published a guidance document on Local Air Quality Management (LAQM) - *Local Air Quality Management Technical Guidance (TG16) April 2018*. This document is designed to support local authorities in carrying out their duties under the Environment Act 1995, the Environment (Northern Ireland) Order 2002, and subsequent regulations. LAQM is the statutory process by which local authorities monitor, assess, and take action to improve local air quality. The Technical Guidance provides tools, approaches and technical information related to air quality.

Guidance on the Assessment of Mineral Dust Impacts for Planning

2.18 The IAQM produced guidance on the assessment of mineral dust impacts for planning (IAQM, 2016). This document provides a risk-based methodology for assessing dust effects from mineral sources upon locations of sensitive exposure. This guidance has been used in this assessment, which should be read in conjunction with the guidance document.

3 Assessment of Significance

Criteria for this Assessment

Air Quality Objectives and Limit Values

3.1 The AQOs and limit values for England for the pollutants relevant to this project are detailed in Table 1. The WHO guideline values for NO_2 are the same as those presented in Table 1.

Table 1: AQOs and Limit Values

Pollutant	Time Period	AQO / Limit Value	Concentration, and the number of exceedences allowed per year (if any)	Date AQO / Limit Value to be Achieved From and Maintained After
Nitrogen Dioxide (NO_2)	1-hour Mean	AQO / Limit Value	200 µg/m³ not to be exceeded more than 18 times a year	31st December 2005 / 1st January 2010
	Annual Mean	AQO / Limit Value	40 µg/m³	31st December 2005 / 1st January 2010
Fine Particles (PM_{10})	24-hour Mean	AQO / Limit Value	50 µg/m³ not to be exceeded more than 35 times a year	31st December 2004
	Annual Mean	AQO / Limit Value	40 µg/m³ [a]	31st December 2004
Fine Particles ($PM_{2.5}$) [b c]	Annual Mean	AQO / Limit Value	25 µg/m³	2020 / 2015

[a] The PM_{10} limit is 20 µg/m³ and may be adopted soon.

[b] The PM2.5 objective is not in Regulations and there is no legal requirement for local authorities to meet it.

[c] The PM2.5 limit is 10 µg/m³ and may be adopted soon.

Relevant exposure

AQO Receptors

3.2 The annual mean AQOs apply at locations where members of the public might be regularly exposed, such as building façades of residential properties, schools, hospitals, and care homes.

3.3 The 24-hour mean AQO applies at the annual mean locations of exposure as well as at hotels and residential gardens.

3.4 The 1-hour mean AQO applies at the annual mean locations of exposure and at hotels, residential gardens, and any outdoor location where members of the public might reasonably be expected to spend one hour or longer, such as busy pavements, outdoor bus stations and locations with outdoor seating.

3.5 Places of work like factories or offices are not considered places where members of the public might be regularly exposed and therefore the AQO's do not apply at these locations.

Limit Value Receptors

3.6 In accordance with Article 2(1), Annex III, Part A, paragraph 2 of Directive 2008/50/EC details locations where compliance with the limit values does not need to be assessed:

"Compliance with the limit values directed at the protection of human health shall not be assessed at the following locations:

a) Any locations situated within areas where members of the public do not have access and there is no fixed habitation;

b) In accordance with Article 2(1), on factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply; and

c) On the carriageway of roads; and on the central reservation of roads except where there is normally pedestrian access to the central reservation."

3.7 The government models compliance with the Directive at locations 4 m from the kerbside, 2 m high, more than 25 m from major road junctions and adjacent to at least 100 m of road length where the limit value applies.

Assessment Approach

3.8 Standard practice is to assess the impacts of a proposed development on local air quality using the EPUK and IAQM guidance on *Land-Use Planning & Development Control: Planning For Air Quality*.

3.9 The EPUK and IAQM guidance provides a staged approach to considering air quality assessments:

- Stage 1) Initial screening
- Stage 2) Detailed screening
- Stage 3) Simple or Detailed assessment

3.10 The approach includes elements of professional judgement, and the experience of the consultants preparing the report is set out in Appendix A2.

Impacts of the Development on the Local Area

3.11 Table 6.1 of the EPUK and IAQM guidance provides the Stage 1 screening criteria. The approach first considers the size and parking provision of a development; if the development is residential and is for fewer than ten homes or covers less than 0.5 ha, or is non-residential and will provide less than 1,000 m^2 of floor space or cover a site area of less than 1 ha, and will provide ten or fewer parking spaces, then there is no need to progress to a Stage 2 and in general there is no need to consider the impacts of the development on the local area.

Impacts of Emissions Sources on the Development

3.12 The EPUK and IAQM guidance explains that 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".*

Stage 2 Screening Criteria

3.13 The guidance provides example criteria and states the following in relation to the criteria:

"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".

3.14 The guidance notes that consideration should still be given to the potential impacts of neighbouring sources on the site, even if an assessment of impacts of the development on the surrounding area is screened out.

Road Traffic Assessments

3.15 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".*

3.16 The criteria relating to road traffic are:

- A change of LDV flows of:

  - more than 100 AADT within or adjacent to an AQMA

  - more than 500 AADT elsewhere.

- A change of HDV flows of:

  - more than 25 AADT within or adjacent to an AQMA

  - more than 100 AADT elsewhere.

- Where roads are realigned near to sensitive receptors and the change in alignment is 5 m or more and the road is within an AQMA.
- Applies to junctions that cause traffic to significantly change vehicle acceleration/deceleration, e.g. traffic lights, or roundabouts.
- Where bus flows will change by:

  - more than 25 AADT within or adjacent to an AQMA

  - more than 100 AADT elsewhere.

Simple or Detailed Assessments

3.17 Where an air quality assessment is identified as being required, then this may take the form of either a Simple Assessment or a Detailed Assessment. It is not uncommon for assessments to utilise detailed dispersion models to predict pollutant concentrations and impacts on local air quality (Detailed Assessment), however, it should be noted that exceeding a screening criterion in Table 6.2 of the guidance does not automatically lead to the requirement for a Detailed Assessment and the use of professional judgement and sufficient evidence can be considered appropriate at times (Simple Assessment).

3.18 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.

Long-term (Annual Mean) Impacts on Human Health

3.19 The approach set out in the EPUK and IAQM guidance provides a method for describing the impacts on local air quality arising from development.

3.20 Impact descriptors for individual receptors are used which expresses the magnitude of incremental change as a proportion of a relevant assessment level and then examining this change in the context of the new total concentration and its relationship with the assessment criterion. Table 2 sets out the matrix for determining the impact descriptor for annual mean concentrations at individual receptors, based on Table 6.3 in the EPUK and IAQM guidance document.

3.21 Where the impacts are negligible the overall significance is judged to be ‘not significant’.

Table 2: Annual mean impact descriptors for individual receptors

Annual Mean Concentration with Proposed Development (µg/m³)	% Change in Concentration relative to the AQO (µg/m³)			
	1	2-5	6-10	>10
75% or less of AQO	Negligible	Negligible	Slight	Moderate
76-94% of AQO	Negligible	Slight	Moderate	Moderate
95-102% of AQO	Slight	Moderate	Moderate	Substantial
103-109% of AQO	Moderate	Moderate	Substantial	Substantial
75% or less of AQO	Negligible	Negligible	Substantial	Substantial

Short-term Impacts on Human Health

3.22 Previous research carried out on behalf of Defra and the devolved administrations identified that exceedences of the 1-hour mean NO_2 AQO are unlikely to occur where the annual mean is below 60 µg/m^3 (Defra, 2018). Similarly, exceedences of the 24-hour mean PM_{10} AQO are unlikely to occur where the annual mean is below 32 µg/m^3. Where annual mean concentrations are below these levels the short-term impacts are considered to be negligible.

Significance

3.23 The approach developed by EPUK and IAQM (2017) has been used. 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".

3.24 If none of the criteria in Stage 1 and 2 are met, then there should be no requirement to carry out an air quality assessment for the impact of the development on the local area, and the impacts can be considered as having a not significant effect.

3.25 Where a Simple or Detailed assessment is carried out, in drawing the determination of significance, the following factors should be taken into account:

- the existing and future air quality in the absence of the Proposed 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; i.e. 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.

3.26 The guidance is clear that other factors may be relevant in individual cases. It also states that the effect on the users of any new development where the air quality is such that an air quality objective is not met will be judged as significant.

Mineral Dust Assessment Approach

3.27 There are currently no statutory standards in the UK covering the release or subsequent impacts of mineral dust, nor any formal assessment criteria for quantifying dust impacts, except where concentrations can be calculated and compared to the AQOs and limit values. In the absence of formal criteria, the impacts have been derived following the IAQM's mineral dust guidance (2016).

3.28 Potential mineral dust impacts may only occur where there is relevant exposure, i.e. where there is an emission source of dust, a pathway for dust to travel through the air and the presence of sensitive receptors (people) to either be exposed to the dust (human-health effect) or be caused nuisance from the dust (dust soiling effects).

3.29 The risk-based assessment approach set out by the IAQM utilises considers these factors to derive an overall risk that depends on the probability of there being dust exposure/nuisance together with the likely consequence if it were to transpire.

Significance Criteria

3.30 In the absence of formal criteria, the significance of the impacts has been judged based on professional experience and taking account of the IAQM mineral dust guidance (2016), which should be read in conjunction with this report. Details of the professional experience of the authors of this report are given in Appendix A2.

4 The Proposed Development

4.1 The Proposed Development comprises two residential flats, which will be located above two existing floors with planning permission for use as residential flats. Although the local area is largely light industrial in nature, an Inspector recently stated within an appeal decision relating to a different planning application (The Planning Inspectorate, 2020) concluded that the local area is suitable for residential use. The Proposed Development is shown in Figure 2.

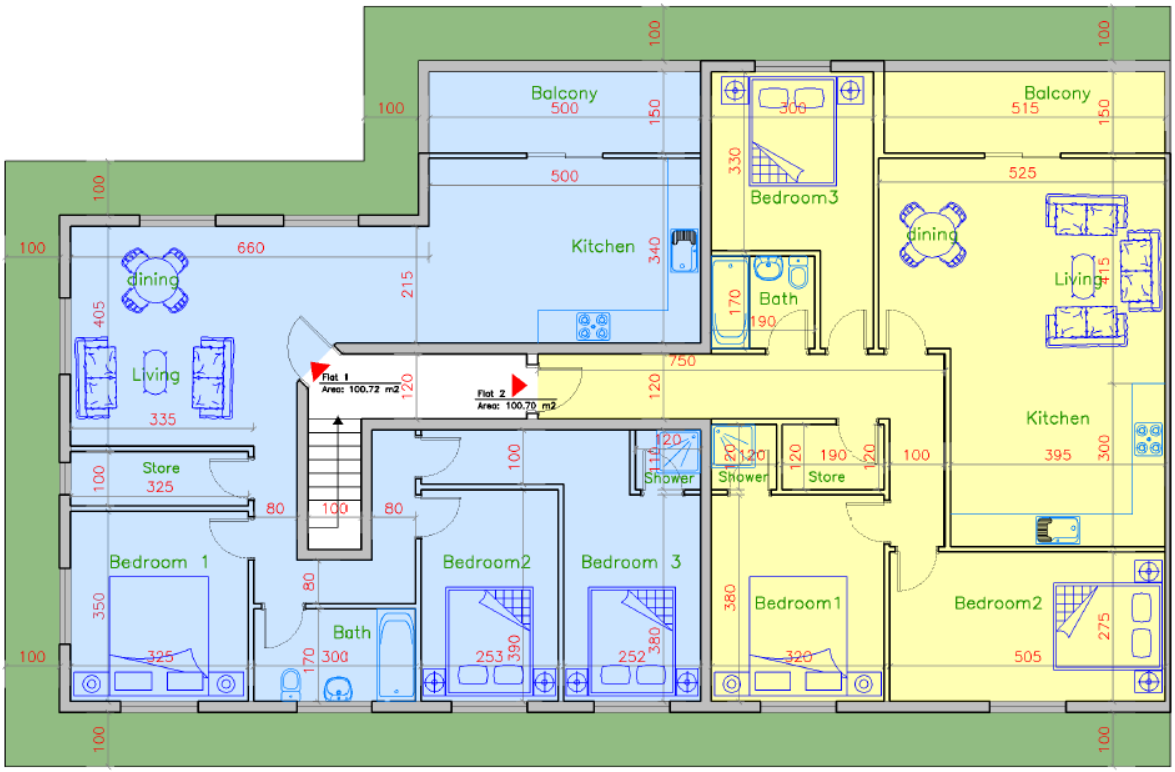

Figure 2: The Proposed Development

Information provided by Carlton Properties Ltd.

Mitigation Included by Design

4.2 The EPUK and IAQM guidance (2017) is clear that it is important that Proposed Development incorporate good design and best practice measures to ensure any impacts are minimalised as far as practicable, even where pollutant concentrations are predicted to be below the AQOs/limit values. This Proposed Development includes the following good design and best practice measures by design:

- removal of some existing parking spaces to minimise emissions associated with road transport;
- provision of electric heating and hot water, rather than gas-fired, to minimise pollutant emissions;
- provision of secure covered bicycle storage, to encourage sustainable modes of transport and minimise pollutant emissions from transportation;

- inclusion of walls, fences, and vegetation (such as trees) within the application site, to help provide screening against local sources of dust;
- situated close to local amenities, such as schools and shops, which will help minimise vehicle use; and
- situated within 140 m of several bus stops, allowing easy access to sustainable modes of transport.

5 Methodology

5.1 The following section details the methodology of the assessment. The process consists of:

1. Defining baseline conditions.
2. Considering the impact of existing emissions on the future users of the Proposed Development and the potential emissions from the development on existing receptors.
3. Evaluating the significance of any impacts in relation to both the AQO receptors, using EPUK & IAQM and the compliance receptors.

Existing Conditions

5.2 Consideration of the baseline conditions within the area of the Proposed Development have made based on the following:

- Industrial and waste management sources that may affect the area have been identified using the European Pollutant Release and Transfer Register (European Environment Agency, 2021). Local sources have also been identified through examination of maps and the Council's Air Quality Review and Assessment reports.
- Information on existing air quality has been obtained by collating the results of monitoring carried out by the local authority. This covers both the proposed site and the surrounding area, the latter being used to provide context to the assessment.
- Background concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ have been defined using the national pollution maps published by Defra (Defra, 2019b). These cover the whole of the country on a 1x1 km grid of average concentrations.
- Predicted roadside concentrations of 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, to report exceedances of the limit value to the EU. The national maps of roadside PM_{10} and $PM_{2.5}$ concentrations (Defra, 2019c), which are available for the years 2009 to 2015, show no exceedances of the limit values anywhere in the UK in 2015.
- Predicted mapped concentrations of nitrogen dioxide and PM_{10} have been defined using pollution maps published by the GLA and Transport for London (TfL) (2019b). These cover the whole of Greater London on a 20x20 m grid of average ground level concentrations for 2016.

Impacts of the Proposed Development on the local area

5.3 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 and IAQM guidance, as described in Paragraphs 3.12 to 3.14. Where impacts can be screened out there is no need to progress to a more detailed assessment.

Impacts of emissions sources on sensitive receptors within the Proposed Development

5.4 The following section sets out the approach taken to the assessment of existing sources of pollutant emissions upon air quality at the Proposed Development.

Modelling approach overview

5.5 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted at the Proposed Development, for the existing year of 2017 and the year of 2020 using the ADMS-Roads atmospheric dispersion model (v4.1.1) with the latest vehicle emission factors available from Defra's Emission Factor Toolkit (EFT) (v9.0).

5.6 As mentioned in Paragraph 1.3, the modelling was carried out in 2019 and there has since been updated emission factors and model versions published. The latest version of Defra's EFT is version 10.1. This incorporates emission factors from COPERT 5.3, leading to lower NOx emission rates for Euro 5 and 6 diesel Light Goods Vehicles (LGVs) and lower NOx emissions for motorcycles (Defra, 2020b). Since the modelling was based on the previous version of the EFT (v9.0), it can be concluded that the modelling is based upon higher emission rates than necessary and as such provides a conservative assessment.

5.7 The ADMS-Roads atmospheric dispersion model has also since been updated, with version 5.0 now available. The key differences between v4.1.1 and v5.0 relate to the usability functions within the model and have no effect on the conclusions of the assessment.

5.8 ADMS-Roads was developed and validated by Cambridge Environmental Research Consultants (CERC). The model is used extensively throughout the UK for dispersion modelling and is accepted as an appropriate tool by local authorities. The model requires a range of input parameters which are discussed below.

Modelled Receptors

5.9 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted using the ADMS-Roads dispersion model for series of receptor grids covering the Proposed Development. These grids are:

- a 0.5x0.5 m grid across the ground-floor of the application site to assess short-term air quality impacts at the car park and garden of the Proposed Development; and
- a 0.5x0.5 m grid across all floors of the application site building, including residential units, balconies, roof terrace, and mechanical ventilation inlets, to assess both short-term and long-term air quality impacts at the proposed building.

5.10 In addition, concentrations have also been predicted at the automatic monitoring sites located at Ikea and Neasden Lane, in order to verify the model (see paragraph A3.16).

5.11 The onsite receptors grids are shown in Figure 3.

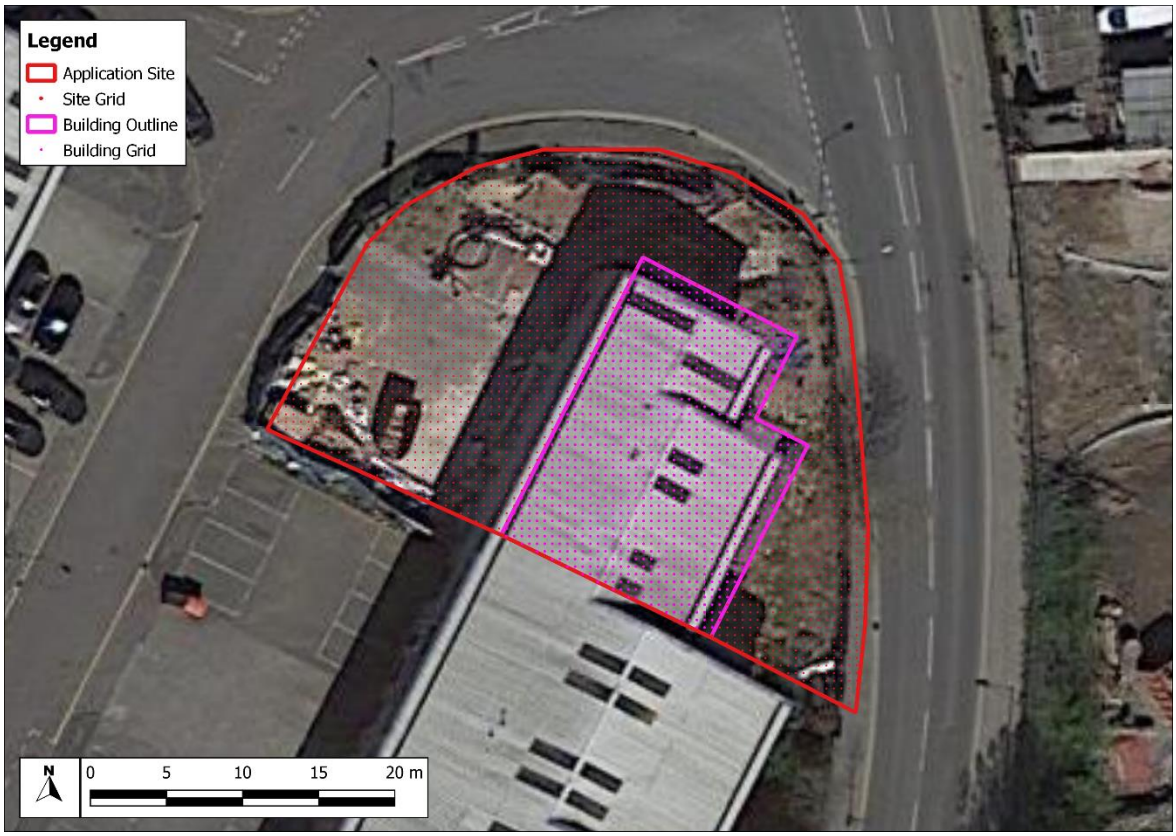

Figure 3: Site and building receptor locations, Site location, and Building location

Imagery ©2019 Google. Map data ©2019.

Modelled Roads

5.12 The road links, widths and heights included in the dispersion model have been aligned with data from Ordinance Survey maps, google maps and considering distances based on a range of mapping sources ensuring relative distances from the roadsides to receptors and monitoring sites are carefully set. The modelled road links are shown in Figure 4. This includes roads near to the Proposed Development and those close to local monitoring sites.

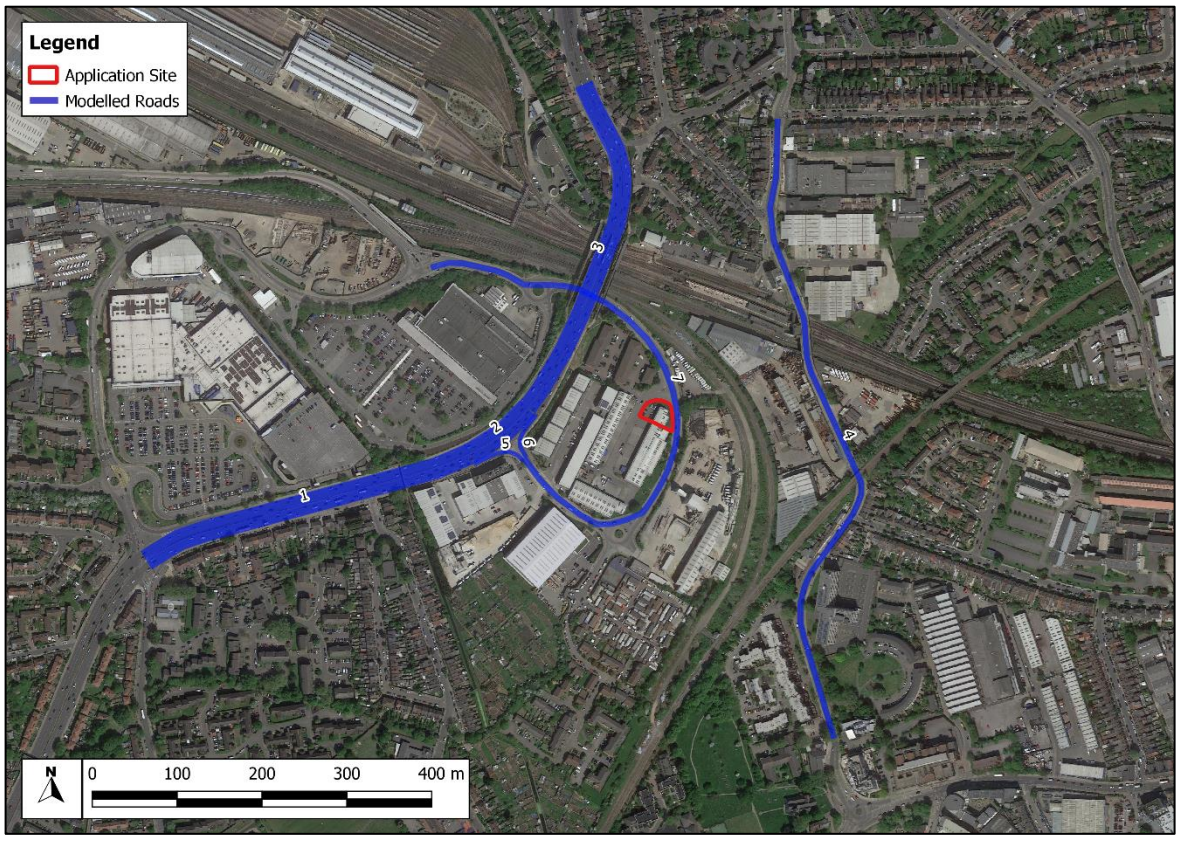

Figure 4: Modelled road links and Application Site

Traffic Data

5.13 Traffic data have been taken from the GLA's London Atmospheric Emissions Inventory (LAEI) for the years of 2017 and 2020. This data includes Annual Average Daily Traffic (AADT) flows, the percentage of diesel and petrol cars, Light Goods Vehicles (LGVs), Heavy Goods Vehicles (HGVs), buses and motorcycles, and average vehicle speeds for all main roads in London.

5.14 Where appropriate, the vehicle speeds have been reduced to take account of slower speeds at junctions and queuing. A summary of the traffic data used in the model is presented in Appendix A3.

5.15 As mentioned in Paragraph 1.3, the modelling was carried out in 2019 and the earliest year that the development might now be operational would be 2021. Table 3 presents the traffic flows derived for 2020 and 2021. This demonstrates that traffic flows are predicted by the GLA to slightly reduce in 2021. Since the modelling is based on 2020 traffic data which has higher AADT flows, the assessment is thus conservative and the changes in traffic will not materially alter the conclusions of the report. It is also worth noting that the UK is currently experiencing the Covid-19 Pandemic which has led to significant reductions in vehicle traffic, which might continue to some degree into the future, post Pandemic, due to changes in working practices.

Table 3: Traffic data comparison

Link ID	Link	2020 AADT	2021 AADT	AADT Change	% Change
1	North Circular Road, west of Great Central Way	100,549	99,925	-156	-0.2%
2	North Circular Road, at junction of Great Central Way	100,710	100,084	-156	-0.2%
3	North Circular Road, east of Great Central Way	100,577	99,953	-156	-0.2%
4	Neasden Lane	22,031	21,718	-78	-0.4%
5	Slip onto North Circular Road from Great Central Way	4,908	4,838	-17	-0.4%
6	Slip off from North Circular Road onto Great Central Way	4,908	4,838	-17	-0.4%
7	Great Central Way	9,817	9,677	-35	-0.4%

Additional Model Setup Parameters and Post-processing

5.16 Further details on additional model setup parameters and post-processing approaches are set out in Appendix A3. These include the vehicles emission factors, meteorology, model verification and other key modelling considerations.

Uncertainty and limitations

5.17 The assessment involves a range of uncertainties, including the model inputs, assumptions, the model, model verification and post-processing of model results. A brief overview of the key uncertainties is discussed below.

5.18 There are inherent uncertainties associated with the traffic data; the LAEI traffic data are based upon a total of 2009 one day Manual Classified Count (MCC) surveys of vehicles travelling on the roads in Greater London carried out by both DfT and Transport for London (TfL), and based on TfL's London Highway Assignment Model (LoHAM) and the London Transportation Studies (LTS) models. These provide estimated vehicle trips in an average way, but the specific routing, timing, driving conditions and driving behavior of vehicles will vary and potentially lead to different emission levels. The emission factors also involve a considerable amount of uncertainty. Emissions from the EFT are link averages and do not explicitly take account of acceleration or deceleration. Modelled speeds have been adjusted to account for this where possible.

5.19 The emission factors also involve a considerable amount of uncertainty. Emissions from the EFT are link averages and do not explicitly take account of acceleration or deceleration. Modelled speeds have been adjusted to account for this where possible. Future year vehicle emission rates are also based on a range of factors, such as expected vehicle fleet release dates, anticipated improvements in emission reduction technologies, expected uptake rates of different vehicles based on government policies, etc. It is therefore possible that the expected future emission rates in the EFT may differ from reality. Historically, evidence had suggested that Defra's EFT exaggerated reductions in NOx emissions as expectations of reductions from diesel vehicles were included which were not seen in practice. However, analyses of recent NOx measurements now provide evidence

that vehicle controls are working and as a result Defra's EFT (v9 onwards) is reflecting the rate of observed reductions and can be relied upon to give the most likely emissions; v9.0 has been used in this assessment. The approach of this assessment has been to utilise the EFT as recommended by Defra in the LAQM.TG(16) guidance (Defra, 2018).

5.20 The model itself is based on assumptions of a range of parameters, including road geometries, road widths and meteorological related parameters. There is uncertainty in all these parameters, but the modelling has been setup in a robust way based on professional experience to best represent the conditions. One of the main uncertainties in the model is meteorological data; this has been based on measurements made at a representative meteorological station, and although meteorological conditions will remain similar, it entirely likely that meteorological conditions will vary in subsequent years and lead to marginally different concentrations.

5.21 The ambient background concentrations are also uncertain. While these are provided by Defra, the 1x1 km resolution is coarse and the maps do not include all sources of pollution. Although reasonable, given the urban location of the Proposed Development, it is considered likely that the background maps for this area may be marginally underestimated. To minimise the uncertainty in the spatial resolution of the maps, the background concentrations have been interpolated to each receptor; essentially smoothing out the coarseness of the maps.

5.22 Emerging evidence (Grange, S, et al., 2017) suggests that the f-NO_2 has been decreasing in recent years, which is not taken into account within Defra's EFT or NOx to NO_2 Calculator. If lower f-NO_2 values were assumed, then the predicted concentrations would likely be slightly lower throughout the development and local area. Until more detailed scientific analysis is undertaken to understand the full extent of why f-NO_2 is decreasing and how it will behave in the future, it remains an uncertainty.

5.23 A model verification exercise has been undertaken to adjust the predicted concentrations from the model so that they match local conditions as best as possible. This has adjusted concentrations to match average conditions; some locations will remain underpredicted and some overpredicted.

5.24 This report does not consider the impacts of air quality on the health implications associated with Covid-19, as there remains too much uncertainty at this stage to consider this explicitly. In addition, the potential long-term implications of the pandemic on transport practices has not been considered, as it is too uncertain at this stage.

5.25 Although there is uncertainty associated with air quality modelling, the predictions made by this assessment have been carried out in a robust manner in order to minimise uncertainties where possible.

6 Baseline Conditions

AQMAs

6.1 The London Borough of Brent has investigated air quality within its area as part of its responsibilities under the LAQM regime. The Council have declared an AQMA for exceedences of the annual mean NO_2 objective and the 24-hour mean and annual mean PM_{10} objectives. The AQMA covers the entire area south of the North Circular Road and all sensitive properties close to the North Circular Road. The Proposed Development site is thus located within the AQMA.

Air Quality Emission Zones

6.2 The Proposed Development is also located within the London Low Emission Zone (LEZ) operated by Transport for London (TfL). Light Goods Vehicles (LGVs) and Heavy-Duty Vehicles (HDVs) are charged to travel within the zone. Tougher emission standards are due to come into force from March 2021 and will still only apply to these vehicle types.

6.3 TfL also operate the Ultra-Low Emission Zone (ULEZ) in London, which charges most vehicle types including private vehicles such as cars. The Proposed Development is located outside the current ULEZ. However, in October 2021 the ULEZ boundary will be expanded and the Proposed Development will be located within the expanded ULEZ. Air quality in the local area is thus likely to improve from 2021 onwards.

Focus Areas

6.4 The GLA has identified 187 Air Quality Focus Areas (AQFA) in London. These are locations that not only exceed the EU annual mean limit value for NO_2, 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 TfL will focus actions to improve air quality.

6.5 The Proposed Development is located within 1 km of three AQFAs. The locations of these are described in Table 4 and shown in Figure 5.

Table 4: Description of Air Quality Focus Areas within 1 km of the Development

ID	Name	Distance from Site (m)
19	A406 North Circular from Stonebridge Park to Gresham Road	145
22	Neasden Junction inc Neasden Lane/Dudden Hill	320
25	High Road / Dudden Hill Lane to High Road / Walm Lane	730

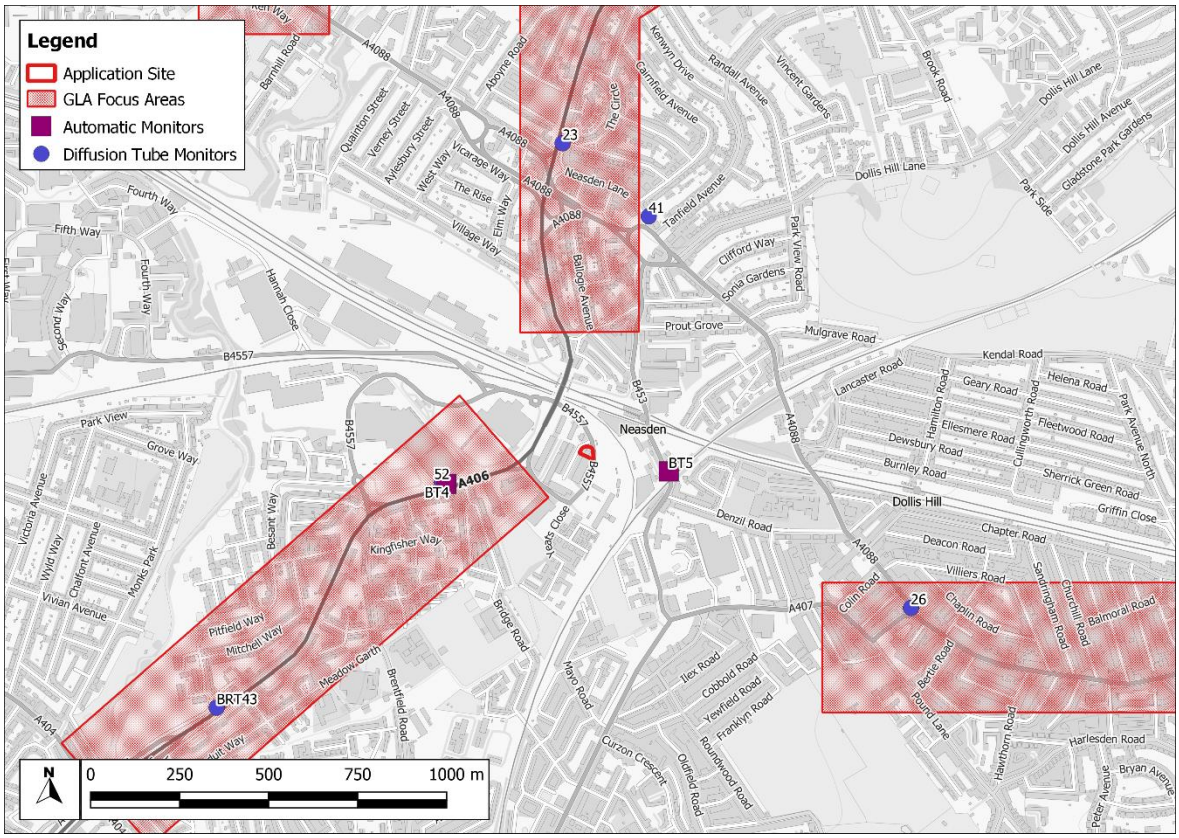

Figure 5: Focus Area locations relative to Site location and relevant monitoring sites

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Baseline Concentrations

LAQM monitoring

6.6 The London Borough of Brent operate four automatic monitoring sites that measure concentrations of NO_2 and PM_{10}; two of these sites are located within 1 km of the Proposed Development. The Council also measure NO_2 concentrations using diffusion tubes; there are four of these monitoring sites in the local area. NO_2 concentrations for the years 2013 to 2019 are presented Table 5, and the locations of the monitoring sites are shown in Figure 5. Data has been taken from the 2020 Air Quality Annual Status Report (London Borough of Brent, 2020). In addition, no measurements of $PM_{2.5}$ have been reported by the Council.

Annual Mean NO_2

6.7 Measured annual mean NO_2 concentrations were above the objective in 2017 at all monitoring sites and in all previous years presented, with the exception of 2013 and 2015 at the Neasden Lane automatic monitoring site. Since 2017, concentrations have generally decreased, with no exceedences measured along Neasden Lane. None of these monitoring sites are considered to be representative of conditions at the Proposed Development site; the monitoring sites are all located adjacent to busy roads, while the Proposed Development is located adjacent to a quieter road. NO_2 concentrations at the Proposed Development are thus likely to be lower than those measured.

Table 5: Relevant Measured NO_2 Annual Mean Concentrations ($\mu g/m^3$) [a]

Site Name (ID – Type)	2013	2014	2015	2016	2017	2018	2019
Ikea (BT4 - Roadside)	n/a	**80**	**41**	**76**	**72**	**71**	**63**
Neasden Lane (BT5 - Industrial)	39	n/a	39	**44**	**45**	38	38
Junction North Circular Rd/Chartley Avenue (23 - Roadside)	**105**	**109**	**93**	**115**	**94**	n/a	**71**
Dudden Hill Lane junction with High Road – (26 Roadside)	**65**	**69**	**64**	**74**	**62**	n/a	35
R/O 246 Neasden Lane (41 - Roadside)	**58**	**66**	**61**	**74**	**60**	n/a	37
IKEA, Hut, North Circular Road (52 - Roadside)	**104**	**103**	**88**	**102**	**87**	n/a	**63**
Pitfield Way (BRT43 - Roadside)	**67**	**73**	**80**	**81**	**74**	n/a	**47**
AQO	**40**						

[a] Exceedances of the objective are presented in bold.

1-Hour Mean NO_2

6.8 The automatic monitoring sites also measure 1-hour mean concentrations; the measured number of 1-hour mean NO_2 concentrations above 200 $\mu g/m^3$ for these monitoring sites are presented in Table 6. The 1-hour mean objective was exceeded in 2016 at both monitors and 2017 at the Ikea monitor. These monitors are both located adjacent to busy roads and are not representative of conditions at the Proposed Development site.

Table 6: Measured Number of NO2 1-Hour Mean Concentrations > 200 µg/m3 [a]

Site Name (ID – Type)	2013	2014	2015	2016	2017	2018	2019
Ikea (BT4 - Roadside)	n/a	10	0	**33**	**33**	1	7
Neasden Lane (BT5 - Industrial)	0	n/a	0	**25**	17	1	2
AQO	**18 (200)**						

[a] Exceedances of the objective are presented in bold.

Annual Mean PM_{10}

6.9 Measured annual mean concentrations of PM_{10} were also measured at the automatic monitoring sites; these concentrations are presented in Table 7. Concentrations were below the objective at both sites in all years between 2013 and 2019. These monitors are both located adjacent to busy roads and are not representative of conditions at the Proposed Development site.

Table 7: Measured PM_{10} Annual Mean Concentrations ($\mu g/m^3$) [a]

Site Name (ID – Type)	2013	2014	2015	2016	2017	2018	2019
Ikea (BT4 - Roadside)	34	29	29	33	33	32	30
Neasden Lane (BT5 - Industrial)	27	24	31	31	30	28	26
AQO	**40**						

[a] Exceedances of the objective are presented in bold.

24-Hour Mean PM_{10}

6.10 The automatic monitoring sites also measured 24-hour mean PM_{10} concentrations. The measured number of 24-hour mean NO_2 concentrations above 50 $\mu g/m^3$ for the monitoring sites are presented in Table 8. The 24-hour mean objective was exceeded in 2013, 2016, 2017 and 2018 at the Ikea monitor and in 2016 at the Neasden Lane monitor. These monitors are both located adjacent to busy roads and are not representative of conditions at the Proposed Development site.

Table 8: Measured Number of PM_{10} 24-Hour Mean Concentrations > 50 $\mu g/m^3$ [a]

Site Name (ID – Type)	2013	2014	2015	2016	2017	2018	2019
Ikea (BT4 - Roadside)	**38**	26	23	**45**	**41**	**37**	29
Neasden Lane (BT5 - Industrial)	17	5	15	**37**	29	22	15
AQO	**35 (50)**						

[a] Exceedances of the objective are presented in bold.

AURN Monitoring

6.11 The Government also undertakes monitoring of air quality, with national sites operated as part of the AURN regime. There are, however, no AURN monitoring sites within 1 km of the Proposed Development.

LAQN Monitoring

6.12 The LondonAir website (www.londonair.org.uk) hosts air quality monitoring data for many sites in London (Kings College London, 2020), mainly for local authority monitoring sites. Some of the sites may therefore already be presented in the sections above and have therefore not been presented below.

6.13 NO2 monitoring sites, operated as part of the London Air Quality Network, near the application site include both the Ikea (BT4) and Neasden Lane (BT5) monitoring sites, which are presented above. There are no other relevant monitoring sites within 1 km of the Proposed Development.

Breathe London

6.14 The Breathe London monitoring survey is a multi-partner project (EDF Europe, 2020) which uses low-cost continuous monitoring sensors to measure pollutant concentrations. The reliability of these measurements is currently under review, however, the data can provide some useful information. There are, however, no sites within the local area.

Predicted Background Concentrations

6.15 Ambient background concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been taken from the national maps provided by Defra (Defra, 2019b). These give background concentrations for every 1x1 km grid cell across the UK for each year from 2017 until 2030. Concentrations for 2017 and 2020 have been extracted for the grid cell that covers the application site and surrounding local area. The values are presented in Table 9.

Table 9: Mapped Background Concentrations (µg/m^3)

Year	NO_2	PM_{10}	$PM_{2.5}$
2017	32.1	19.0	12.9
2020	27.1	18.2	12.3

6.16 The concentrations are all lower than the objectives. The background concentrations for surrounding grid cells are even lower. These concentrations have been bilinearly interpolated to give specific background concentrations at each receptor location.

Predicted Roadside Concentrations

6.17 Defra has predicted roadside concentrations of NO_2 and PM_{10} for the main roads in the UK (Defra, 2017b) for the years 2017 to 2030 as part of Defra's commitment to report exceedences of the NO_2 limit value to the EU. For 2017, exceedences of the limit value are predicted along the North Circular Road, 120 m northwest of the application site, see Figure 6. The predicted concentration along this road nearest to the Proposed Development in 2017 is 50.8 µg/m^3.

6.18 The earliest year that the Proposed Development might contribute to or be exposed to local air pollution is 2021, if construction begins this year. By 2021, there are predicted to be no exceedences of the limit value near to the Proposed Development, with the concentration reducing significantly down to 39.3 µg/m^3. There is thus unlikely to be any exceedences of the limit values within the Proposed Development.

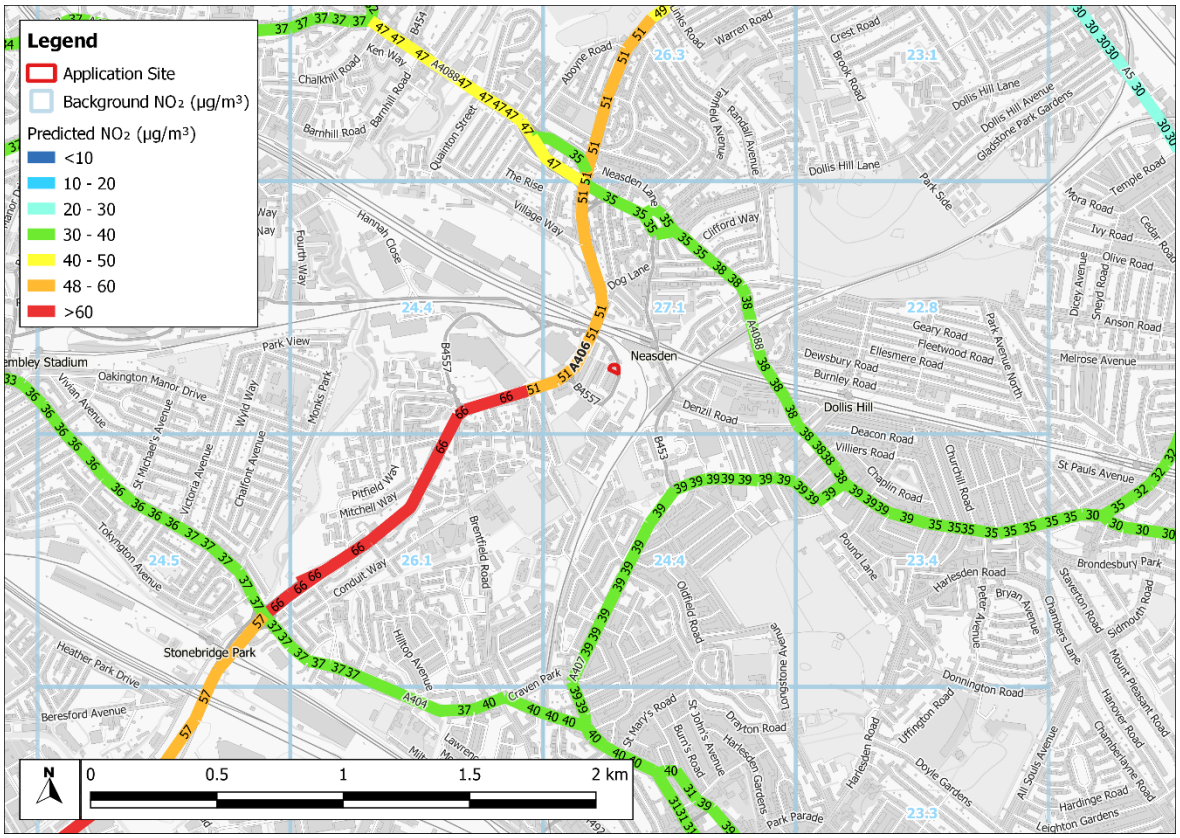

Figure 6: PCM modelled nitrogen dioxide concentrations in 2017 and Defra mapped background concentrations for 2020 in the local area

LAEI concentrations

6.19 The GLA and TfL have jointly produced the London Atmospheric Emissions Inventory (LAEI), a database of geographically referenced datasets of pollutant emissions and sources in Greater London. It includes maps of modelled ground level NO_2 and PM_{10} concentrations at a 20x20 m grid resolution for the base year of 2016.

6.20 The mapped concentrations of NO_2 and PM_{10} in the vicinity of the proposed development are shown in Figure 7 and Figure 8, respectively. Figure 7 illustrates the annual mean NO_2 concentrations are predicted to range between 40.8 – 52.3 µg/m^3 at ground level at the Proposed Development site, i.e. above the objective throughout the ground floor of the site. Figure 8 shows the annual mean PM_{10} concentrations are predicted to range between 23.7 – 28.4 µg/m^3 at ground level at the Proposed Development site; below the objective. These concentrations are for the year of 2016; concentrations in 2021 are expected to be lower.

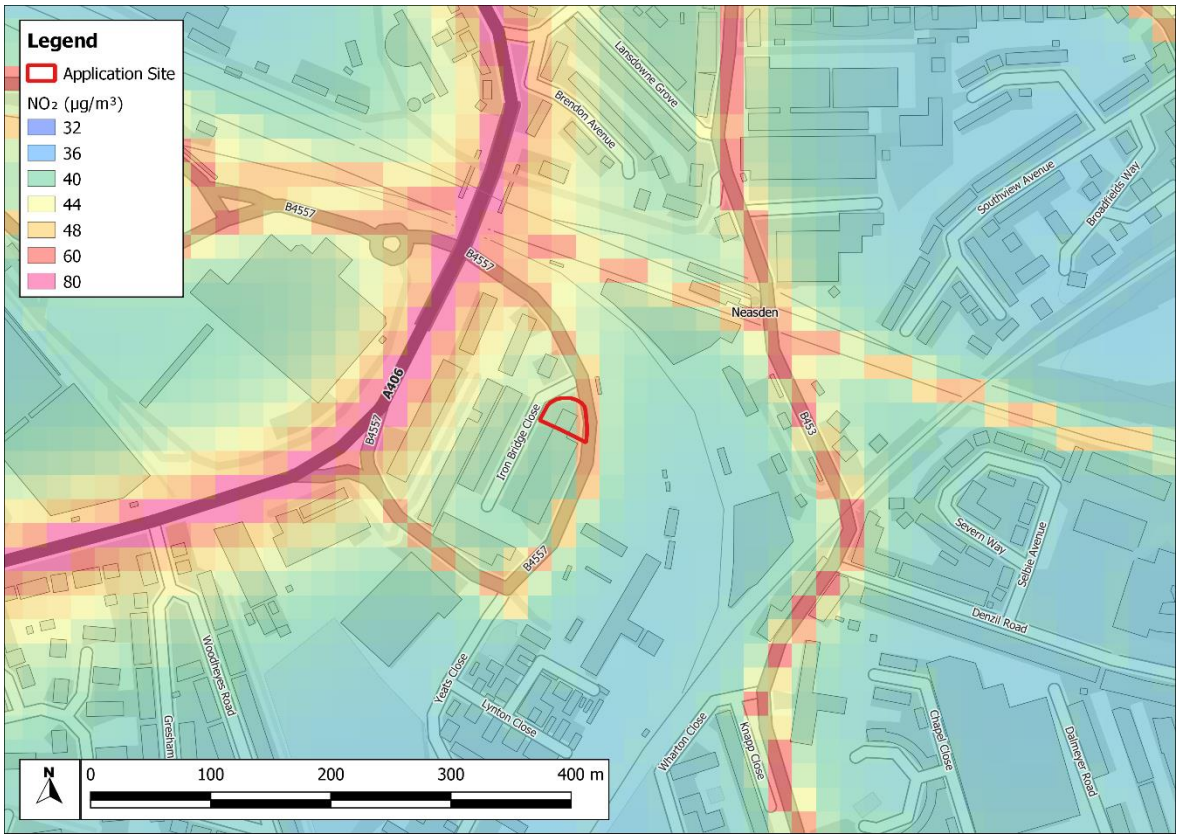

Figure 7: Ground Level LAEI predicted annual mean NO_2 concentrations for 2016

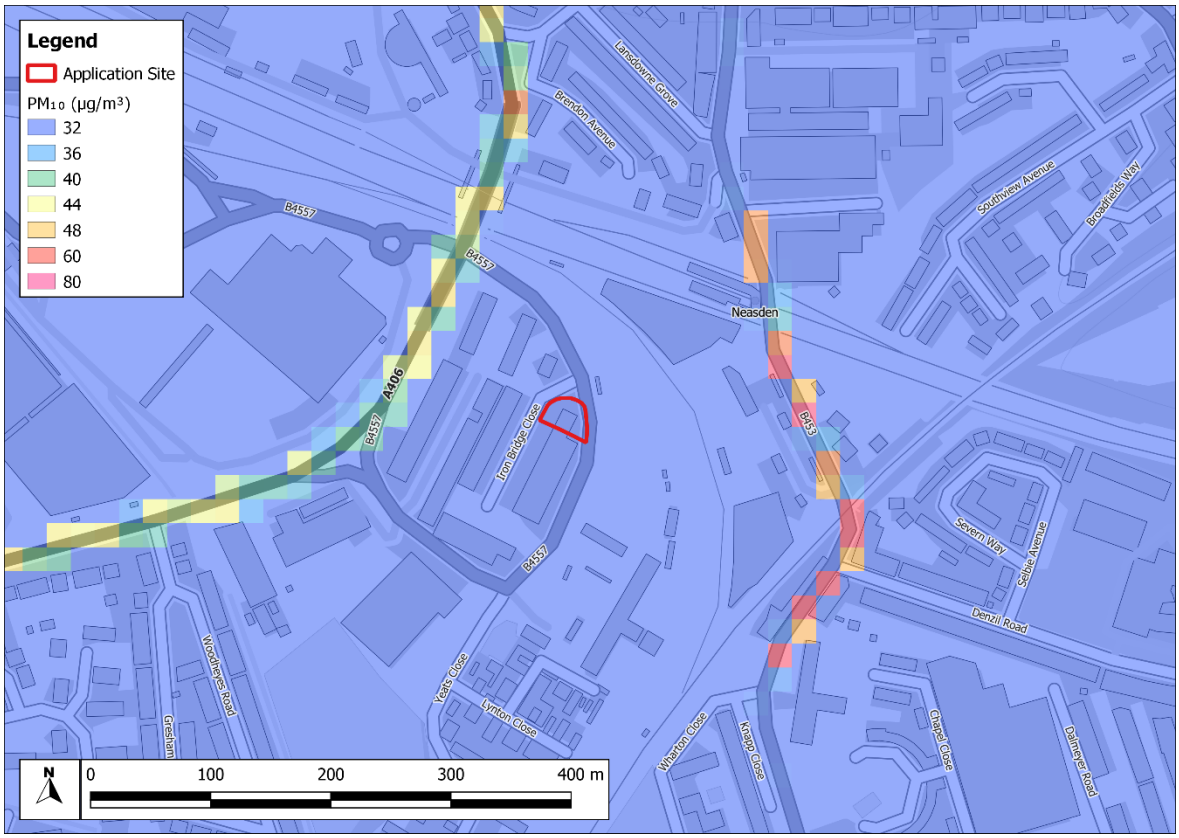

Figure 8: Ground Level LAEI predicted annual mean PM_{10} concentrations for 2016

Other Sources of Air Pollution

Environment Agency Permitted Sources

6.21 The Environment Agency regulates sites which are at risk of contributing significantly to pollutant concentrations and maintains a database of these sites called the UK Pollutant Release and Transfer Register (PRTR). The UK PRTR data has been used to fulfil the reporting requirements of the European Pollutant Release and Transfer Register (E-PRTR) which provides details of all regulated sites in the UK (European Environment Agency, 2021). The 2017 database has identified two sites within 1 km of the application site; a waste treatment site 675 m northwest (Seneca Environmental Solutions Ltd) and a combustion facility 925 m southwest (Uniper UK Ltd). Given the distance of these sites away from the proposed development, there is considered to be little risk of any existing industrial sources of pollution having a significant contribution to 1-hour or 24-hour mean concentrations at the Proposed Development. The combustion facility may contribute to annual mean concentrations at the Proposed Development, but these emissions are likely accounted for in Defra's background mapped concentrations.

Other Local Sources

6.22 Two cement batching facilities have been identified in the local area through discussions with the London Borough of Brent and searches of maps. The locations of these sites are shown in Figure 9.

The Procon Readymix site is located approximately 190 m southwest of the Proposed Development and the Aggregate Industries (London Concrete) site is located about 15 m east of the Proposed Development. These sites involve a range of activities that may result in the release of dust, potentially leading to nuisance or human-health effects at the Proposed Development. The Aggregate Industries site also includes a large stack that may release pollutant emissions. The effects of these sites are assessed later in section 7.

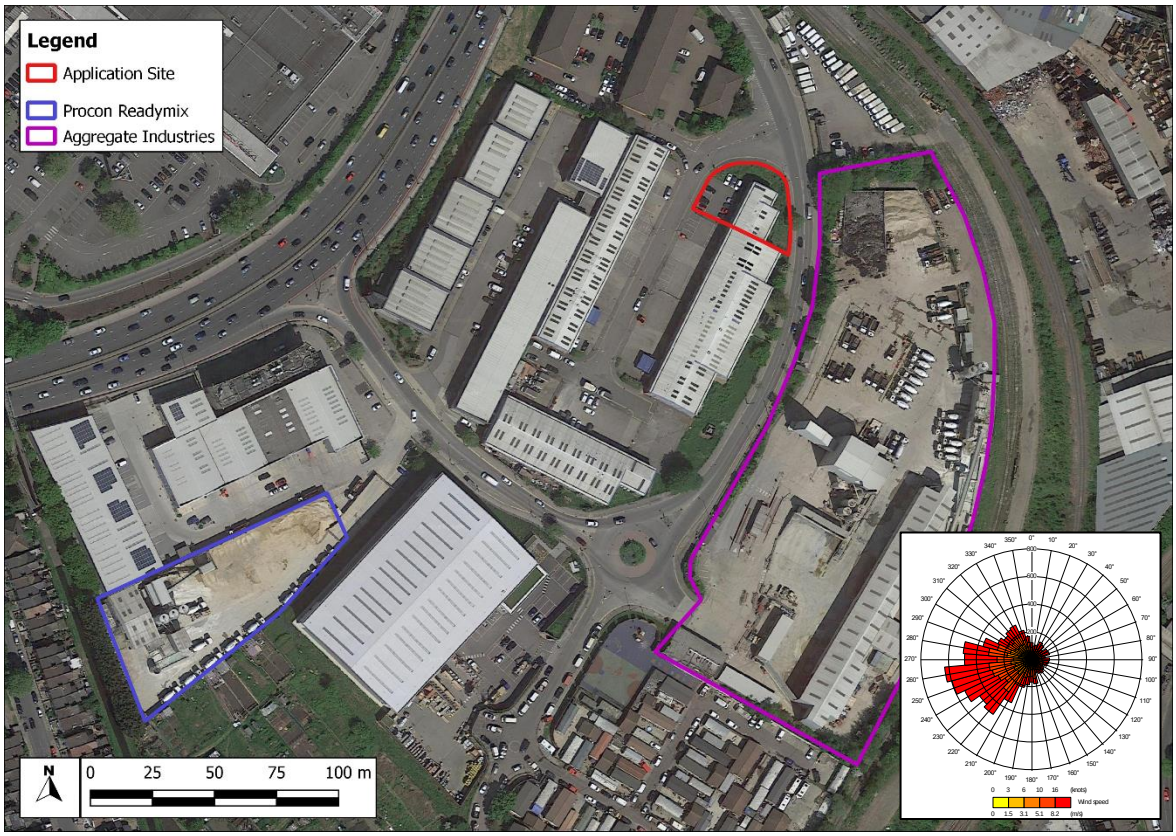

Figure 9: Locations of local sources for consideration

Imagery ©2019 Google. Map data ©2019.

7 Impact Assessment

Impacts on the Local Air Quality

7.1 The Proposed Development involves fewer than 10 residential units, less than 1,000 m^2 of floor space and fewer than 10 parking spaces, thus based on the EPUK and IAQM guidance there is no need to consider the impacts on local air quality.

7.2 Furthermore, CCP Group has confirmed that the building as a whole (including the Proposed Development) is likely to result in fewer vehicle movements compared to the existing commercial use, and the proposed residential units will be provided with electric heating and hot water. The Proposed Development is thus anticipated to lead to a marginal improvement in local air quality.

Impacts on Local Limit Value Compliance

7.3 Without the Proposed Development, existing levels of air pollution are predicted by Defra to be below the limit values in 2021. As demonstrated above, the Proposed Development is expected to lead to a marginal improvement in air quality in the local area and will therefore not delay compliance with the limit values in the London Borough of Brent.

Impacts on the Proposed Development

Impacts from Local Road Traffic

7.4 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted for the year of 2020 at the Proposed Development. In addition, concentrations have also been predicted across the local area to provide context for the Proposed Development location.

7.5 It should be noted that the year of 2020 provides a worst-case assessment as concentrations of NO_2 into the future are anticipated to reduce with the improvements in vehicle emissions, such as the increasing uptake of electric vehicles. Local measurements made by the Council and predictions from Defra (see Section 6) also suggest air quality is already improving and will continue to improve.

7.6 The maximum predicted concentrations within each of the areas are given in Table 10. All values are below the objectives. Air quality for future residents of the Proposed Development will be acceptable both within the residential units and at outdoor locations of the Proposed Development.

Table 10: Predicted Concentrations at the Development [a]

Area	Maximum Predicted Annual Mean Concentration (µg/m³)			Maximum Predicted 1-Hour Mean NO_2 Concentration (µg/m³)	Maximum Predicted 24-Hour Mean PM_{10} Concentration (µg/m³)
	NO_2	PM_{10}	$PM_{2.5}$		
Proposed Residential Units	33.2	20.7	13.8	79.1	18.5
Proposed Outdoor Locations [b]	n/a	n/a	n/a	96.7	18.9

[a] Annual mean objectives do not apply at outdoor locations.

[b] Includes the car park, garden, balconies, and roof terraces.

Impacts of Potential Congestion

7.7 Concerns have previously been raised regarding the effects of potential congestion that may occur on Great Central Way and the North Circular Road (The Planning Inspectorate, 2020).

7.8 It is extremely unlikely that any congestion will occur on Great Central Way, and in the unlikely event that congestion occurs this might only happen at the junction of the road with the North Circular Road. This junction is approximately 140 m away from the Proposed Development where any slight increase in vehicle emissions due to the reduced speed and accumulation of vehicles will have little effect upon the Proposed Development. This is because elevated levels of pollution from road traffic fall off rapidly with distance away from roads (Defra, 2018). Similarly, the North Circular Road is located over 100 m away from the Proposed Development and will have little effect on concentrations at the Proposed Development.

7.9 Defra have published a *'Nitrogen Dioxide fall off with distance'* calculator as part of their LAQM tools (Defra, 2020a). Based on this tool, the pollutant contributions from vehicles at these distances will have dispersed into the atmosphere to such an extent that the contributions will be insignificant at the Proposed Development.

7.10 It is also worth noting that the concentrations of pollutants are predicted to be below the objectives (see Table 10) and the contribution from road traffic would need to increase by an additional 96% for there to be any exceedences of the objectives at the Proposed Development.

7.11 Irrespective of whether any congestion occurs, the effects of this upon future occupants is thus likely to be insignificant and not lead to any exceedences of the objectives.

Dust Impacts from Local Cement Batching Facilities

7.12 When considering the effects that the existing local cement batching facilities sources may have on the Proposed Development it is important to take into account the magnitude of dust generated by the sources, the distances between the sources and the Proposed Development site, meteorological conditions (i.e. the frequency of winds blowing dust towards the Proposed Development on dry days) and whether there are any barriers that may impede dust blowing towards the Proposed Development.

7.13 The IAQM has produced guidance on the assessment of mineral dust impacts for planning (IAQM, 2016) and this has been used to determine the sensitivity of the Proposed Development to dust effects and the risk of dust impacts at the Proposed Development.

Emission Magnitude

7.14 The Procon Readymix site includes a sand/aggregate bund approximately 20x50 m in area and about 4 m tall, which may be a source of dust when blown by wind. This is, however, surrounded by a barrier about 6 m tall which will help minimise dust release. The site also includes a concrete batching plant, which will elevate dust on the conveyer belt during operation. Dust may also be generated by vehicles loading and unloading materials onsite. When vehicles exit the site, they will

normally be covered or sealed to prevent any dust release, but some dirt may be tracked out from the site. Any dirt tracked out from the site will be deposited on roads close to the site exit, well away from the Proposed Development. Overall, the site is considered to have a small emission magnitude.

7.15 The Aggregate Industries site includes similar sources of dust. It has sand and aggregate bunds of approximately 10x20 m in size, both of which are about 1.5 m tall and surrounded by 2 m high barriers. It includes multiple large plant, of which the conveyor belts may be a source of dust. The site likely involves many onsite vehicle movements per day, including loading and unloading dusty materials. The site is completely paved, so little resuspension of dust will occur onsite; which is predisposition of a well-maintained site. The site exit is located well away from the site and it is unlikely that many associated vehicles will travel past the site; there is thus little concern regarding the trackout of dirt. Overall, the site is considered to have a medium emission magnitude.

Pathway Effectiveness

7.16 The frequency of potentially dusty winds from each of the sites has been calculated from five years of meteorological data (2014 – 2018) from the Northolt meteorological station. The frequency of winds on dry hours (i.e. <0.2 mm of rain accumulated per hour) with winds speeds greater than 5 m/s from the direction of the source (i.e. blowing towards the development) has been calculated for each site and compared to Table A3-2 of the IAQM guidance in order to determine the frequency category. These have then been combined with the distances to determine the pathway effectiveness (i.e. how effective the transmission of dust is from the sites to the development), following Table A3-4 of the IAQM guidance. Details of the pathway effectiveness derivation is given in Table 11.

Table 11: Pathway Effectiveness Description [a]

Source	Procon Readymix	Aggregate Industries
Wind direction from Source (°)	48 – 60	238 – 12
Frequency of winds >5 m/s from the source direction on dry hours (%)	1.2	21.2
Frequency category	Infrequent	Very Frequent
Receptor distance category	Intermediate	Close
Other considerations	There are buildings between the source and development that will help shield the development from dust.	Trees and fences will provide a partial barrier between the source and development. The largest sources of potential dust (onsite processing plant and material handling) are located away from the development.
Pathway Effectiveness	Ineffective	Moderately Effective

Dust Impact Risk and Magnitude of Effects

7.17 The guidance has, helpfully, provided matrices to determine the dust impact risk and the magnitude of dust effects, based on the emission magnitude and pathway effectiveness.

7.18 The dust emission magnitudes described in paragraphs 7.14 and 7.15 have been combined with the pathway effectiveness (see Table 11) for each source using the matrix in Table 2 in the guidance, in order to assign a dust impact risk to each source. These risks are then combined with the receptor sensitivity (high for residential use) using the matrix in Table 3 in the guidance, to determine the magnitude of dust soiling effects and human-health effects at the Proposed Development. The resulting dust impact risks and magnitude of dust soiling are set out for each source in Table 12.

Table 12: Dust Impact Risk and Magnitude of Dust Effects [a]

Source	Procon Readymix	Aggregate Industries
Emission Magnitude	Small	Medium
Pathway Effectiveness	Ineffective	Moderately Effective
Dust Impact Risk	Negligible Risk	Low Risk
Receptor Sensitivity	High	High
Magnitude of Dust Soiling Effects	Negligible Effect	Negligible Effect
Magnitude of Human-Health Effects	Slight Adverse Effect	Slight Adverse Effect

7.19 When considering the combined effects of these with other sources of pollution (i.e. road traffic and background contributions), annual mean PM_{10} and $PM_{2.5}$ concentrations may be higher than the values predicted in Table 10, and 24-hour mean PM_{10} concentrations may on occasion be higher as well. Sand and aggregates tend typically comprise of larger particle sizes and it is thus likely that mainly PM_{10} concentrations will be affected and $PM_{2.5}$ concentrations will be less affected. The guidance also sets out the following equation to estimate how PM_{10} concentrations fall off with distance away from dust sources:

$$Concentration = \left(\frac{PC}{26}\right) * 27.975 * Distance^{-1.11}$$

7.20 The guidance sets this out for a worst-case example of a coal handling plant, which has a Process Contribution (PC) of 350 µg/m^3. Taking the minimum distance of the Aggregate Industries boundary to the proposed residential units (15 m), the predicted concentration from this source would be 18.6 µg/m^3. The source, however, will create significantly less dust than a coal handling plant (50 - 150 µg/m^3) and most of the dust would be produced at least 80 m away; it is therefore considered that the predicted concentration would be in the range of 0.4 – 1.2 µg/m^3. This may already be taken account of within Defra's background concentrations. When combined with road traffic and background contributions, total PM_{10} concentrations will be well below the 24-hour mean and annual mean objectives.

7.21 Table 12 also demonstrates that the magnitude of dust soiling effects will be negligible. As such, there is unlikely to be any nuisance complaints from future residents of the Proposed Development.

7.22 It is also worth noting that planning permission has already been granted for residential use at the ground and first floors of the application site building; as such these local sources will have been previously been considered not significant.

Significance of Operational Air Quality Effects

7.23 The operational air quality effects without mitigation are judged to be "not significant". This professional judgement is made in accordance with the methodology and assessment criteria set out earlier in this report.

7.24 The judgement that the operational air quality effects will be "not significant" without mitigation takes account of the assessment that:

- The impacts of the Proposed Development on local air quality have been screened out as insignificant, following the EPUK and IAQM guidance, and the Proposed Development is likely to lead to a reduction is trips associated with the site, compared to the existing use;
- LAEI concentrations of annual mean NO_2, PM_{10} and $PM_{2.5}$ predicted by the GLA and TfL for the year of 2016 demonstrate concentration below the objectives at the Proposed Development site;
- Predicted concentrations of annual mean NO_2, PM_{10} and $PM_{2.5}$, 1-hour mean NO_2 and 24-hour mean PM_{10} are all below the objectives throughout the Proposed Development site and thus air the air quality for the future occupants of the Proposed Development will be acceptable;
- Potential effects of congestion on nearby roads has been demonstrated to be insignificant at the Proposed Development;
- Predicted dust contributions from nearby cement works have been demonstrated to be less than 1.2 $\mu g/m^3$ and total PM_{10} and $PM_{2.5}$ will be below the objectives. The cement works will thus not materially effect future occupants of the Proposed Development at either indoor or outdoor locations within the application site; and
- The amenity of the Proposed Development, both indoor and outdoor, has been demonstrated to be acceptable both in terms of air quality and dust soiling. The nearby cement works will have a 'Negligible Effect' on dust soiling at the Proposed Development; it is therefore considered that the introduction of new residential exposure at the Proposed Development will not lead to any nuisance dust complaints.

8 Mitigation

Mitigation Included by Design

8.1 Mitigation measured included by design are set out in Section 4.

Recommended Mitigation

8.2 The assessment has demonstrated that the Proposed Development will not cause any exceedences of the air quality objectives in the local area, including within the AQMA and the nearby Air Quality Focus Areas. Furthermore, the future residents of the Proposed Development will not be exposed to unacceptable air quality conditions. The overall effect of the Proposed Development will be "not significant". It is, therefore, not considered appropriate to propose further mitigation measures.

8.1 Measures to reduce pollutant emissions from road traffic are principally being delivered in the longer term by the introduction of more stringent emissions standards, largely via European legislation (which was transposed into UK law). Furthermore, the government, GLA and the local authority are working on improving air quality under the relevant air quality Strategies and LAQM regime.

9 Summary and Conclusions

9.1 The impacts of the Proposed Development on the local area have been considered and found to be negligible. The Proposed Development is expected to lead to a slight reduction in vehicle traffic and will have no building-related pollutant emissions; the Proposed Development is thus expected to result in a marginal improvement in local air quality.

9.2 The impacts of existing sources of pollution in the local area upon air quality for future residents has also been considered. Concentrations of NO_2, PM_{10} and $PM_{2.5}$ associated with background and road traffic have been predicted throughout the Proposed Development, at both the residential units and outdoor locations. All predicted concentrations are below the objectives.

9.3 Consideration has been given to whether potential congestion on local roads may affect air quality for future residents of the Proposed Development. The assessment has demonstrated that for the roads where congestion might occur, the roads are located well away from the Proposed Development to such an extent that any potential elevated emissions arising from congestion are likely to be well dispersed and led to insignificant contributions at the Proposed Development.

9.4 Two cement batching facilities have been identified in the local area, the effects of which have been assessed. The contribution of dust from these sources has been quantified at the Proposed Development and the contributions will not lead to any of the objectives being exceeded at the Proposed Development. Dust from the cement works will therefore not materially effect air quality for future occupants of the Proposed Development at indoor or outdoor locations.

9.5 Consideration has also been given to the effects on amenity for future residents of the Proposed Development. Air quality has been demonstrated to be acceptable for future residents at both indoor and outdoor locations within the application site. Potential dust soiling from the nearby cement works has also been considered. The assessment has demonstrated that the cement works will have a 'Negligible Effect' of dust soiling at the Proposed Development. It is therefore judged that the introduction of new sensitive exposure at the Proposed Development would not lead to any future nuisance dust complaints.

9.6 Overall, the impacts of the development will be 'not significant' and air quality for future residents will be acceptable. It is thus not considered appropriate to propose further mitigation measures for this development.

10 Glossary, References and Appendices

Glossary

AADT	Annual Average Daily Traffic
Air Quality Standards	Concentrations recorded over a given time period, which are considered to be acceptable in terms of what is scientifically known about the effects of each pollutant on health and on the environment.
An exceedence	A period of time (defined for each standard) where the concentration is higher than that set out in the Standard.
An objective	The target date on which exceedances of a Standard must not exceed a specified number.
APS	Air Pollution Services Ltd
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
COPERT	Computer Programme to calculate Emissions from Road Transport
DfT	Department for Transport
EFT	Emission Factor Toolkit
EPUK	Environmental Protection UK
Limit Values	Legally binding UK parameters that must not be exceeded. Limit values are set for individual pollutants and are made up of a concentration value, an averaging time over which it is to be measured, the number of exceedances allowed per year, if any, and a date by which it must be achieved. Some pollutants have more than one limit value covering different endpoints or averaging times.
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LGV	Light Goods Vehicle
NO_2	Nitrogen Dioxide
NOx	Nitrogen Oxides
NPPF	National Planning Policy Framework

µg/m³	Micrograms per cubic metre
PM_{10}	Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter
$PM_{2.5}$	Small airborne particles, more specifically particulate matter less than 2.5 micrometres in aerodynamic diameter
RMSE	Root Mean Square Error
WHO	World Health Organization

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A1 Legislation, Policy and Guidance

A1.1 There are a large number of policy, guidance, and strategy documents published regarding air quality at a national, regional and local level. The documents all provide useful context, information, and justification in support of the approaches in this assessment. Details of relevant documents are provided below.

National

Planning Practice Guidance

A1.2 The NPPF is supported by Planning Practice Guidance (PPG) (Ministry of Housing, Communities & Local Government, 2019b). The PPG on air quality published in November 2019 states:

Paragraph: 001 Reference ID: 32-001-20191101: *"The Department for Environment, Food and Rural Affairs carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with Limit Values. It is important that the potential impact of new development on air quality is taken into account in planning where the national assessment indicates that relevant limits have been exceeded or are near the limit, or where the need for emissions reductions has been identified."*

Paragraph: 002 Reference ID: 32-002-20191101: *"It is important to take into account air quality management areas, Clean Air Zones and other areas including sensitive habitats or designated sites of importance for biodiversity where there could be specific requirements or limitations on new development because of air quality".*

Paragraph: 005 Reference ID: 32-005-20191101: *"Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity.*

Where air quality is a relevant consideration the local planning authority may need to establish:

- *the 'baseline' local air quality, including what would happen to air quality in the absence of the development;*
- *whether the proposed development could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity); and*
- *whether occupiers or users of the development could experience poor living conditions or health due to poor air quality".*

Paragraph: 007 Reference ID: 32-007-20191101: *"Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific".*

Paragraph: 008 Reference ID: 32-008-20191101: *"Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact. It is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented".*

Clean Air Strategy

A1.3 Defra published the Clean Air Strategy in January 2019 (Defra, 2019a). The strategy focuses on exposure to toxic pollutants like nitrogen oxides, ammonia, particulate matter, non-methane volatile organic compounds and sulphur dioxide. The strategy aims to reduce emissions of pollutants including the aim to reduce particulate matter emissions by 30% by 2020, and by 46% by 2030.

A1.4 This strategy sets out the aim for new enforcement powers at a national and local level, across all sectors of society and sets out the comprehensive action that is required from government and society to meet these targets. The strategy includes actions to reduce emissions from transport (including road, maritime, rail, aviation and NRMM), homes, farming and industry.

A1.5 The strategy states that:

"New legislation will create a stronger and more coherent framework for action to tackle air pollution. This will be underpinned by new England-wide powers to control major sources of air pollution, in line with the risk they pose to public health and the environment, plus new local powers to take action in areas with an air pollution problem."

The Industrial Strategy

A1.6 The Government has published a white paper that sets out a long-term 'Industrial Strategy' for the UK (HM Government, 2017). It includes a key policy to *"support electric vehicles through a £400m charging infrastructure investment and an extra £100m to extend the plug-in car grant"* and states *"the UK's road and rail network could dramatically reduce carbon emissions and other pollutants".* Unlike their fossil fuel counterparts, electric vehicles do not release nitrogen oxides (NOx) emissions; if the strategy is fulfilled then NOx emissions will reduce significantly over the coming decades.

The Clean Growth Strategy

A1.7 An ambitious blueprint for Britain's low carbon future was set out by the Government in a Policy paper (HM Government, 2018) in April 2018. Although this strategy focuses on reducing the UK's carbon footprint, it contains several policies and proposals that relate to air quality, including:

22. "End the sale of new conventional petrol and diesel cars and vans by 2040

23. Spend £1 billion supporting the take-up of ultra low emission vehicles (ULEV), including helping consumers to overcome the upfront cost of an electric car

24. Develop one of the best electric vehicle charging networks in the world by:

    - Investing an additional £80 million, alongside £15 million from Highways England, to support charging infrastructure deployment

    - Taking new powers under the Automated and Electric Vehicles Bill, allowing the Government to set requirements for the provision of charging points

25. Accelerate the uptake of low emission taxis and buses by:

    - Providing £50 million for the Plug-in Taxi programme, which gives taxi drivers up to £7,500 off the purchase price of a new ULEV taxi, alongside £14 million to support 10 local areas to deliver dedicated charge points for taxis

    - Providing £100 million for a national programme of support for retrofitting and new low emission buses in England and Wales

26. Work with industry as they develop an Automotive Sector Deal to accelerate the transition to zero emission vehicles

27. Announce plans for the public sector to lead the way in transitioning to zero emissions vehicles

28. Invest £1.2 billion to make cycling and walking the natural choice for shorter journeys

29. Work to enable cost-effective options for shifting more freight from road to rail, including using low emission rail freight for deliveries into urban areas, with zero emission last mile deliveries

30. Position the UK at the forefront of research, development and demonstration of Connected and Autonomous Vehicle technologies, including through the establishment of the Centre for Connected and Autonomous Vehicles and investment of over £250 million, matched by industry The Clean Growth Strategy 15

31. Innovation: Invest around £841 million of public funds in innovation in low carbon transport technology and fuels including:

    - Ensuring the UK builds on its strengths and leads the world in the design, development and manufacture of electric batteries through investment of up to £246 million in the Faraday Challenge

    - Delivering trials of Heavy Goods Vehicle (HGV) platoons, which could deliver significant fuel and emissions savings".

The 25 Year Environment Plan

A1.8 The Government has published a Policy paper called the '25 Year Environment Plan' (HM Government, 2019) which set out what the government will do to improve the environment within a generation. This includes the first goal 'Clean air' where the government states *"we will achieve clean air by:*

- Meeting legally binding targets to reduce emissions of five damaging air pollutants. This should halve the effects of air pollution on health by 2030.
- Ending the sale of new conventional petrol and diesel cars and vans by 2040.
- Maintaining the continuous improvement in industrial emissions by building on existing good practice and the successful regulatory framework".

Road to Zero

A1.9 The Office for Low Emission Vehicles (OLEV) and Department for Transport (DfT) published a Policy Paper (DfT, 2018) in July 2018 outlining how the government will support the transition to zero tailpipe emission road transport and reduce tailpipe emissions from conventional vehicles during the transition.

A1.10 This paper confirms the Government's pledge to end the sale of new conventional petrol and diesel cars and vans by 2040, and states that the Government expects the majority of new cars and vans sold to be 100% zero tailpipe emission and all new cars and vans to have significant zero tailpipe emission capability by 2040, and that by 2050 almost every car and van should have zero tailpipe emissions. It states that the Government wants to see at least 50%, and as many as 70%, of new car sales, and up to 40% of new van sales, being ultra-low emission by 2030.

A1.11 The paper sets out a number of measures by which Government will support this transition, but is clear that Government expects this transition to be industry and consumer led. If these ambitions are realised then road traffic-related NOx emissions can be expected to reduce significantly over the coming decades.

Air Quality Plan

A1.12 Defra has produced an Air Quality Plan to tackle roadside NO_2 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 produce local plans by December 2018. These plans are undertaken in stages and must have measures to achieve the statutory limit values within the shortest possible time, which may include the implementation of a charging Clean Air Zone (CAZ).

Regional

The London Plan

A1.13 The London Plan (GLA, 2017) sets out the overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London.

A1.14 The current plan was published in 2016 and updated in 2017. It consolidates the alterations made to the superseded 2011 Plan. The plan includes Policy 7.14 on improving air quality:

"Planning decisions

B 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*

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 Draft London Plan

A1.15 A draft new London Plan is currently being prepared by the Mayor (GLA, 2019a). The current 2016 Plan (The London Plan consolidated with alterations since 2011) is still the adopted Development Plan, but the Draft London Plan is a material consideration in planning decisions. The draft London Plan includes the following policies relating to air quality:

A1.16 Policy GG3 on 'Creating a healthy city' states:

"To improve Londoners' health and reduce health inequalities, those involved in planning and development must… seek to improve London's air quality, reduce public exposure to poor air quality and minimise inequalities in levels of exposure to air pollution."

A1.17 Policy SD4 on 'The Central Activities Zone (CAZ)' states:

"Taking account of the dense nature of the CAZ, practical measures should be taken to improve air quality, using an air quality positive approach where possible (Policy SI1 Improving air quality) and to address issues related to climate change and the urban heat island effect".

A1.18 Policy SI1 from the Draft Plan on 'Improving Air Quality' states that:

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

B To tackle poor air quality, protect health and meet legal obligations the following criteria should be addressed:

1 Development proposals should not:

a) lead to further deterioration of existing poor air quality.

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

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

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

a) Development proposals must be at least air quality neutral.

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

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

d) Development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people, which do not demonstrate that design measures have been used to minimise exposure should be refused.

C Masterplans and development briefs for large-scale development proposals subject to an Environmental Impact Assessment should consider how local air quality can be improved across

the area of the proposal as part of an air quality positive approach. To achieve this a statement should be submitted demonstrating:

a) How proposals have considered ways to maximise benefits to local air quality, and

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

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

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

London Environment Strategy

A1.19 The revised Mayor's Air Quality Strategy (MAQS) Clearing the Air 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. The MAQS has been replaced by the London Environment Strategy.

A1.20 The London Environment Strategy was published in May 2018 (GLA, 2018a). The Strategy sets out a vision for improving London's environment for the benefit of all Londoners. One of the aims if for London to "*have the best air quality of any major world city by 2050, going beyond the legal requirements to protect human health and minimise inequalities*."

A1.21 The strategy considers air quality in Chapter 4; the Mayor's main objectives are:

"• reducing exposure of Londoners to harmful pollution across London – especially at priority locations like schools – and tackling health inequality

• achieving legal compliance with UK and EU limits as soon as possible, including by mobilising action from the London boroughs, government and other partners

• establishing and achieving new, tighter air quality targets for a cleaner London, meeting World Health Organization (WHO) health-based guidelines by 2030 by transitioning to a zero emission London to create a "zero emission London by 2050".

A1.22 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". Policy 4.3.2 states "The Mayor will encourage the take up of ultra low and zero emission technologies to make sure London's entire transport system is zero emission by 2050 to further reduce levels of pollution and achieve WHO air quality guidelines".

A1.23 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

A1.24 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".

A2 Professional Experience

Dr Austin Cogan, MPhys (Hons) PhD MIEnvSc MIAQM

Dr Cogan is a Director of APS and has over twelve years' experience in environmental sciences. Austin has extensive experience of air quality, dust and odour assessments for a range of industries as well as services for local authorities, including Clean Air Zone and micro-simulation modelling. He is also an international expert in the field of climate change, having monitored greenhouses gases globally, published numerous scientific papers and presented at conferences internationally.

Kieran Laxen, MEng (Hons) MIEnvSc MIAQM

Mr Laxen is a Director of APS and has over twelve years' experience in the field of air quality. Kieran is an active member of the IAQM committee. He has extensive experience of air quality monitoring and is a leading UK expert in the assessment of power generating facilities for both permitting and planning applications. He has been a stakeholder in Defra's and the Environment Agency's consultations into implementing the MCPD and Specified Generator Controls.

Katya Kaczmarczyk, MBChB, BSc (Hons)

Mrs Kaczmarczyk is an assistant consultant of APS. She is currently gaining experience of undertaking air quality assessments for planning and permit applications as well as research in the field of air quality. She completed BSc Medical Biochemistry at the University of Leicester and continued her studies at the University of Warwick to complete a MBChB Medicine, working as a Doctor in the Southwest Deanery afterwards. Her focus is now on the effects on health from air pollution.

A3 Modelling

The model

A3.1 Parameters and data relating to the detailed dispersion modelling approach are set out below.

Vehicle Emissions

A3.2 Emissions of road-NOx (i.e. the contribution from vehicles using roads), road-PM_{10} and road-$PM_{2.5}$ have been derived from the latest version of Defra's Emission Factor Toolkit (EFT) (v9.0) using the traffic data presented in Table A1. The EFT is based on the COPERT 5 (Computer Programme to calculate Emissions from Road Transport) vehicle emission model and provides speed-average based emission rates. The EFT provides vehicle emission rates for the years 2017 – 2030; future years are based on a range of factors, such as expected vehicle fleet release dates, anticipated improvements in emission reduction technologies, expected uptake rates of different vehicles based on government policies, etc. It is possible that the expected future emission rates in the EFT may not be achieved in reality, however alternative emission databases which attempt to account for emission uncertainties do not predict a significant deviation (if any) from the EFT emission rates up to and including those for 2020.

Fraction of Primary Nitrogen Dioxide

A3.3 In addition to emission rates, the fraction of primary nitrogen dioxide (f-NO_2) has been obtained from the EFT. This represents the amount of nitrogen dioxide released from vehicle exhausts, before any further chemical reactions in the atmosphere, which becomes an important variable when post-processing the model predictions. In order to obtain the f-NO_2 value at each receptor location, the NOx emission rates have been multiplied by f-NO_2 values to derive NO_2 emission rates. These NO_2 emissions have been included in the model and primary nitrogen dioxide concentrations have been predicted at the receptors. The predicted NOx concentrations have been divided by the predicted primary nitrogen dioxide concentrations to calculate the f-NO_2 values at the receptor locations. The f-NO_2 values have then been used in the model post-processing (see paragraph A3.22).

Time-Based Profiles

A3.4 Vehicle emissions vary over time depending on the volume of traffic, this includes hourly, daily and seasonal variations. Seasonal (monthly) and diurnal (hourly) traffic flow profiles have been taken from DfT national statistics (DfT, 2019). Both the profiles have been assumed to follow an urban traffic profile and have been used in the model to adjust the emissions for each hour of the year modelled. These profiles are shown in Figure A1 and Figure A2.

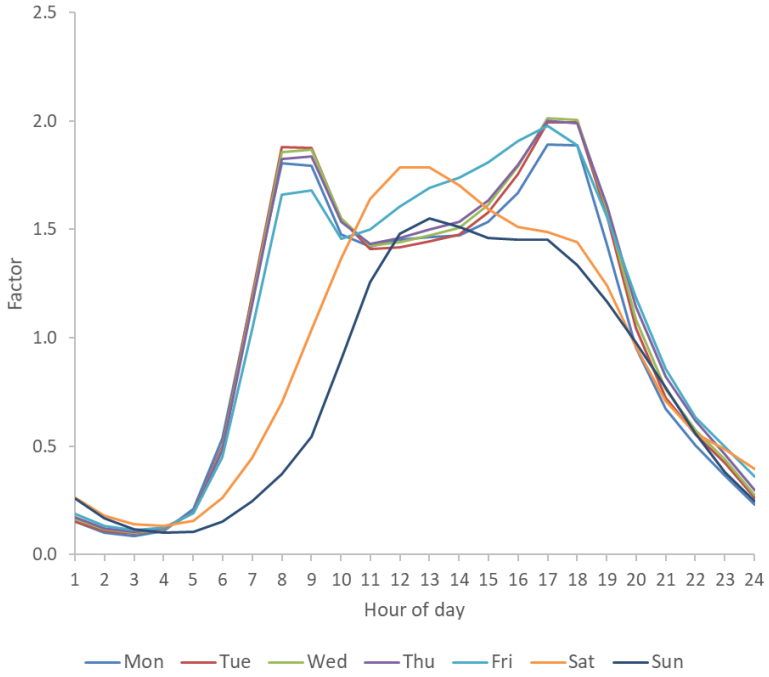

Figure A1: Diurnal profile for each day of the week used in the model, where the factor is the value that the average daily emissions are multiplied by in the model

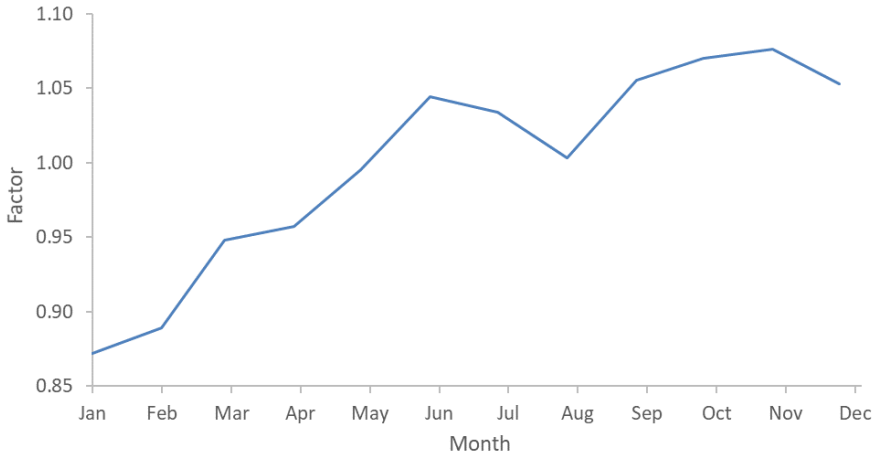

Figure A2: Seasonal profile for each month of the year used in the model

Traffic Data

A3.5 Traffic data have been taken from the GLA's London Atmospheric Emissions Inventory (LAEI) for the years of 2013 and 2020. This data includes Annual Average Daily Traffic (AADT) flows, the percentage of diesel and petrol cars, Light Goods Vehicles (LGVs), Heavy Goods Vehicles (HGVs), buses and motorcycles, and average vehicle speeds for all main roads in London. The data for 2017 has been linearly interpolated from the data for 2013 and 2020. Where appropriate, the vehicle speeds have been reduced to take account of slower speeds at junctions and queuing. A summary of the traffic data used in the model is presented in Table A1.

Table A1: Traffic data used in the model

Link ID	Link	2017			2020		
		AADT	HDV (%)	Speed (kph)	AADT	HDV (%)	Speed (kph)
1	North Circular Road, west of Great Central Way	100,549	6.1	46.1	100,081	6.1	46.2
2	North Circular Road, at junction of Great Central Way	100,710	6.3	46.5	100,241	6.3	46.7
3	North Circular Road, east of Great Central Way	100,577	6.1	48.8	100,109	6.2	49.0
4	Neasden Lane	22,031	6.7	38.9	21,796	6.7	39.1
5	Slip onto North Circular Road from Great Central Way	4,908	10.5	20.0	4,856	10.6	20.0
6	Slip off from North Circular Road onto Great Central Way	4,908	10.5	20.0	4,856	10.6	20.0
7	Great Central Way	9,817	10.5	40.4	9,712	10.6	40.5

Wake effects

A3.6 As vehicles travel along a road a wake is left behind the vehicles as air in the path of travel is forced around the vehicle. The wake can be considered the turbulence induced by the movement of the vehicle, which affects the dispersion of pollution away from roads. The AADT traffic flows have been entered into the ADMS-roads dispersion modeling in order to account for vehicle wake effects which will vary on each link depending on the proportion of large vehicles to small vehicles.

Meteorology

A3.7 Meteorological data has been taken from the Northolt Meteorological Station for the year of 2017. This station is located at the Northolt RAF Airfield in South Ruislip, London, approximately 11 km west of the application site, and is considered to be representative of meteorological conditions in the London Borough of Brent; both the station and application site are located in flat urban areas in Greater London and will experience very similar meteorological conditions. Meteorological data for the year of 2017 is considered to provide typical conditions. Illustrations of wind speed and direction for 2017 and other recent years are presented in Figure A3.

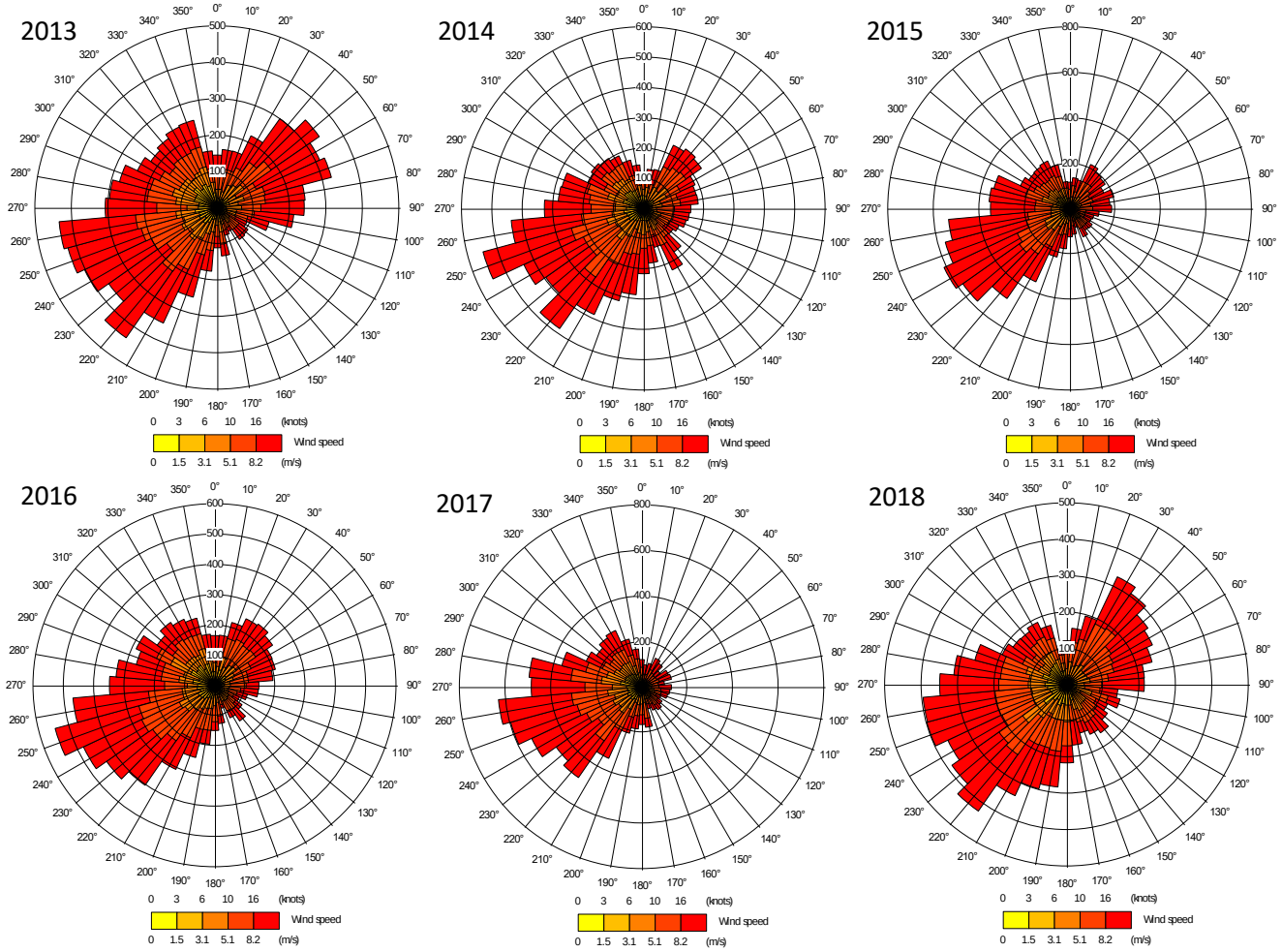

Figure A3: Windrose of wind speed and direction for each year between 2013 and 2018 at the Northolt Meteorological Station

Meteorological Parameters

A3.8 In addition to the meteorological data, the model requires values to be set for a number of meteorological related parameters, for both the meteorological station and the dispersion site (the development). Details of the parameter values used in the modelling are provided in Table A2 below.

A3.9 Land-use and surface characteristics have an important influence in determining turbulent fluxes and, hence, the stability of the boundary layer and atmospheric dispersion.

A3.10 Surface roughness length used within the model represents the aerodynamic effects of surface friction and is defined as the height at which the extrapolated surface layer wind profile tends to zero. This value is an important parameter used by meteorological pre-processors to interpret the vertical profile of wind speed and estimate friction velocities which are, in turn, used to define heat and momentum fluxes and, consequently, the degree of turbulent mixing. Surface roughness values for different land-use classifications are provided in published classifications (Megajoule, 2007) for the Corine Land Use dataset (Copernicus, 2018). Due to the high variability of land use types within the local area, a variable surface roughness file has been used within the model based on the

spatially variable land-uses and the equivalent roughness values associated with the 2018 Corine Land Use dataset. Figure A4 shows the values used across the modelled domain.

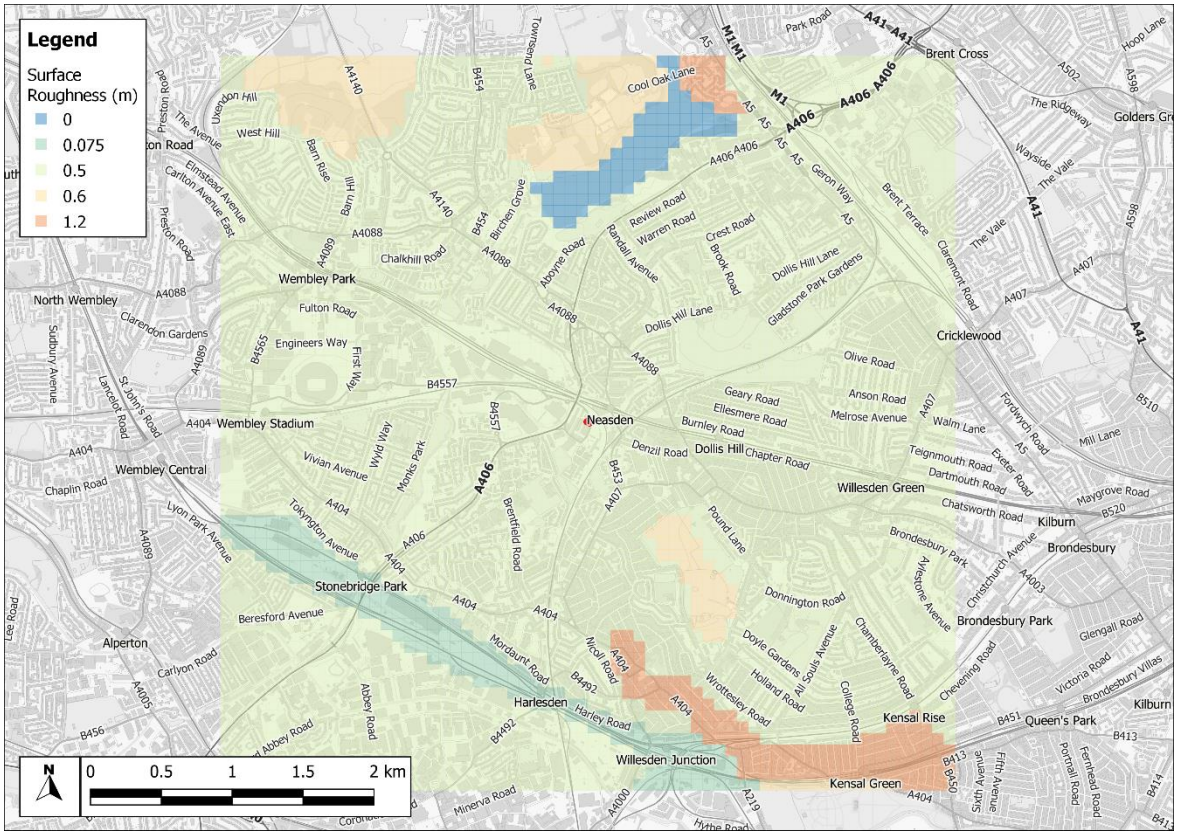

Figure A4: Modelled Surface Roughness

A3.11 The surface albedo is the ratio of reflected to incident shortwave solar radiation at the surface of the earth. This varies depending on the land use, and thus area-weighted average albedos have been derived for the meteorological and dispersion sites and used in the models. Albedo values have been taken from US Environmental Protection Agency (EPA) guidance (2018) and associated with the different land uses in the 2018 Corine Land Use dataset (Copernicus, 2018).

A3.12 The Priestley-Taylor parameter is a parameter representing the surface moisture available for evaporation. A Priestley-Taylor parameter of 1 has been set in the model.

A3.13 The CERC user guide explains that “the Monin-Obukhov length provides a measure of the stability of the atmosphere. In very stable conditions in a rural area its value would typically be 2 to 20 m. In urban areas, there is a significant amount of heat generated from buildings and traffic, which warms the air above the town/city”. For large urban areas this is known as the urban heat island. It has the effect of preventing the atmosphere from ever becoming very stable. The model has the ability to define the mimimum Monin-Obukhov length to account for the urban heat island effect which is not represented by the meteorological data. The value set in the model is 75 m, which is considered appropriate for urbanised areas of London.

Table A2: Meteorological parameters values used in the model

Parameter	Meteorological Site Value	Dispersion Site Value
Latitude (°)	51.55	51.55
Surface roughness (m)	0.241	0.486
Surface albedo	0.175	0.169
Minimum Monin-Obukhov length (m)	75	75
Priestley-Taylor parameter	1	1

A3.14 The meteorological parameters alter the meteorological data inputted into the model to reflect conditions at the dispersion site. For example, if the dispersion site has a higher surface roughness value than the meteorological site, then the model will reduce the wind speed at the dispersion site to reflect this. Figure A5 shows the frequency of wind speeds and directions measured at the Northolt meteorological station in 2017 (left), which has been inputted into the model, as well as the frequency of wind speeds and directions processed by the ADMS-roads model for the dispersion site (right). These illustrate that wind predominantly comes from the west/southwest and that the model has marginally lower wind speed at the dispersion site.

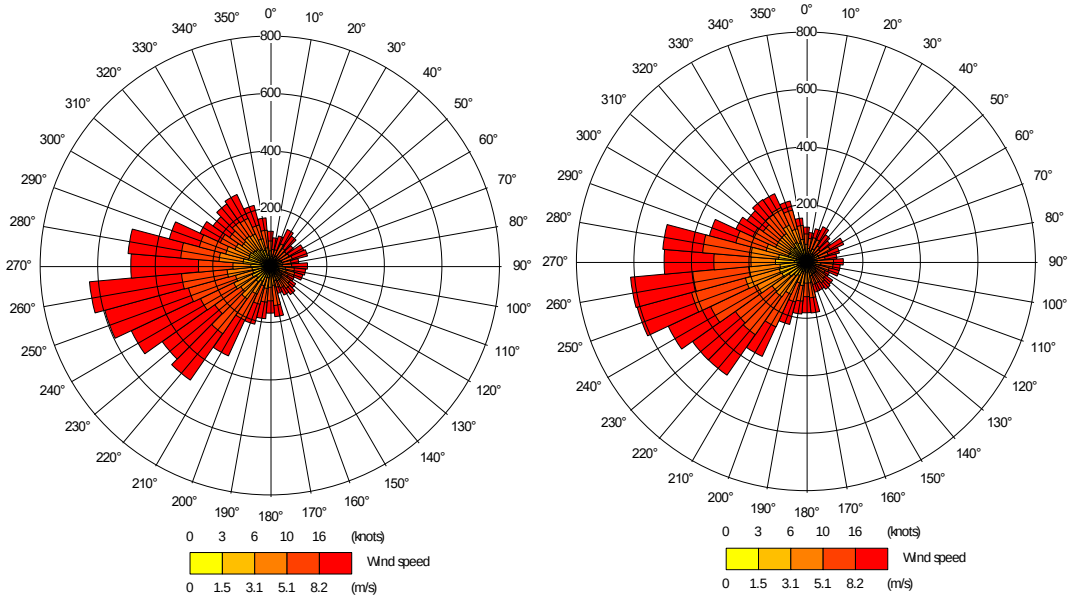

Figure A5: Wind Rose showing the frequency of wind speed and wind direction for the meteorological station at Northolt (Left) and the modelled dispersion site (Right) for the year of 2017

Model Verification

A3.15 The modelling will inherently have some uncertainties and may not reflect real conditions in the local area. A model verification exercise has therefore been undertaken to derive a factor with which to adjust the predicted concentrations from the model so that they match local conditions as closely as possible. The methodology of this follows the guidance set out by Defra in Box 7.14 and Box 7.15 of LAQM.TG(16) (Defra, 2018).

A3.16 Concentrations of road-NOx, road-PM_{10}, road-$PM_{2.5}$ and primary NO_2 have been predicted using the ADMS-roads dispersion model at the automatic monitoring sites located at Ikea and Neasden Lane in the London Borough of Brent. Predictions have been made at the height of the monitor inlets (2.5 m).

Nitrogen Dioxide

A3.17 Initially, the measured NO_2 concentrations at the monitoring sites have been inputted into Defra's NOx to NO_2 Calculator, along with the background NO_2 concentrations and f-NO_2 values, in order to obtain 'measured' road-NOx concentrations at the monitoring sites. The primary NO_2 emission factor (f-NO_2) at each monitoring site was calculated by taking the ratio of predicted primary NO_2 concentration to predicted road-NOx concentration.

A3.18 The predicted road-NOx concentrations have then been compared to the 'measured' road-NOx concentrations, see Figure A6. An adjustment factor of 4.621 has been derived from the equation of the linear trend line that has been fitted through zero. This factor indicates that the model is slightly underpredicting concentrations at the monitoring sites. The statistics of the fit were poor, due to predicted concentrations being underestimated much more at the Ikea monitoring site. To provide a robust assessment, the adjustment factor derived for just the Ikea monitoring sites of 5.213 has been used. This will lead to concentrations along Neasden Lane being overestimated. This adjustment factor has been applied to all predicted road-NOx concentrations to uplift the values to match the real measured 2017 conditions at the Ikea monitoring site. This is illustrated in Figure A7, which shows a comparison of the measured NO_2 concentrations and the total (i.e. road plus background) predicted NO_2 concentrations. Further statistics of this comparison are given in Table A3, which demonstrate that the predicted NO_2 concentrations have an insignificant fractional bias (~0) and an acceptable root mean square error (RMSE <10).

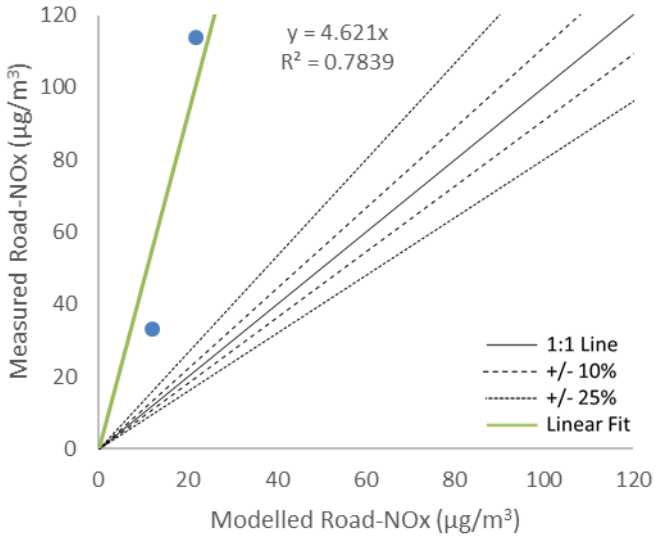

Figure A6: Comparison of predicted road-NOx to 'measured' road-NOx

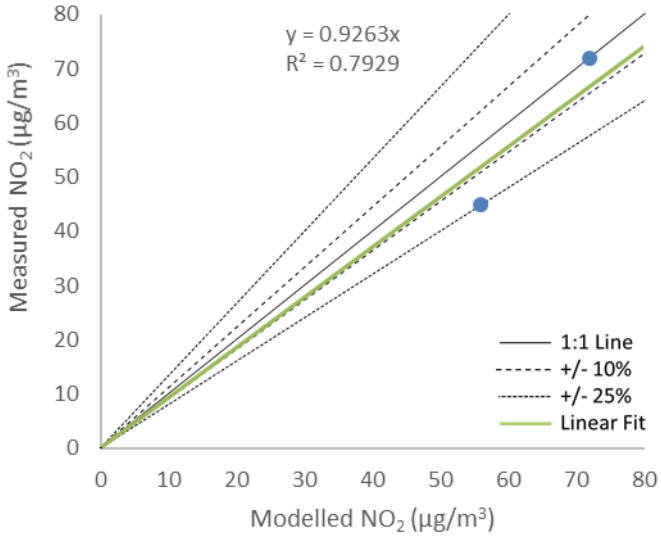

Figure A7: Comparison of predicted NO_2 to measured NO_2

Table A3: Model Verification Statistics

Statistic	NO_2
Correlation Coefficient (r) [a]	1.000
Real Mean Squared Error (RSME) [b]	7.77
Fractional Bias (FB) [c]	-0.089

[a] This is used to measure the linear relationship between predicted and measured concentrations. A value of zero means no relationship and a value of 1 means absolute relationship (ideal value).

[b] RMSE is used to define the average error or uncertainty in the model. The ideal value for NO_2 is zero, if greater than 25% of the objective (i.e. 10 µg/m³) then it is recommended that the model be revisited (this only applies to NO_2)

[c] This is used to identify if the model shows a systematic tendency to over or under predict. FB values range between -2 and +2 and has an ideal value of zero. Negative values indicate a model over-prediction and positive values indicate a model under-prediction.

PM_{10}

A3.19 Both the Ikea and Neasden Lane monitoring sites also measured concentrations of PM_{10} in 2017. Concentrations have been predicted at these monitoring sites in order to verify the model predictions of PM_{10}.

A3.20 The predicted road-PM_{10} concentrations have then been compared to the 'measured' road-PM_{10} concentrations, see Figure A8. An adjustment factor of 8.622 has been derived from the equation of the linear trend line that has been fitted through zero. This factor indicates that the model is underpredicting concentrations at the monitoring sites. The statistics of the fit were slightly poor, due to predicted concentrations being underestimated much more at the Neasden Lane monitoring site, there is however no clear reason for this. To provide a robust assessment, the adjustment factor derived from the linear trend line of both monitoring sites has been used, since the Ikea monitoring site is located adjacent to the main source of pollution in the local area. This adjustment factor has been applied to all predicted road-PM_{10} concentrations to uplift the values to match the real measured 2017 conditions. This is illustrated in Figure A9, which shows a comparison of the measured PM_{10} concentrations and the total (i.e. road plus background) predicted PM_{10} concentrations. Further statistics of this comparison are given in Table A4**Error! Reference source**

not found., which demonstrate that the predicted PM_{10} concentrations have an insignificant fractional bias (~0) and a good root mean square error (RMSE <10).

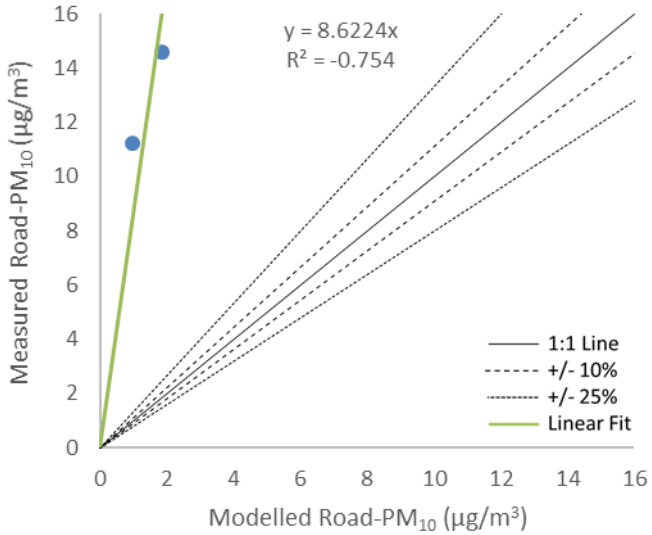

Figure A8: Comparison of predicted road-PM_{10} to 'measured' road-PM_{10}

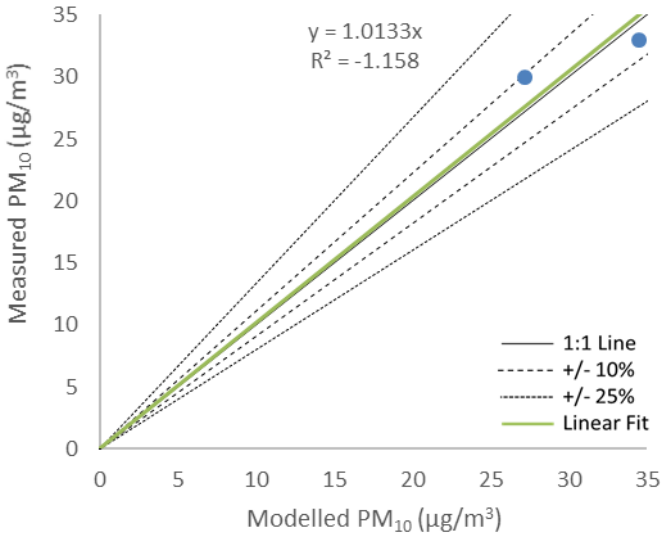

Figure A9: Comparison of predicted PM_{10} to measured PM_{10}

Table A4: Model Verification Statistics

Statistic	PM_{10}
Correlation Coefficient (r) [a]	1.000
Real Mean Squared Error (RSME) [b]	2.24
Fractional Bias (FB) [c]	0.021

[a] This is used to measure the linear relationship between predicted and measured concentrations. A value of zero means no relationship and a value of 1 means absolute relationship (ideal value).

[b] RMSE is used to define the average error or uncertainty in the model. The ideal value for NO_2 is zero, if greater than 25% of the objective (i.e. 10 µg/m³) then it is recommended that the model be revisited (this only applies to NO_2)

[c] This is used to identify if the model shows a systematic tendency to over or under predict. FB values range between -2 and +2 and has an ideal value of zero. Negative values indicate a model over-prediction and positive values indicate a model under-prediction.

$PM_{2.5}$

A3.21 There are no monitoring sites in the local area with which to verify the model predictions of $PM_{2.5}$ against. In the absence of comparable measurements, the model adjustment factor for road-PM_{10} has been used to uplift all predicted road-$PM_{2.5}$ concentrations.

Post Processing

Annual Mean Concentrations

A3.22 Concentrations of road-NOx and primary NO_2 have been predicted at each receptor using the ADMS-Roads model. The primary NO_2 emission factor (f-NO_2) at each receptor has been calculated by taking the ratio of predicted primary NO_2 concentration to road-NOx concentration. The f-NO_2 values along with the adjusted modelled road-NOx concentrations and background NO_2 concentrations have been inputted into Defra's NOx to NO_2 calculator (v7.1) in order to obtain predicted road-NO_2 concentrations at each receptor. This tool has been run assuming the traffic is described as 'All London traffic', which is considered appropriate for the traffic associated with the London Borough of Brent. The road-NO_2 concentrations have then been added to the background NO2 concentrations to obtain total NO_2 concentrations at the receptors. Similarly, the adjusted road-PM_{10} and road-$PM_{2.5}$ concentrations have been added to the background PM_{10} and $PM_{2.5}$ concentrations to obtain total PM_{10} and $PM_{2.5}$ concentrations at the receptors.

1-Hour and 24-Hour Concentrations

A3.23 In order to calculate the total 1-hour and 24-hour concentrations from the predicted percentiles, the approach set out in Box 7.13 of LAQM-TG16 have been followed. The total concentrations have thus been calculated as follows:

- the 99.79th percentiles of predicted 1-hour mean nitrogen oxides concentrations have been added to twice the annual mean nitrogen dioxide background concentration; and
- the 90.4th percentiles of predicted 24-hour mean PM_{10} concentrations have been added to the annual mean PM_{10} background concentration.

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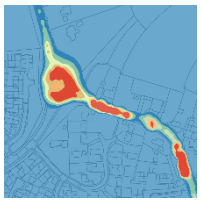

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