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The Old Power Station, Vastern Road

Air Quality Assessment

On behalf of **Berkeley Homes (Oxford and Chiltern) Limited**

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Contents

1	Introduction	1
1.1	Proposed Development.....	1
1.2	Scope of Assessment.....	1
2	Legislation, Policy and Guidance	2
2.1	National Air Quality Objectives.....	2
2.2	The Air Quality Strategy	3
2.3	Planning Policy	4
2.4	Assessment Guidance	8
3	Methodology	9
3.2	Baseline Air Quality	9
3.3	Construction Dust Impacts	9
3.4	Site Suitability	12
3.5	Assumptions and Limitations.....	13
3.6	Air Quality Impacts Significance Criteria	13
4	Baseline Environment.....	14
4.1	Site Context and Study Area	14
4.2	Sensitive Receptors.....	14
4.3	Ambient Air Quality.....	15
4.4	Predicted Background Concentrations.....	16
5	Predicted Impacts	17
5.1	Construction Dust Impacts	17
5.2	Site Suitability	18
6	Mitigation	19
6.1	Construction	19
6.2	Operation.....	20
7	Summary and Conclusions	21
	References	22

Tables

Table 2-1 NO ₂ and PM ₁₀ Objectives.....	2
Table 2-2 PM _{2.5} Objectives	2
Table 2-3 Relevant Public Exposure	3
Table 3-1 Criteria for Dust Emission Magnitude.....	9
Table 3-2 Area Sensitivity Definitions.....	11
Table 3-3 Risk of Dust Impacts - Demolition	11
Table 3-4 Risk of Dust Impacts - Earthworks and Construction.....	11
Table 3-5 Risk of Dust Impacts - Trackout.....	12
Table 4-1 Receptor Locations Description	14
Table 4-2 Measured NO ₂ Concentrations	15
Table 4-3 Measured Exceedances of the Hourly Mean NO ₂ Objective	15

Table 4-4 Measured PM ₁₀ and PM _{2.5} Concentrations	16
Table 4-5 Estimated Annual Mean Background Concentrations	16
Table 5-1 Predicted Concentrations Within the Development in 2021	18

Appendices

Appendix A	Glossary
Appendix B	Model Verification
Appendix C	Model Inputs and Results Processing Tools
Appendix D	Traffic Data and Road Network
Appendix E	Future Year Modelling – Road Transport Emissions Factors
Appendix F	Background Concentrations
Appendix G	Figures

1 Introduction

1.1 Proposed Development

- 1.1.1 Berkeley Homes (Oxford and Chiltern) Limited has commissioned Peter Brett Associates (PBA), now part of Stantec, to undertake an air quality assessment to support the full planning application for the redevelopment of 53-55 Vastern Road, Reading. The proposed development site is located within the administrative boundary of Reading Borough Council (RBC).
- 1.1.2 The planning application seeks permission for the demolition of existing buildings and structures and provision of residential units, a new café and a new north-south pedestrian link, connecting Christchurch Bridge to Vastern Road.

1.2 Scope of Assessment

- 1.2.1 This report describes existing air quality within the study area, considers the suitability of the site for the proposed redevelopment and assesses the impact of the construction and demolition of the development on air quality in the study area. The main air pollutants of concern related to construction are dust and fine particulate matter (PM₁₀), and for road traffic are nitrogen dioxide (NO₂), PM₁₀ and PM_{2.5}.
- 1.2.2 The proposed development is expected to lead to a net reduction in vehicle trips on the surrounding road network (**Appendix A** when compared to the existing use. Therefore, an assessment of the impact of development traffic on air quality at existing receptor locations has been scoped out.
- 1.2.3 The assessment has been prepared taking into account relevant local and national guidance, policy and legislation.

2 Legislation, Policy and Guidance

2.1 National Air Quality Objectives

- 2.1.1 National Air Quality Objectives (NAQOs) are defined by the Air Quality Standards (Amendment) Regulations 2016, which implement the European Union's Directive on ambient air quality and cleaner air for Europe (2008/50/EC).
- 2.1.2 Directive 2008/50/EC consolidated the previous framework directive on ambient air quality assessment and management and its first three daughter directives. The limit values remained unchanged, but it now allows Member States a time extension for compliance, subject to European Commission approval.
- 2.1.3 The NAQOs for NO₂ and PM₁₀ are shown in **Table 2-1**.

Table 2-1 NO₂ and PM₁₀ Objectives

Pollutant	Time Period	Objective
Nitrogen Dioxide (NO ₂)	1-hour mean	200 µg/m ³ not to be exceeded more than 18 times a year
	Annual mean	40 µg/m ³
Particulate Matter (PM ₁₀)	24-hour mean	50 µg/m ³ not to be exceeded more than 35 times a year
	Annual mean	40 µg/m ³

- 2.1.4 The NAQO's for NO₂ and PM₁₀ were to have been achieved by 2005 and 2004, respectively, but also continue to apply in all future years thereafter.
- 2.1.5 The EU Directive (2008/50/EC) also includes a national exposure reduction target, a target value and a limit value for PM_{2.5}, shown in **Table 2-2**. The UK Government transposed this new directive into national legislation in June 2010.
- 2.1.6 In relation to PM_{2.5}, the Air Quality Strategy 2007 (Defra, 2007) includes an exposure reduction target comprising an annual mean target of 25 µg/m³ by 2020 and an average urban background exposure reduction target of 15% between 2010 and 2020

Table 2-2 PM_{2.5} Objectives

	Time Period	Objective	To be Achieved by
UK Objectives	Annual mean	25 µg/m ³	2020
	3 year running annual mean	15% reduction in concentrations measured at urban background sites	Between 2010 and 2020
European Obligations	Annual mean	Target value of 25 µg/m ³	2010
	Annual mean	Limit value of 25 µg/m ³	2015

	Time Period	Objective	To be Achieved by
	Annual mean	Stage 2 indicative Limit value of 20 $\mu\text{g}/\text{m}^3$	2020
	3 year Average Exposure Indicator (AEI) (a)	Exposure reduction target relative to the AEI depending on the 2010 value of the 3 year AEI (ranging from a 0% to a 20% reduction)	2020
	3 year Average Exposure Indicator (AEI)	Exposure concentration obligation of 20 $\mu\text{g}/\text{m}^3$	2015

(a) The 3 year annual or AEI is calculated from the $\text{PM}_{2.5}$ concentration averaged across all urban background monitoring locations in the UK e.g. the AEI for 2010 is the mean concentration measured over 2008, 2009 and 2010.

2.2 The Air Quality Strategy

- 2.2.1 The Air Quality Strategy (2007) establishes the policy framework for ambient air quality management and assessment in the UK (Defra, 2007). The primary objective of the Air Quality Strategy is to ensure that everyone can enjoy a level of ambient air quality which poses no significant risk to health or quality of life. The Air Quality Strategy sets out the NAQOs and Government policy on achieving these.
- 2.2.2 Part IV of the Environment Act 1995 (Environment Act, 1995) introduced a system of Local Air Quality Management (LAQM) which requires local authorities to regularly and systematically review and assess air quality within their boundary, and appraise development and transport plans against these assessments.
- 2.2.3 Where a NAQO is unlikely to be met, the local authority must designate an Air Quality Management Area (AQMA) and draw up an Air Quality Action Plan (AQAP) setting out the measures it intends to introduce in pursuit of the NAQO's within its AQMA.
- 2.2.4 The Local Air Quality Management Technical Guidance 2016 (LAQM.TG(16); Defra, 2016), issued by the Department for Environment, Food and Rural Affairs (Defra) for Local Authorities provides advice as to where the NAQOs apply. These include outdoor locations where members of the public are likely to be regularly present for the averaging period of the objective (which vary from 15 minutes to a year) as summarised in **Table 2-3**.

Table 2-3 Relevant Public Exposure

Averaging Period	Relevant Locations	NAQO's should apply at:	NAQO's don't apply at:
Annual mean	Where individuals are exposed for a cumulative period of 6 months in a year	Building facades of residential properties, schools, hospitals etc.	Facades of offices Hotels Gardens of residences Kerbside sites

1-hour mean	Where individuals might reasonably expected to spend one hour or longer	As above together with locations of regular access, car parks, bus stations etc.	Locations not publicly accessible or where occupation is not regular
15-minute mean	All locations where members of the public might reasonably be regularly exposed for a period of 15-minutes or longer		

Clean Air Strategy 2019

- 2.2.5 The Clean Air Strategy (2019) aims to lower national emissions of pollutants, thereby reducing background pollution and minimising human exposure to harmful concentrations of pollution. The Strategy will create a stronger and more coherent framework for action to tackle air pollution (Defra, 2019a).

2.3 Planning Policy

National Policy

- 2.3.1 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how they are expected to be applied (Ministry of Housing, Communities & Local Government, 2019). The following paragraphs are considered relevant from an air quality perspective.

- 2.3.2 Paragraph 102 on promoting sustainable transport states:

"Transport issues should be considered from the earliest stages of plan-making and development proposals, so that:

...

d) the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains; ..."

- 2.3.3 Paragraph 103 continues to state:

"Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health."

- 2.3.4 Paragraph 170 on conserving and enhancing the natural environment states:

"Planning policies and decisions should contribute to and enhance the natural and local environment by: ..."

e) 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 stability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans, and..."

- 2.3.5 Paragraph 180 within ground conditions and pollution states:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health,

living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.”

2.3.6 Paragraph 181 states that:

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

2.3.7 Paragraph 182 states that:

“Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed”.

Planning Practice Guidance

2.3.8 Planning Practice Guidance (PPG) (Planning Practice Guidance, 2014) was first published in March 2014 to support the National Planning Policy Framework. Paragraph 001, Reference 32-007-20140306 (revision date 06.03.2014) of the PPG provides a summary as to why air quality is a consideration for planning:

“... Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values. It is important that the potential impact of new development on air quality is taken into account in planning where the national assessment indicates that relevant limits have been exceeded or are near the limit... The local air quality management (LAQM) regime requires every district and unitary authority to regularly review and assess air quality in their area. These reviews identify whether national objectives have been, or will be, achieved at relevant locations, by an applicable date... If national objectives are not met, or at risk of not being met, the local authority concerned must declare an air quality management area and prepare an air quality action plan... Air quality can also affect biodiversity and may therefore impact on our international obligations under the Habitats Directive... Odour and dust can also be a planning concern, for example, because of the effect on local amenity.”

2.3.9 Paragraph 002 of the PPG concerns the role of Local Plans with regard to air quality;

“... Drawing on the review of air quality carried out for the local air quality management regime, the Local Plan may need to consider;

- *the potential cumulative impact of a number of smaller developments on air quality as well as the effect of more substantial developments;*
- *the impact of point sources of air pollution...; and*

- *ways in which new development would be appropriate in locations where air quality is or likely to be a concern and not give rise to unacceptable risks from pollution. This could be through, for example, identifying measures for offsetting the impact on air quality arising from new development including supporting measures in an air quality action plan or low emissions strategy where applicable.”*

2.3.10 Paragraph 005 of the PPG identifies when air quality could be relevant for a planning decision;

“... When deciding whether air quality is relevant to a planning application, considerations could include whether the development would;

- *Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; adds to turnover in a large car park; or result in construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more;*
- *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Areas;*
- *Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality;*
- *Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations; and*
- *Affect biodiversity. In particular, is it likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site, and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites.”*

2.3.11 Paragraph 007 of the PPG provides guidance on how detailed an assessment needs to be;

“Assessments should be proportionate to the nature and scale of development proposed and the level of concern about air quality, and because of this are likely to be locationally specific.”

2.3.12 Paragraph 008 of the PPG provides guidance on how an impact on air quality can be mitigated;

“Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact... Examples of mitigation include;

- *the design and layout of development to increase separation distances from sources of air pollution;*
- *using green infrastructure, in particular trees, to absorb dust and other pollutants;*
- *means of ventilation;*
- *promoting infrastructure to promote modes of transport with low impact on air quality;*
- *controlling dust and emissions from construction, operation and demolition; and*
- *contributing funding to measures, including those identified in air quality action plans and low emission strategies, designed to offset the impact on air quality arising from new development.”*

- 2.3.13 Paragraph 009 of the PPG provides guidance on how considerations about air quality fit into the development management process by means of a flowchart. The final two stages in the process deal with the results of the assessment;

“Will the proposed development (including mitigation) lead to an unacceptable risk from air pollution, prevent sustained compliance with EU limit values or national objectives for pollutants or fail to comply with the requirements of the Habitats Regulations.” If Yes:

“Consider how the proposal could be amended to make it acceptable or, where not practicable, consider whether planning permission should be refused.”

Local Policy

New Local Plan

- 2.3.14 The RBC Local Plan, adopted in November 2019, provides the planning policies to guide development in the borough up to 2036 (RBC, 2019a). The Local Plan contains policy EN15 on Air Quality which states:

“Development should have regard to the need to improve air quality and reduce the effects of poor air quality.

i. Development that would detrimentally affect air quality will not be permitted unless the effect is to be mitigated. The following criteria should be taken into account:

- Whether the proposal, including when combined with the cumulative effect of other developments already permitted, would worsen air quality;*
- Whether the development is within, or accessed via, an Air Quality Management Area; and*
- Whether it can be demonstrated that a local worsening in air quality that would not detrimentally affect human health or the environment would be offset by an overall improvement in air quality, for instance through the reduction in need to travel.*

ii. Where a development would introduce sensitive uses (such as residential, schools and nurseries, hospitals, care facilities) into, or intensify such uses within, an Air Quality Management Area, detrimental effects on that use will be mitigated. Mitigation measures should be detailed in any planning application. If there are significant detrimental effects that cannot be mitigated, the application should be refused.

iii. Where required, planning obligations will be used to secure contributions to measures to tackle poor air quality or for air quality monitoring.”

Air Quality Action Plan

- 2.3.15 RBC has declared an AQMA in the Borough due to exceedances of the annual mean NO₂ objective. As a result RBC has the responsibility to prepare an AQAP. The revised AQAP (RBC, 2016) contains measures aimed at improving air quality across Reading, centred around two themes: ‘intervention’ and ‘education/promotion’. In addition to a number of measures targeted at improving traffic congestion in the central area, and reducing the number of trips made by car, the AQAP contains a measure of particular relevance to new development in the Borough:

“We will ensure through the planning process that future development does not result in further deterioration in air quality and where possible, results in an improvement in overall environmental quality”.

2.4 Assessment Guidance

- 2.4.1 The primary guidance documents used in undertaking this assessment are detailed below.

Defra 'Local Air Quality Management Technical Guidance (LAQM.TG(16))'

- 2.4.2 Defra LAQM.TG(16) was published for use by local authorities in their LAQM review and assessment work (Defra, 2016). The document provides key guidance in aspects of air quality assessment, including screening, use of monitoring data, and use of background data that are applicable to all air quality assessments.

EPUK-IAQM 'Land-Use Planning & Development Control: Planning For Air Quality'

- 2.4.3 Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have together published guidance to help ensure that air quality is properly accounted for in the development control process (IAQM EPUK 2017). It clarifies when an air quality assessment should be undertaken, what it should contain, and how impacts should be described and assessed including guidelines for assessing the significance of impacts.

IAQM 'Guidance on the Assessment of Dust from Demolition and Construction'

- 2.4.4 Guidance on the assessment of dust from demolition and construction has been published by the IAQM (IAQM, 2014). The guidance provides a series of matrices to determine the risk magnitude of potential dust sources associated with construction activities in order to identify appropriate mitigation measures that are defined within further IAQM guidance. Within the IAQM guidance, an 'impact' is described as a change in pollutant concentrations or dust deposition and an 'effect' is described as the consequence of an impact.

3 Methodology

- 3.1.1 The assessment methodology detailed in the following sections has been applied to ascertain the suitability of the site for the proposed end-use so that compliance with policy and regulatory requirements (outlined in **Section 2** of this report) can be demonstrated, or whether additional mitigation is required.
- 3.1.2 This assessment first outlines the existing air quality within the study area, then considers the suitability of the site for the proposed end-use. It also assesses the impact of construction activities on air quality and sensitive receptors in the study area.

3.2 Baseline Air Quality

- 3.2.1 Information on baseline air quality in the study area has been obtained by collating the results of monitoring carried out by RBC. Background concentrations for the study area have been defined using the national pollution maps published by Defra. These cover the whole country on a 1x1 km grid (Defra, 2019b).

3.3 Construction Dust Impacts

- 3.3.1 During pre-construction demolition and construction, the main potential effects are dust annoyance and locally elevated concentrations of PM₁₀. The suspension of particles in the air is dependent on surface characteristics, weather conditions and on-site activities. Impacts have the potential to occur when dust generating activities coincide with dry, windy conditions, and where sensitive receptors are located downwind of the dust source.
- 3.3.2 Separation distance is also an important factor. Large dust particles (greater than 30 µm), responsible for most dust annoyance, will largely deposit within 100 m of sources. Intermediate particles (10-30 µm) can travel 200-500 m. Consequently, significant dust annoyance is usually limited to within a few hundred metres of its source. Smaller particles (less than 10µm) are deposited slowly and may travel up to 1 km; however, the impact on the short-term concentrations of PM₁₀ occurs over a shorter distance. This is due to the rapid decrease in concentrations with distance from the source due to dispersion.
- 3.3.3 The IAQM guidance recommends that the risk of dust emission magnitude is combined with the sensitivity of the area surrounding the site to determine the risk of dust impacts from construction and demolition activities. Depending on the level of risk (high, medium, low or negligible) for each activity, appropriate mitigation is selected.
- 3.3.4 In accordance with the IAQM, the dust emission magnitude is defined as either large, medium or small (**Table 3-1**) taking into account the general activity descriptors on site and professional judgement.
- 3.3.5 The sensitivity of the study area to construction dust impacts is defined based on the examples provided within the IAQM 2014 guidance (**Table 3-2**), taking into account professional judgement.

Table 3-1 Criteria for Dust Emission Magnitude

Dust Emission Magnitude	Activity
Large	Demolition >50,000 m ³ building demolished, dusty material (e.g. concrete), on-site crushing/screening, demolition >20 m above ground level

Dust Emission Magnitude	Activity
	Earthworks >10,000 m ² site area, dusty soil type (e.g. clay) >10 earth moving vehicles active simultaneously >8 m high bunds formed, >100,000 tonnes material moved
	Construction >100,000 m ³ building volume, on site concrete batching, sandblasting
	Trackout >50 HDVs out / day, dusty soil type (e.g. clay), >100 m unpaved roads
Medium	Demolition 20,000 - 50,000 m ³ building demolished, dusty material (e.g. concrete) 10-20 m above ground level
	Earthworks 2,500 - 10,000 m ² site area, moderately dusty soil (e.g. silt), 5 - 10 earth moving vehicles active simultaneously, 4 m - 8 m high bunds, 20,000 - 100,000 tonnes material moved
	Construction 25,000 - 100,000 m ³ building volume, on site concrete batching
	Trackout 10 - 50 HDVs out / day, moderately dusty surface material, 50 -100 m unpaved roads
Small	Demolition <20,000 m ³ building demolished, non-dusty material, <10 m above ground level, work in winter
	Earthworks <2,500 m ² site area, non-dusty soil, <5 earth moving vehicles active simultaneously, <4 m high bunds, <20,000 tonnes material moved
	Construction <25,000 m ³ , non-dusty material
	Trackout <10 HDVs out / day, non-dusty soil, < 50 m unpaved roads

Table 3-2 Area Sensitivity Definitions

Area Sensitivity	People and Property Receptors	Ecological Receptors
High	>100 dwellings, hospitals, schools, care homes within 50 m 10 - 100 dwellings within 20 m Museums, car parks, car showrooms within 50 m PM₁₀ concentrations approach or are above the daily mean objective.	National or Internationally designated site within 20 m with dust sensitive features / species present
Medium	>100 dwellings, hospitals, schools, care homes within 100 m 10 - 100 dwellings within 50 m < 10 dwellings within 20 m Offices/shops/parks within 20 m PM₁₀ concentrations below the daily mean objective.	National or Internationally designated site within 50 m with dust sensitive features / species present Nationally designated site or particularly important plant species within 20 m
Low	>100 dwellings, hospitals, schools, care homes 100 - 350 m away 10 - 100 dwellings within 50 – 350 m < 10 dwellings within 20 – 350 m Playing fields, parks, farmland, footpaths, short term car parks, roads, shopping streets PM₁₀ concentrations well below the daily mean objective.	Nationally designated site or particularly important plant species 20 – 50 m Locally designated site with dust sensitive features within 50 m

- 3.3.6 Based on the dust emission magnitude and the area sensitivity, the risk of dust impacts is then determined (**Table 3-3**, **Table 3-4** and **Table 3-5**), taking into account professional judgement.

Table 3-3 Risk of Dust Impacts - Demolition

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

Table 3-4 Risk of Dust Impacts - Earthworks and Construction

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

Table 3-5 Risk of Dust Impacts - Trackout

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

- 3.3.7 Based on the risk of dust impacts, appropriate mitigation is selected from the IAQM guidance using professional judgement.

3.4 Site Suitability

- 3.4.1 In relation to proposed human receptors within the site, concentrations of pollutants have been calculated at a range of locations of relevant exposure to allow assessment of the significance of predicted impacts from existing emission sources.
- 3.4.2 Emissions from road vehicles and their resultant impact at receptor locations have been predicted using the ADMS-Roads dispersion model (v4.1.1).
- 3.4.3 The model requires the user to provide various input data, including the Annual Average Daily Traffic (AADT) flow, the proportion of Heavy Duty Vehicles (HDVs), road characteristics (including road width and street canyon height, where applicable), and the vehicle speed. It also requires meteorological data. The model has been run using 2018 meteorological data from the Farnborough meteorological station, which are considered suitable for this area. **Appendix D** provides further details on the model inputs.
- 3.4.4 AADT flows and the proportions of HDVs, for roads within the study area have been provided by the project's transport consultants, Peter Brett Associates. Traffic data used in this assessment are summarised in **Appendix A**
- 3.4.5 Traffic emissions were calculated using the Emission Factor Toolkit (EFT) v9.0, which utilises NO_x emission factors taken from the European Environment Agency COPERT 5 emission tool. The traffic data were entered into the EFT, along with speed data to provide combined emission rates for each of the road links entered into the model. Road vehicular emissions are primarily associated with the exhaust emissions but also include particles generated from abrasion (of tyres, brakes and road). The EFT allows users to calculate road vehicle pollutant emission rates for NO_x, PM₁₀, (exhaust and brake, tyre and road wear) and PM_{2.5} (exhaust and brake, tyre and road wear) for a specified year, road type, vehicle speed and vehicle fleet composition.
- 3.4.6 The EFT provides pollutant emission rates for 2017 through to 2030 and takes into consideration the following information available from the National Atmospheric Emissions Inventory (NAEI):
- fleet composition data for motorways, urban and rural roads in London and rest of the UK;
 - fleet composition based on European emission standards from pre-Euro I to Euro 6(a-d)/VI;
 - scaling factors reflecting improvements in the quality of fuel and some degree of retrofitting; and
 - technology conversions in the national fleet.
- 3.4.7 As a result of this the road vehicle exhaust emissions are projected to decrease year-on-year due to technological advances and improvements to the fleet mix i.e. penetration of Euro VI HGVs, which recent research suggests are performing well. Whilst there is current uncertainty over NO_x emissions from vehicle exhausts (particularly from Euro 5 and 6 LGVs) it is important to note the EFT is not based on the Euro emission standards. Specifically, the latest version of the EFT (v9.0) includes updated NO_x and PM speed emission coefficient equations for Euro 5

and 6 vehicles taken from the European Environment Agency (EEA) COPERT 4 v11 emission calculation tool, reflecting emerging evidence on the real-world emission performance of these vehicles.

- 3.4.8 The earliest year of development occupation is expected to be 2021. Therefore, an assessment has been carried out utilising 2021 vehicle emissions, traffic data and background concentrations. **Appendix E** provides further explanation of the selection of future year vehicle emission factors.

3.5 Assumptions and Limitations

- 3.5.1 There are many components that contribute to the uncertainty in predicted concentrations. The model used in this assessment is dependent upon the traffic data that have been input which will have inherent uncertainties associated with them. There is then additional uncertainty as the model is required to simplify real-world conditions into a series of algorithms.
- 3.5.2 There has been an acknowledged disparity between national road transport emissions projections and measured annual mean concentrations of nitrogen oxides and NO₂ for many years. Recent monitoring has shown that reductions in concentrations are now being measured in many parts of the country, however, there is still some uncertainty regarding the rate at which emissions will reduce in the future and therefore some consideration must be given the accuracy of any projection and to appropriately respond to this. Further discussion relating to emissions factors is included in **Appendix E**.
- 3.5.3 The modelling has been based on 2021 emission factors and background concentrations, whilst utilising 2021 completed development traffic flows. The model has been verified against 2018 monitoring data. This is considered to provide an appropriate assessment taking into account the uncertainties regarding future vehicle emission factors.

3.6 Air Quality Impacts Significance Criteria

Construction Impacts

- 3.6.1 The construction impact significance criteria are based on the IAQM guidance. The guidance recommends that no assessment of the significance of effects is made without mitigation in place, as mitigation is assumed to be secured by planning conditions, legal requirements or required by regulations.
- 3.6.2 With appropriate mitigation in place, the residual effect of construction impacts on air quality is assessed as being not significant.

Site Suitability

- 3.6.3 There is no official guidance in the UK on how to assess the significance of air quality impacts of existing sources on a new development. The assessment of future receptors at the development site has been limited to predicting air quality at the site and the significance of this is based on whether the NAQOs (**Table 2-1** and **Table 2-2**) for each pollutant are exceeded or not.

4 Baseline Environment

4.1 Site Context and Study Area

- 4.1.1 The site is bound to the south by Vastern Road, beyond which lies a number of commercial units and Reading train station. To the east of the site lies an office development, and residential properties to the west. A public footpath and the River Thames border the site to the north.
- 4.1.2 For the construction phase assessment, the study area (based on IAQM, 2014 guidance) is defined as up to 350 m from the development or 50 m from the route of construction vehicles (up to 500 m from the site entrance).
- 4.1.3 For the site suitability assessment, the study area (based on IAQM EPUK, 2017 guidance) is defined as all roads within 250 m of the development.

4.2 Sensitive Receptors

Human Receptors

- 4.2.1 Relevant sensitive locations are places where members of the public might be expected to be regularly present over the averaging period of the objectives. For the annual mean and daily mean objectives that are the focus of this assessment, sensitive receptors will generally be residential properties, schools, nursing homes, etc. When identifying these receptors, particular attention has been paid to assessing impacts close to junctions, where traffic may become congested, and where there is a combined effect of several road links.
- 4.2.2 Four receptor locations within the proposed development site have been chosen in order to assess the suitability of the site for residential development. Receptor locations were modelled at a height of 1.5 m, 4.5 m and 7.5 m representing residential exposure at ground, first and second floor level. Proposed receptors are described in **Table 4-1** below and their locations are shown in **Figure 1 Appendix G**.
- 4.2.3 Concentrations have also been predicted at three diffusion tube monitors (**Table 4-2**) located on Vastern Road and Caversham Road in order to verify the modelled results. **Appendix C** provides further details on the verification method.

Table 4-1 Receptor Locations Description

Receptor	Location	x	y	Height (m)
PR1	Proposed Block A Southern Façade	471476.9	174101.3	1.5, 4.5 and 7.5 m
PR2	Proposed Block A Southern Façade	471503.7	174087.3	1.5, 4.5 and 7.5 m
PR3	Proposed Block B Southern Façade	471519.5	174079.8	1.5, 4.5 and 7.5 m
PR4	Proposed Block B Southern Façade	471546.2	174065.7	1.5, 4.5 and 7.5 m

4.3 Ambient Air Quality

LAQM

- 4.3.1 RBC has investigated air quality within its area as part of its responsibilities under the LAQM regime and has declared an AQMA due to exceedances of the annual mean NO₂ objective. The AQMA encompasses the central area and the main arterial routes in and out of Reading. The site is located within the Reading AQMA.

Local Monitoring Data

Nitrogen Dioxide (NO₂)

- 4.3.2 RBC carries out automatic monitoring at three roadside sites in the borough. In addition, Defra also carries out monitoring at one automatic urban background monitoring site in the borough as part of the Automatic Urban and Rural Network (AURN). The closest automatic monitoring location to the site is RD1, approximately 460 m northwest. RBC also has a network of diffusion tubes to monitor NO₂ concentrations. The closest monitoring location is DT52 on Vastern Road, located approximately 60 m from the site. The closest and most representative monitoring locations are described in **Table 4-2** below and their locations are shown in **Figure 2, Appendix G**. Results from these monitoring locations are provided in **Table 4-2** and **Table 4-3**.

Table 4-2 Measured NO₂ Concentrations

Site ID	Site Type	Within AQMA	Annual Mean (µg/m³)				
			2014	2015	2016	2017	2018
Automatic Site							
RD1 – Caversham Road	Roadside	Yes	41	38	39	37	40
Diffusion Tubes							
DT43 – 59a, Caversham Road	Roadside	Yes	47	42	41	43	39**
DT47 – 197, Caversham Road	Roadside	Yes	43	39	35	36	34
DT48 – Caversham Co-location	Roadside	Yes	41	38	37	38	38
DT49 – Caversham Co-location	Roadside	Yes	40	37	38	36	39
DT50 – Caversham Co-location	Roadside	Yes	41	37	36	37	39
DT51 – 108, Caversham Road*	Roadside	Yes	48	41	41	40	42
DT52 – 31a, Vastern Road*	Roadside	Yes	40	36	37	38	35
DT53 – 131, Caversham Road*	Roadside	Yes	47	40	36	36	35
Objective			40				

Exceedances of the objective highlighted in bold.

2014 – 2018 data taken from the RBC 2019 Air Quality Annual Status Report (RBC, 2019b).

*Used for model verification

**Low data capture

Table 4-3 Measured Exceedances of the Hourly Mean NO₂ Objective

Site ID	Number of Hours >200µg/m ³				
	2014	2015	2016	2017	2018
RD1 – Caversham Road	0	1	0	0	7
Objective	18 (200)				

2014 – 2018 data taken from the RBC 2019 Air Quality Annual Status Report (RBC, 2019b).

4.3.3 **Table 4-2** shows that measured concentrations have been below the annual mean NO₂ objective at the closest monitoring location to the site, DT52, since 2015. In 2014, exceedances of the annual mean NO₂ objective occurred at all monitoring sites presented in **Table 4-2**, however in 2018 exceedances only occurred at RD1 and DT51.

4.3.4 **Table 4-3** shows that there were no measured exceedances of the hourly mean NO₂ objective between 2014 and 2018.

Particulates (PM₁₀ and PM_{2.5})

4.3.5 The results of the PM₁₀ monitoring at the RD1 automatic monitoring site on Caversham Road are shown in **Table 4-4** below. There is no PM_{2.5} monitoring undertaken by RBC in close proximity to the site.

Table 4-4 Measured PM₁₀ and PM_{2.5} Concentrations

	2014	2015	2016	2017	2018
Annual Mean PM ₁₀ (µg/m³)					
RD1 – Caversham Road	33	28	20	23	24
Objective	40				
Number of days > 50µg/m³					
RD1 – Caversham Road	31(51)	8(41)	5	7	3
Objective	35				

2014 – 2018 data taken from the RBC 2019 Air Quality Annual Status Report (RBC, 2019b).
If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

4.3.6 Measured PM₁₀ concentrations have been below the relevant objectives and limit values since 2014.

4.4 Predicted Background Concentrations

4.4.1 In addition to these measured concentrations, estimated background concentrations for the site have been obtained from the national maps provided by Defra (Defra, 2019b). The mapped background concentrations were calibrated against background concentrations measured at the Reading AURN monitoring site (see **Appendix F** for more details). The calibrated Defra background concentrations for the site are provided in **Table 4-5**.

4.4.2 The background concentrations are all well below the relevant objectives.

Table 4-5 Estimated Annual Mean Background Concentrations

Year	Location	Annual Mean (µg/m ³)		
		NO ₂	PM ₁₀	PM _{2.5}
2018	471_174	25.8	13.1	7.1
2021	471_174	23.3	12.6	6.8
Objectives		40	40	25

5 Predicted Impacts

5.1 Construction Dust Impacts

5.1.1 The main potential effects during construction are dust deposition and elevated PM₁₀ concentrations. The following activities have the potential to cause emissions of dust:

- Site preparation including delivery of construction material, erection of fences and barriers;
- Demolition of existing buildings on site;
- Earthworks including digging foundations and landscaping;
- Materials handling such as storage of material in stockpiles and spillage;
- Construction and fabrication of units; and
- Disposal of waste materials off-site.

5.1.2 Typically the main cause of unmitigated dust generation on construction sites is from demolition and vehicles using unpaved haul roads, and off-site from the suspension of dust from mud deposited on local roads by construction traffic. The main determinants of unmitigated dust annoyance are the weather and the distance to the nearest receptor.

5.1.3 Based on the IAQM guidance criteria, the potential dust emission magnitude for the phases of construction are as follows:

- for demolition activities the potential dust emission magnitude is considered to be 'medium' as demolition is expected to occur 10 m above ground level;
- for earthworks, the emissions magnitude is classified as 'medium' given the size of the site, activities involved and soil types;
- for construction activities, the dust emission magnitude is considered to be 'medium' due to the total building volume and construction materials; and
- For trackout, the dust emission magnitude is considered to be 'medium' as there are anticipated to be between 10 - 25 HDV movements out per day.

5.1.4 The study area is considered to be of 'high' sensitivity to potential dust soiling impacts, as there are between 10-100 dwellings within 20 m of the site boundary.

5.1.5 The study area is considered to be of 'low' sensitivity to potential PM₁₀ impacts, as baseline annual mean PM₁₀ concentrations are below 24 µg/m³ (**Table 4-5**) and there are between 10-100 dwellings within 20 m of the site.

5.1.6 There are no sensitive ecological receptors within 50 m of the site and therefore the study area is not considered to be sensitive to potential dust soiling or PM₁₀ impacts on ecological receptors.

5.1.7 The risk of dust soiling impacts are classified as 'medium' risk for demolition, construction, earthworks and trackout. The risk of PM₁₀ impacts are classified as 'low' risk for demolition, construction, earthworks and trackout. Appropriate mitigation measures corresponding to the level of risk identified for each activity are therefore required during the construction phase of the development (**see paragraph 6.1.1**).

5.2 Site Suitability

- 5.2.1 Predicted concentrations at modelled receptor locations are presented in [Error! Reference source not found.](#). Details of the proposed receptors are provided in **Table 4-1** and their locations are shown in **Figure 1, Appendix G**.

Table 5-1 Predicted Concentrations Within the Development in 2021

Receptor	Modelled Height (m)	Annual Mean ($\mu\text{g}/\text{m}^3$)		
		NO ₂	PM ₁₀	PM _{2.5}
PR1	1.5	32.0	14.3	7.8
PR1A	4.5	29.7	13.8	7.5
PR1B	7.5	27.3	13.4	7.3
PR2	1.5	32.0	14.3	7.8
PR2A	4.5	29.6	13.8	7.5
PR2B	7.5	27.2	13.4	7.2
PR3	1.5	31.7	14.2	7.7
PR3A	4.5	29.5	13.8	7.5
PR3B	7.5	27.2	13.4	7.2
PR4	1.5	31.7	14.2	7.7
PR4A	4.5	29.5	13.8	7.5
PR4B	7.5	27.2	13.4	7.2
Objectives		40	40	25

- 5.2.2 There are no predicted exceedances of the annual mean NO₂, PM₁₀ or PM_{2.5} concentrations at any of the proposed receptors locations. Air quality within the site is therefore considered acceptable for the proposed end-use.

6 Mitigation

6.1 Construction

6.1.1 The following standard medium risk mitigation measures from the IAQM 2014 guidance are recommended.

Communication

- Develop and implement a stakeholder communications plan.
- Display the name and contact details of persons accountable on the site boundary.
- Display the head or regional office information on the site boundary.

Management

- Develop and implement a dust management plan.
- Record all dust and air quality complaints, identify causes and take measures to reduce emissions.
- Record exceptional incidents and action taken to resolve the situation.
- Carry out regular site inspections to monitor compliance with the dust management plan and record results.
- Increase site inspection frequency during prolonged dry or windy conditions and when activities with high dust potential are being undertaken.
- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible.
- Erect solid screens or barriers around dusty activities or the site boundary at least as high as any stockpile on site.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site run off of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove potentially dusty materials from site as soon as possible.
- Cover, seed or fence stockpiles to prevent wind whipping.
- Ensure all vehicles switch off engines when stationary.
- Avoid the use of diesel or petrol powered generators where possible.
- Produce a Construction Logistics Plan to manage the delivery of goods and materials.
- Only use cutting, grinding and sawing equipment with dust suppression equipment.
- Ensure an adequate supply of water on site for dust suppressant.

- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use water sprays on such equipment where appropriate.
- Ensure equipment is readily available on site to clean up spillages of dry materials.
- No on-site bonfires and burning of waste materials on site.

Earthworks

- Re-vegetate earthworks and exposed areas /soil stockpiles to stabilise surfaces as soon as practicable.
- Only remove the cover in small areas during work and not all at once.

Demolition

- Incorporate soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- Ensure water suppression is used during demolition operation.
- Avoid explosive blasting, using appropriate manual and mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

Construction

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless required for a particular process.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored silos with suitable emissions control systems.

Trackout

- Use water assisted dust sweepers on the site access and local roads.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving the site are covered to prevent escape of materials.
- Record inspection of on-site haul routes and any subsequent action, repairing as soon as reasonably practicable.
- Install hard surfaced haul routes which are regularly damped down.
- Install a wheel wash with a hard-surfaced road to the site exit where site layout permits.
- The site access gate to be located at least 10m from receptors where possible.

6.2 Operation

- 6.2.1 The assessment has demonstrated that the predicted pollutant concentrations within the site are below the relevant NAQOs. The site is therefore considered suitable for the proposed development without the need for specific mitigation in relation to air quality.

7 Summary and Conclusions

- 7.1.1 The air quality impacts associated with the proposed residential-led development of the site on Vastern Road, within the administrative boundary of Reading Borough Council (RBC) have been assessed.
- 7.1.2 RBC has investigated air quality within its area as part of its responsibilities under the Local Air Quality Management (LAQM) regime and has declared an Air Quality Management Area (AQMA) due to exceedances of the annual mean nitrogen dioxide (NO₂) National Air Quality Objective (NAQO). The AQMA encompasses the central area and the main arterial routes in and out of Reading. The site is located within the Reading AQMA.
- 7.1.3 The construction works have the potential to create dust. During construction it is recommended that, in accordance with the Institute of Air Quality Management's (IAQM's) guidance, a package of mitigation measures is put in place to minimise the risk of elevated PM₁₀ concentrations and dust nuisance in the surrounding area. With mitigation in place the construction impacts are judged as not significant.
- 7.1.4 Predicted annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} at proposed receptor locations within the site are below the relevant NAQOs. The site is therefore considered suitable for the proposed redevelopment without the need for on-site specific mitigation in relation to air quality.
- 7.1.5 The proposed development is therefore considered to be in accordance with the requirements of relevant local and national guidance, policy and legislation in relation to Air Quality.

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Appendix A Traffic Data and Road Network

Link No.	Location	2018 Baseline		2021 Without Development		2021 With Development	
		AADT	HDV (%)	AADT	HDV (%)	AADT	HDV (%)
1_2	Caversham Rd (south of Vastern Rd/Caversham Rd Roundabout)(2-Way)	32,793	6	34,540	5.5	34,492	5.5
3_4	Vastern Rd (2-Way)	25,327	5	26,676	5.5	26,325	5.5
7	Trooper Potts Way	1,998	7	2,105	7.0	2,105	7.0
8_9	Caversham Rd (north of Vastern Rd/Caversham Rd Roundabout)(2-Way)	28,315	3	29,823	3.0	29,775	3.0
10_11	Vastern Rd East (south of Napier Rd/George St Roundabout) (2-Way)	43,933	8	46,272	8.0	46,240	8.0
12_13	Napier Rd (2-Way)	3,038	5	3,199	4.5	3,199	4.5
14	George St (2-Way)*	15,000	5	15,000	5.0	15,000	5.0

* No traffic data available so estimated flows included.

Appendix B Glossary

Abbreviations	Meaning
AADT	Annual Average Daily Traffic
ADMS	Air Dispersion Modelling System
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
CEMP	Construction Environmental Management Plan
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
Diffusion Tube	A passive sampler used for collecting NO ₂ in the air
EA	Environmental Agency
EFT	Emission Factor Toolkit
EHO	Environmental Health Officer
EPUK	Environmental Protection UK
HDV	Heavy Duty Vehicle; a vehicle with a gross vehicle weight greater than 3.5 tonnes. Includes Heavy Goods Vehicles and buses
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
NAQO	National Air Quality Objective as set out in the Air Quality Strategy and the Air Quality Regulations
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen oxides, generally considered to be nitric oxide and NO ₂ . Its main source is from combustion of fossil fuels, including petrol and diesel used in road vehicles
NPPF	National Planning Policy Framework
PBA	Peter Brett Associates LLP
PM ₁₀ /PM _{2.5}	Small airborne particles less than 10/2.5 µm in diameter
PPG	Planning Practice Guidance
Receptor	A location where the effects of pollution may occur
TEA	Triethanolamine

Appendix C Model Verification

Nitrogen Dioxide

Most NO₂ is produced in the atmosphere by the reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emission of nitrogen oxides (NO_x = NO + NO₂). The model has been run to predict the 2018 annual mean road-NO_x contribution at three monitoring locations (identified in **Table 4-2**). Concentrations have been modelled at a height of 2 m for 108, Caversham Road (DT51) and 131, Caversham Road (DT53), and 2.5 m for 31a Vastern Road (DT52).

The model output of road-NO_x has been compared with the 'measured' road-NO_x, which was calculated from the measured NO₂ concentrations and the adjusted background NO₂ concentrations within the NO_x from NO₂ calculator.

A primary adjustment factor was determined as the slope of the best fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (**Figure C.1**). This factor was then applied to the modelled road-NO_x concentration for each monitoring site to provide adjusted modelled road-NO_x concentrations. The total nitrogen dioxide concentrations were then determined by combining the adjusted modelled road-NO_x concentrations with the predicted background NO₂ concentration within the NO_x from NO₂ calculator. A secondary adjustment factor was finally calculated as the slope of the best fit line applied to the adjusted data and forced through zero (**Figure C.2**).

The following primary and secondary adjustment factors have been applied to all modelled nitrogen dioxide data:

Primary adjustment factor: **1.7054**

Secondary adjustment factor: **0.9953**

The results imply that overall, the model was under-predicting the road-NO_x contribution. This is a common experience with this and most other models. The final NO₂ adjustment is minor.

Figure C.3 compares final adjusted modelled total NO₂ at each of the monitoring sites, to measured total NO₂, and shows the 1:1 relationship, as well as ±10% and ±25% of the 1:1 line. All three data points lie within ±10% of the 1:1 line.

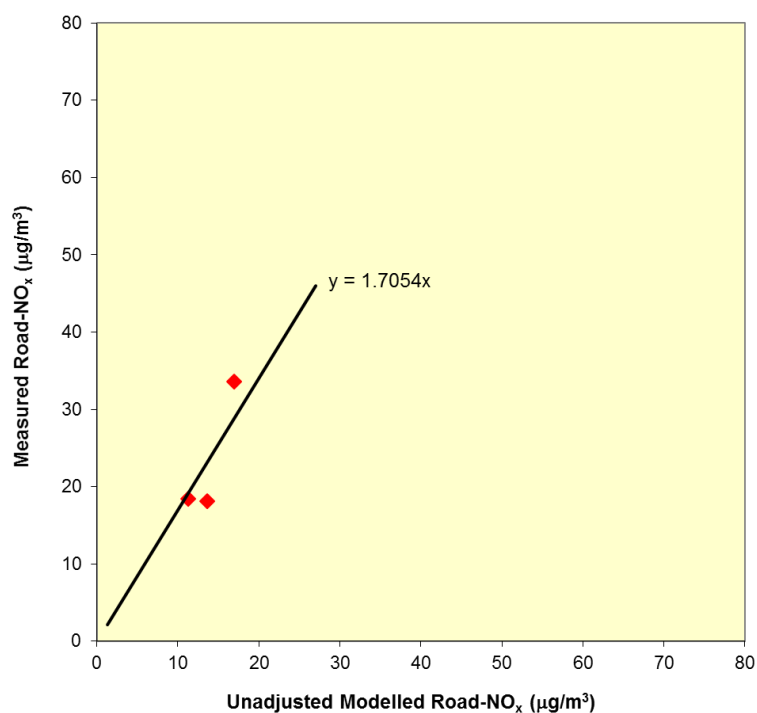


Figure C.1: Comparison of Measured Road-NO_x with Unadjusted Modelled Road-NO_x Concentrations

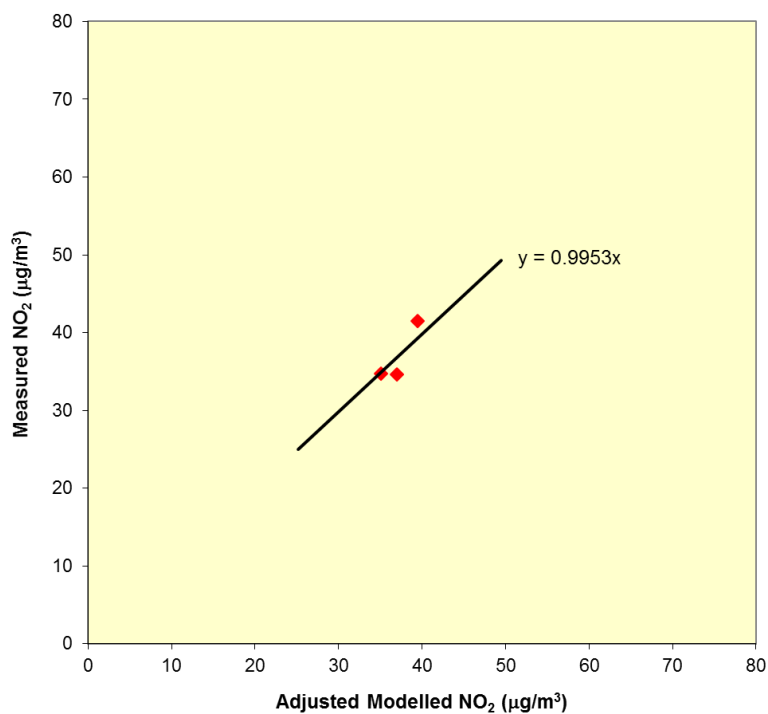


Figure C.2: Comparison of Measured NO₂ with Primary Adjusted Modelled NO₂ Concentrations

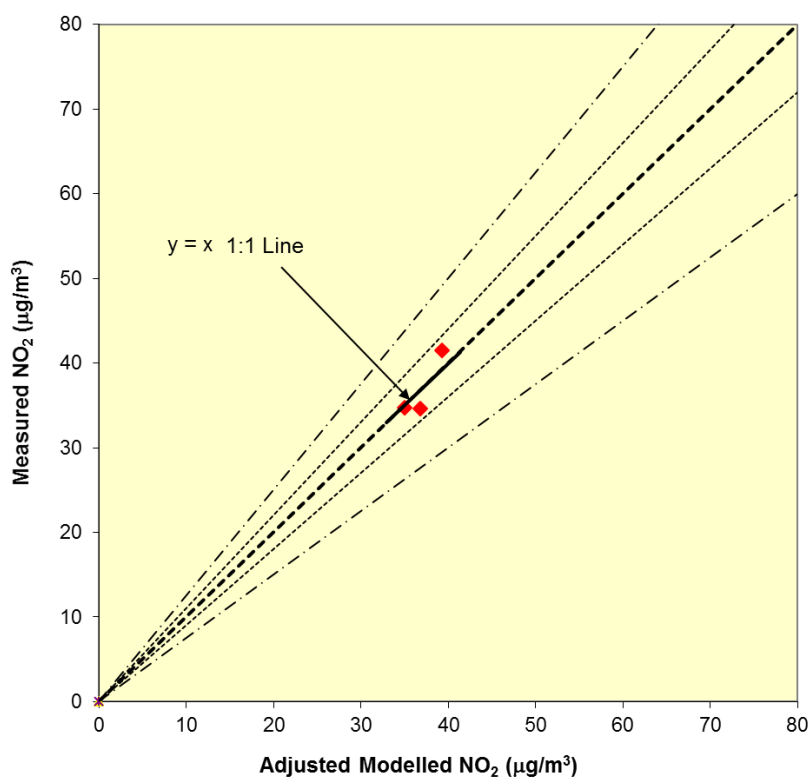


Figure C.3: Comparison of Measured NO₂ with Fully Adjusted Modelled NO₂ Concentrations

Particulates (PM₁₀ and PM_{2.5})

Traffic data were not available for Richfield Avenue and the A4155 Caversham Road adjacent to the RD1 automatic monitor. Therefore, the primary adjustment factor calculated for NO₂ concentrations has been applied to the modelled road-particulates concentrations.

Appendix D Model Inputs and Results Processing Tools

Meteorological Data	2018 hourly meteorological data from the Farnham Meteorological station have been used in the model. The wind rose is shown in Figure D.1 .
ADMS	Version 4.1.1
Time Varying Emission Factors	Based on Department for Transport statistics. Table TRA0307. Motor vehicle traffic distribution by time of day and day of the week on all roads, Great Britain: 2018.
Latitude	51°
Surface Roughness	A value of 1 for 'cities and woodlands' was used to represent the modelled area. A value of 0.3 for 'agricultural areas' was used to represent the meteorological station site.
Minimum Monin-Obukhov length	A value of 30 for 'cities and large towns' was used to represent the modelled area. A value of 10 for 'small towns <50,000' was used to represent the meteorological station site.
Emission Factor Toolkit (EFT)	V9.0 , April 2019.
NO _x to NO ₂ Conversion	NO _x to NO ₂ calculator version 7.1, April 2019
Background Maps	2017 reference year background maps

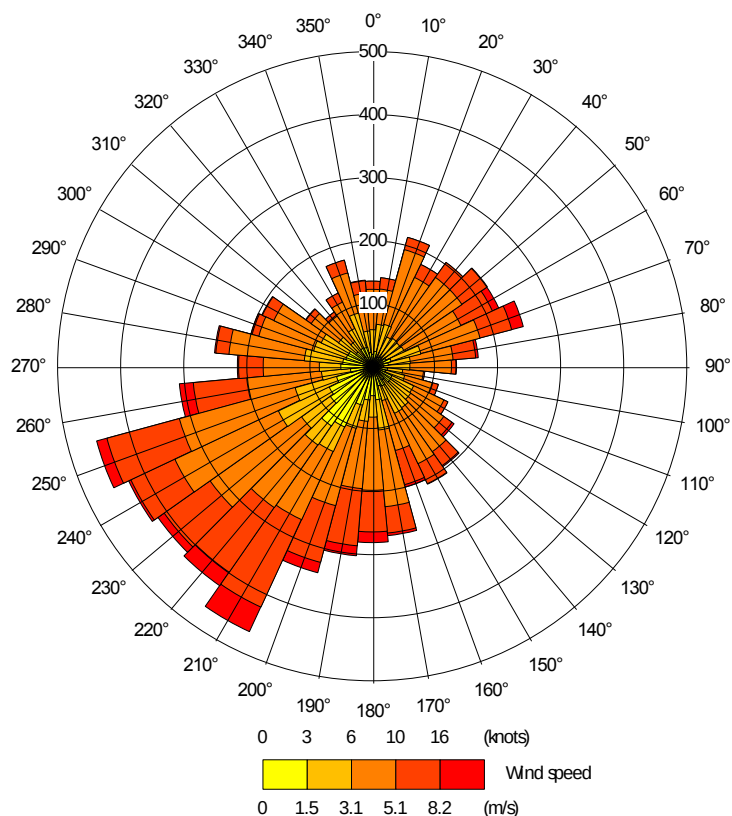


Figure D.1: 2018 Farnborough Wind-rose

Appendix E Future Year Modelling – Road Transport Emissions Factors

Atmospheric dispersion modelling is used to determine the effect of future development traffic on local air quality. The modelling utilises predictions of the composition and emissions profile of the vehicle fleet which are produced by Defra in the emissions factor toolkit (EFT) with the fleet composition and emissions profiles provided on a year by year basis; the most recent update is V9.0 and includes data from 2017 to 2030.

The EFT contains estimates of the future composition of the vehicle fleet in terms of the age and type of vehicles and emissions are primarily related to the age of the vehicles (in terms of their emissions class) and the fuel that they use (i.e. petrol, diesel or electric). In general terms, as new vehicles replace older vehicles, and as the emissions performance of vehicles is generally taken to improve over time.

The modelling of future traffic impacts therefore requires consideration of uncertainty as to the accuracy of the emission factors, as well as uncertainty introduced by the modelling process and the traffic data on which the predictions are based. This has become more important in recent years as it has been realised that previous versions of the EFT were likely to have significantly underestimated the real-world NO_x emissions of the vehicle fleet primarily resulting from diesel vehicles.

Emissions in the EFT

The EFT database was updated in May 2019 to v9.0. It now uses NO_x emissions factors for the vehicles taken from the European Environment Agency's COPERT 5 database and the 2019 update included changes to the fleet mix due largely to reflect the London Low Emissions Zone.

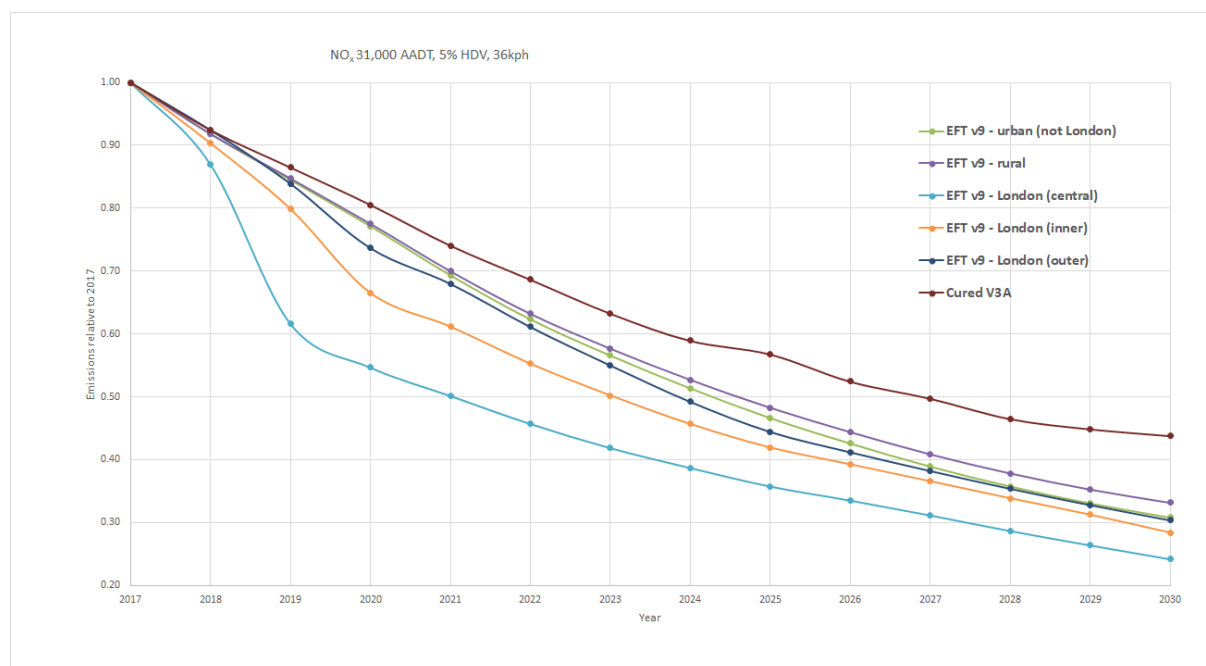
The emissions performance of the vehicles in the EFT is classified in terms of Euro type approval testing; Euro 1 to 6 (with Euro 6 vehicles split into 6a, 6b, 6c and 6d) concerning light duty vehicles and Euro I to VI heavy duty vehicles. Whilst the introduction of each Euro class has generally seen a tightening of emission standards, the standards up until 2017 were based on laboratory testing of vehicles. The emissions performance of the vehicles in real world driving conditions has been higher than the laboratory testing results, especially for diesel vehicles. This factor was not recognised in earlier versions of the EFT, and combined with the fact that diesel vehicles have much higher NO_x emissions than petrol vehicles and there has been a very large increase in the number of diesel vehicles on the road, has meant that the NO_x emissions and NO₂ concentrations did not reduce as was anticipated.

The EFT considers the real-world performance of Euro 6ab diesel cars, applying a high conformity factor to these vehicles. For Euro 6c and Euro 6d vehicles, it assumes that the RDE is effective in bringing down vehicle emissions, but does not assume that vehicle emissions will be as low as the conformity factors in the RDE testing. The EFT therefore incorporates an assumption that diesel car NO_x emissions will be higher in real world driving conditions than the testing standards allow.

Given uncertainty as to the effectiveness of RDE testing, AQC reviewed their approach to vehicle emissions¹ following publication of EFT v8.0. CURED v3A was formulated assuming that light duty vehicle emissions are as per EFT v8.0 up until Euro 6c. Euro 6d vehicles are assumed to have the same emissions as Euro 6c. Emissions from HDVs are assumed to be as per the EFT v8.0. Vehicle emissions using CURED v3A can be considered to be a worst-case sensitivity test post 2020. CURED v3A has not been revised following the publication of EFT v9.0.

The following graph shows the relative decline in vehicle NO_x emissions predicted for an urban road (outside London) with 5% Heavy Duty Vehicle traffic, travelling at 36kph.

¹ Development of the CURED V3A Emissions Model



For emission years prior to 2021, outside of London the CURED v3A methodology is likely to give similar results to using the EFT v9.0 data. Post 2021, when the introduction of Euro 6d begins to take effect, then CURED v3A and the EFT v9.0 begin to diverge particularly in central London as a result of the ULEZ.

Future Year Assessment Methodology

For developments outside of London up until 2021, the current EFT is considered to be appropriate and precautionary as to NO_x emissions from diesel vehicles has been recognised. As such, one is justified in using the emission factors for the year of the assessment as the uncertainty in the emission factors is taken account of by using the verification factor.

Developments post 2021 will increasingly be influenced by the assumption that the RDE testing of diesel vehicles is effective and in essence, the result is likely to lie between the EFT and CURED curves of the previous graph. If a conservative approach is warranted, one could follow the CURED curve, the effect of which is outlined in the table below.

Traffic Data year	EFT v9 year
2017	2017
2018	2018
2019	2019
2020	2020
2021	2021
2022	2021
2023	2022
2024	2022
2025	2023
2026	2023
2027	2024
2028	2024
2029	2025
2030	2025
Beyond 2030	2025

Appendix F Background Concentrations

Introduction

Defra publish details of estimated background concentrations of pollutants for each 1km grid square across the country. Defra operates a background Automatic Urban and Rural Network monitoring site in Reading approximately 2.1 km southeast of the development site. In order to more accurately reflect background concentrations across the study area, defra mapped background concentrations at this site have been compared against concentrations measured at the site in 2018 to produce a calibration factor which is applied to background concentrations across the study area.

The NO₂, PM₁₀ and PM_{2.5} factor has been applied to the mapped background for both baseline and future year scenarios across the study area.

Nitrogen Dioxide

Defra mapped NO₂ = 23.5 µg/m³
Measured NO₂ = 26.0 µg/m³
Calibration factor = 26.0 / 23.5 = 1.11

PM₁₀

Defra mapped PM₁₀ = 16.6 µg/m³
Measured PM₁₀ = 13.0 µg/m³
Calibration factor = 13.0 / 16.6 = 0.78

PM_{2.5}

Defra mapped PM_{2.5} = 11.6 µg/m³
Measured PM_{2.5} = 7.0 µg/m³
Calibration factor = 7.0 / 11.6 = 0.60

Appendix G Figures

