CHAPTER 7:
AIR QUALITY

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7.0 AIR QUALITY

7.1 Scope of Assessment

7.1.1 This chapter of the ES assesses the likely significant effects of the Proposed Development in terms of air quality and is supported by **Volume 4, Appendix E: Air Quality**.

7.1.2 The chapter describes: the assessment methodology; the baseline air quality conditions currently existing at the Site and in the surrounding area; the likely significant air quality effects; the mitigation measures required to prevent, reduce or offset any significant adverse air quality effects; the likely residual air quality effects after these measures have been employed; and the cumulative air quality effects associated with the Proposed Development in combination with other committed developments located within 1 km of the Site.

7.1.3 'Intra-project effects' which are the combined effects of individual topic impacts on a particular sensitive receptor are considered in **Volume 2 Chapter 14: Effect Interactions**

7.1.4 The air pollutants of concern during the construction period are emissions of dust and fine particulate matter (PM_{10}) associated with on-site demolition and construction activities and off-site trackout, and emissions of nitrogen dioxide (NO_2) and fine particulate matter (PM_{10} and $PM_{2.5}$) from demolition and construction vehicles.

7.1.5 The main air pollutants of concern during the operational period are NO_2, PM_{10} and $PM_{2.5}$ emissions associated with traffic on the local road network (both existing traffic and operational traffic generated by the Proposed Development).

7.1.6 The assessment has been prepared taking into account the requirements of relevant local and national guidance, policy and legislation.

7.2 Key Legislation, Policy and Guidance Considerations

7.2.1 The air quality assessment has been undertaken within the context of relevant planning policies, guidance documents and legislative instruments. These are summarised below.

Legislation and Regulation

Air Quality Regulations

7.2.2 The Air Quality (England) Regulations 2000[1] (AQR) defined National Air Quality Objectives (NAQOs, a combination of concentration-based thresholds, averaging periods and compliance dates) for a limited range of pollutants. Subsequent amendments were made to the AQR in 2001 and 2002[2] to incorporate 'limit values' and 'target values' for a wider range of pollutants as defined in European Union (EU) Directives.

[1] Statutory Instrument 2000, No 921, 'The Air Quality (England) Regulations 2000' HMSO, London.

[2] Statutory Instrument 2002, No 3034, 'The Air Quality (England) (Amendment) Regulations 2002' HMSO, London.

7.2.3 These amendments were consolidated by the Air Quality Standards Regulations 2010[3] (AQSR) (with subsequent amendments most notably in 2016 and for the devolved administrations), which transposed the EU's Directive on ambient air quality and cleaner air for Europe (2008/50/EC).

7.2.4 Following the Transition Period after the UK's departure from the EU in January 2020, the Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2018[4] (and subsequent amendments for the devolved administrations) have amended the AQ Standards Regulations 2010 to reflect the fact that the UK has left the EU, but do not change the pollutants assessed or the numerical thresholds.

7.2.5 The relevant NAQOs for this assessment are shown in **Table 7-1**.

Table 7-1 Relevant National Air Quality Objectives

Pollutant	Time Period	NAQOs	Source
NO_2	1-hour mean	200 µg/m^3 not to be exceeded more than 18 times a year	NAQO and EU limit value
	Annual mean	40 µg/m^3	NAQO and EU limit value
PM_{10}	24-hour mean	50 µg/m^3 not to be exceeded more than 35 times a year	NAQO and EU limit value
	Annual mean	40 µg/m^3	NAQO and EU limit value
$PM_{2.5}$	Annual mean	25	Stage 1 limit value by 2015 - NAQO and EU limit value
	Annual mean	20	Stage 2 limit value by 2020 - EU Directive

7.2.6 The NAQO's for NO_2 and PM_{10} were to have been achieved by 2005 and 2004 respectively, but also continue to apply in all future years thereafter.

7.2.7 The 2019 Clean Air Strategy[5] includes a commitment to set a "new, ambitious, long-term target to reduce people's exposure to $PM_{2.5}$" which the Environment Bill commits the Secretary of State to setting.

7.2.8 For the purposes of this assessment the EU Directive Stage 2 limit value for $PM_{2.5}$ has been considered as the relevant NAQO and consideration given to future potential changes.

National Air Pollution Plan for NO_2 in the UK

[3] Statutory Instrument 2010, No. 1001, 'The Air Quality Standards Regulations 2010' HMSO, London.

[4] Statutory Instrument 2018 No.0000 ' The Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2018

[5] DEFRA (2019a). 'Clean Air Strategy 2019'.

7.2.9 The national Air Quality Plan for NO_2[6] sets out how the Government plans to deliver reductions in NO_2 throughout the UK, with a focus on reducing concentrations to below the EU Limit Values throughout the UK within the 'shortest possible time'.

7.2.10 The plan requires all Local Authorities in England which DEFRA identified as having exceedances of the Limit Values in their areas past 2020 to develop local plans to improve air quality and identify measures to deliver reduced emissions, with the aim of meeting the Limit Values within their area within "the shortest time possible". Potential measures include changing road layouts, encouraging public and private ultra-low emission vehicle (ULEV) uptake, the use of retrofitting technologies and new fuels and encouraging public transport. In cases where these measures are not sufficient to bring about the required change within 'the shortest time possible' then LAs may consider implementing access restrictions on more polluting vehicles (e.g. Clean Air Zones (CAZs)). A CAZ is defined within the plan as being "an area where targeted action is taken to improve air quality and resources are prioritised and coordinated in a way that delivers improved health benefits and supports economic growth" and may be charging or non-charging.

Air Quality Management

The Air Quality Strategy

7.2.11 Part IV of the Environment Act 1995[7] required the Secretary of State to prepare and publish and 'strategy' regarding air quality.

7.2.12 The Air Quality Strategy 2007[8] establishes the policy framework for ambient air quality management and assessment in the UK. 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.

7.2.13 The Clean Air Strategy[9] aims to lower national emissions of pollutants, thereby reducing background pollution and minimising human exposure to harmful concentrations of pollution. The Strategy aims to create a stronger and more coherent framework for action to tackle air pollution.

Local Air Quality Management

7.2.14 Part IV of the 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.

[6] Department for Transport (2018). 'The Road to Zero'. Available at: https://www.gov.uk/government/publications/reducing-emissions-from-road-transport-road-to-zero-strategy

[7] Environmental Act 1995, Part IV.

[8] DEFRA in partnership with the Scottish Executive, The National Assembly for Wales and the Department of the Environment for Northern Ireland (2007). 'The Air Quality Strategy for England, Scotland, Wales, Northern Ireland' HMSO, London.

[9] DEFRA (2019). 'Clean Air Strategy 2019'

7.2.15 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.

7.2.16 The Local Air Quality Management Technical Guidance 2016[10], issued by the Department for Environment, Food and Rural Affairs (DEFRA) for Local Authorities (LAs) 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 an NAQO (which vary from 15 minutes to a year) as summarised in **Table 7-2**.

Table 7-2 Relevant Public Exposure

Averaging Period	NAQOs should apply at:	NAQOs don't apply at:
Annual mean	All locations where members of the public might be regularly exposed For example: Building façades of residential properties, schools, hospitals, care homes etc	Façades of offices or other places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence Gardens of residences Kerbside sites Any other location where public exposure is expected to be short term
24-hour mean and 8-hour mean	All locations where the annual mean NAQO would apply, together with hotels and gardens of residences	Kerbside sites Any other location where public exposure is expected to be short term
1-hour mean	All locations where the annual mean and 24 and 8-hour mean NAQOs apply as well as: Kerbside sites Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer.	Kerbside locations where the public would not be expected to have regular access
15-minute mean	All locations where members of the public might reasonably be regularly exposed for a period of 15 minutes or longer.	

Planning Policy

National Planning Policy

[10] DEFRA (2021). ''Local Air Quality Management Technical Guidance (LAQM.TG(16))'

National Planning Policy Framework

7.2.17 The National Planning Policy Framework (NPPF)[11] sets out the Government's planning policies for England and how they are expected to be applied. The following paragraphs are considered relevant from and air quality perspective.

7.2.18 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; …"

7.2.19 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."

7.2.20 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…"

7.2.21 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."

7.2.22 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

[11] Ministry of Housing, Communities & Local Government (2021). 'National Planning Policy Framework'. Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2#history

should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

7.2.23 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".

National Planning Practice Guidance

7.2.24 Paragraph 005, Reference 32-005-20191101 (revision date 01.11.2019), of the Planning Practice Guidance (PPG)[12] provides guidance on how considerations regarding air quality can be relevant to the development management process as follows:

"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."*

7.2.25 Paragraph 006, Reference 32-006-20191101 (revision date 01.11.2019), of the PPG identifies what specific air quality issues need to be considered in determining a planning application:

"Considerations that may be relevant to determining a planning application include whether the development would:

- *Lead to changes (including any potential reductions) in vehicle-related emissions in the immediate vicinity of the proposed development or further afield. This could be through the provision of electric vehicle charging infrastructure; altering the level of traffic congestion; significantly changing traffic volumes, vehicle speeds or*

[12] Ministry of Housing, Communities & Local Government (2019b). 'Planning Practice Guidance'. Available at: https://www.gov.uk/government/collections/planning-practice-guidance

both; and 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; could add to turnover in a large car park; or involve 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; biomass boilers or biomass-fuelled Combined Heat and Power plant; centralised boilers or plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area; or extraction systems (including chimneys) which require approval or permits under pollution control legislation;*
- *Expose people to harmful concentrations of air pollutants, including dust. This could be by building new homes, schools, workplaces or other development in places with poor air quality;*
- *Give rise to potentially unacceptable impacts (such as dust) during construction for nearby sensitive locations; and*
- *Have a potential adverse effect on biodiversity, especially where it would affect sites designated for their biodiversity value."*

7.2.26 Paragraph 007, Reference 32-007-20191101 (revision date 01.11.2019), of the PPG provides guidance on how detailed an assessment needs to be:

"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".

and

"The following could form part of assessments:

A description of baseline conditions and any air quality concerns affecting the area, and how these could change both with and without the proposed development;

- *Sensitive habitats (including designated sites of importance for biodiversity);*
- *The assessment methods to be adopted and any requirements for the verification of modelling air quality;*
- *The basis for assessing impacts and determining the significance of an impact;*
- *Where relevant, the cumulative or in-combination effects arising from several developments;*
- *Construction phase impacts;*
- *Acceptable mitigation measures to reduce or remove adverse effects; and*
- *Measures that could deliver improved air quality even when legally binding limits for concentrations of major air pollutants are not being breached."*

7.2.27 Paragraph 008, Reference 32-008-20140306 (revision date 01.11.2019), of the PPG provides guidance on how an impact on air quality can be mitigated:

"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. Planning conditions and obligations can be used to secure mitigation where the relevant tests are met.

Examples of mitigation include:

- *Maintaining adequate separation distances between sources of air pollution and receptors;*
- *Using green infrastructure, trees, where this can create a barrier or maintain separation between sources of pollution and receptors;*
- *Appropriate means of filtration and ventilation;*
- *Including infrastructure to promote modes of transport with a low impact on air quality (such as electric vehicle charging points);*
- *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."*

Local Planning Policy

Reading Local Plan 2036

7.2.28 RBC has published a new Local Plan which was adopted in November 2019[13]. The new Local Plan will guide development in the Borough until 2036. The document contains Policy EN15 Air Quality, which states:

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

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

- *Whether the proposal, including when combined with the cumulative effect of other developments already permitted, would significantly worsen air quality;*
- *Whether the development is within, or accessed via, an Air Quality Management Area; and*

[13]Reading Borough Council (2019). 'New Local Plan 2019' Available from: http://www.reading.gov.uk/newlocalplan

- *Whether it can be demonstrated that a local worsening of air quality would be offset by an overall improvement in air quality, for instance through the reduction in the need to travel.*

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.

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

Reading Air Quality Action Plan

7.2.29 RBC has declared an AQMA due to exceedances of the annual mean NO_2 objective. The AQMA encompasses all the main arterial routes in and out of Reading and the central area. Due to this declaration, the Council has the responsibility to produce an AQAP. The Reading Air Quality Plan Update 2016[14] aims to improve air quality within the AQMA and wider Reading area. The AQAP contains the following key measures:

- upgrading and expanding local railway services;
- introduction of Mass Rapid Transit (MRT) (southern and eastern MRT) and new park and ride bus routes;
- traffic management to reduce congestion on the A4 and A33;
- cycling network improvements and infrastructure; and
- using the planning process to ensure new developments do not lead to further deterioration in air quality.

Technical Standards and Guidance

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

7.2.30 DEFRA LAQM.TG(16)[10] was published for use by local authorities in their LAQM review and assessment work. 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

7.2.31 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[15]. It clarifies when an air quality assessment should be

[14] RBC (2016). 'Air Quality Action Plan Update'. Available from: http://www.reading.gov.uk/media/6389/Air-Quality-Action-Plan/pdf/AQAP_Update_2016.pdf

[15] EPUK / IAQM (2017). 'Land-use Planning & Development Control: Planning for Air Quality'. V1.2. The Institute for Air Quality Management, London

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'

7.2.32 Guidance on the assessment of dust from demolition and construction has been published by the IAQM[16]. 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.

7.3 Assessment Methodology

7.3.1 The assessment methodology detailed in the following sections has been applied to ascertain the potential impacts of emissions to air in order to identify their significance and compliance with policy and regulatory requirements (as outlined in Section 8.2), and whether or not additional mitigation is required.

7.3.2 This assessment first defines the 'study area' and reviews the baseline air quality (for both an 'existing' year and a 'future' year (i.e. the year of first occupation of the Proposed Development) within this study area. This has been followed by an assessment of impacts associated with the demolition, construction and operation of the Proposed Development, as well as an assessment of the suitability of the site for the proposed end-use.

Determination of Baseline

7.3.3 Information on measured concentrations of pollutants within the study area has been obtained by collating the results of monitoring carried out by RBC and SODC and their LAQM reports to identify potential AQMA's. Background concentrations within the study area have been defined using the national pollution maps published by DEFRA[17] which cover the UK on a 1x1 km grid. Any exceedances of the EU Limit Values along roads within the study area have been identified using the 2019 NO_2 Projections Data published by DEFRA[18].

Study Area

7.3.4 The study area adopted for this assessment is as follows:

- for the construction dust risk assessment the study area (based on IAQM, 2014 guidance[16]) is defined as compromising the area up to 350 m from the Site boundary and 50 m from the route used by construction vehicles (up to 500 m from the Site entrance(s));
- for the demolition and construction phase road traffic emission assessment, the study area includes all roads along which demolition and construction traffic generated by the Proposed Development will travel;

[16] IAQM (2014). 'Assessment of Dust from Demolition and Construction', IAQM, London

[17] DEFRA (2020). '2018 Based Background Maps

[18] DEFRA (2019c). '2019 NO_2 Projections Data (2017 Reference Year)' Online, available at: https://uk-air.defra.gov.uk/library/no2ten/2019-no2-pm-projections-from-2017-data

- for the operational phase road traffic emissions assessment the study area (based on EPUK / IAQM, 2017 guidance[15]) includes the Site and all roads (and adjacent properties) located within 250 m of the Site boundary and any other roads where operational traffic generated by the Proposed Development is predicted to exceed the EPUK / IAQM screening criteria (as outlined in **Volume 4, Appendix E: Air Quality**).

Prediction Methodology

Construction Dust

7.3.5 During demolition and construction, dust from on-site activities and off-site trackout by construction vehicles has the potential to impact on sensitive human receptors within the study area; the main potential impacts are loss of amenity (as a result of dust soiling) and deterioration of air quality (as a result of increased concentrations of PM_{10}).

7.3.6 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(s).

7.3.7 Separation distance is also an important factor. Large dust particles (greater than 30 µm), can be potentially 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 10 µm), which are the predominant fraction that can be potentially responsible for human health impacts largely remain airborne. However, the impact on the short-term concentrations of PM_{10} occurs over a shorter distance due to the rapid decrease in concentrations with distance from the source due to dispersion.

7.3.8 The assessment of the risk of potential construction dust impacts has been undertaken with reference to relevant guidance.

Screening Assessment

7.3.9 The first stage of the assessment involves screening to determine if there are sensitive receptors within threshold distances of the activities associated with the construction phase of the scheme; defined as the Study Area. No further assessment is required if there are no receptors within the Study Area.

7.3.10 The IAQM guidance outlines that an assessment is only required in cases where:

- A ‘human receptor’ is located within:
    - 350 m of the boundary of the Site; OR
    - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the Site entrance(s);
- An ‘ecological receptor’ is located within:
    - 50 m of the boundary of the Site; OR

- 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the Site entrance(s);

Further Assessment

7.3.11 The risk of impacts associated with dust soiling and PM_{10} caused by the Proposed Development has been determined based on the dust emission class (or magnitude) for each of four activities (demolition, earthworks, construction and trackout) in the absence of mitigation and the overall sensitivity of the area (based on the sensitivity and number of receptors within the area). The dust emission class, receptor sensitivity and the overall sensitivity of the area are determined using the criteria outlined in Tables 8.2.1-8.2.5 of **Volume 4, Appendix E: Air Quality**, indicative thresholds and professional judgement.

7.3.12 The risk of dust impacts arising is a product of the relationship between the dust emission magnitude and the area sensitivity and is based on the criteria outlined in Table 7.2.6 of **Volume 4, Appendix E: Air Quality**. The risk of impact is then used to determine the mitigation requirements.

7.3.13 The IAQM 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.

7.3.14 With appropriate mitigation in place, the IAQM guidance indicates that the residual effect dust emissions associated with the demolition and construction can be classified as being 'not significant'.

Operational Road Traffic Emission Impacts

Screening Assessment

Impacts of Development-Generated Traffic on Existing Sensitive Human Receptors

7.3.15 The potential for significant impacts on existing sensitive receptors within the study area as a result of emissions from traffic generated by the Proposed Development is determined based on the screening criteria outlined in the EPUK / IAQM guidance (see **Volume 4, Appendix E: Air Quality**) which includes consideration of the volume and composition of traffic generated by the Proposed Development and existing local air quality conditions (i.e. the presence of any declared AQMAs).

7.3.16 If it is not possible to screen out the potential for significant impacts, then a detailed assessment is undertaken (see Paragraphs 7.3.18 to 7.3.24).

Site Suitability

7.3.17 A qualitative assessment to determine whether there is a potential for exceedances of the relevant NAQOs at sensitive locations within the Proposed Development has been undertaken, taking into account baseline air quality conditions within and in close proximity to the Site and the proximity of sensitive locations within the development to nearby sources of emissions.

Detailed Assessment

7.3.18 Concentrations of pollutants (NO_2, PM_{10} and $PM_{2.5}$) have been predicted for a range of worst-case locations of relevant human receptor exposure both at sensitive existing

properties in the local area and within the Proposed Development itself to allow comparison with the NAQOs and (for existing receptors only) determination of the magnitude of impacts at each receptor.

7.3.19 Emissions from road vehicles and their resultant impact at receptor locations have been predicted using the ADMS-Roads dispersion model. The model requires the user to provide various input data, including traffic flows (in Annual Average Daily Traffic (AADT) format), vehicle composition (i.e. the proportion of Heavy Duty Vehicles (HDVs)), road characteristics (including road width and street canyon dimensions, where applicable), and average vehicle speed. AADT flows and the proportions of HDVs have been provided by the Project's transport consultants (Stantec), and average speeds have been estimated taking into account local speed limits and road conditions. Traffic data used in this assessment are summarised in **Volume 4, Appendix E: Air Quality**.

7.3.20 The model has been run using 2019 meteorological data from the Farnborough meteorological station, which are considered suitable for this area. **Volume 4, Appendix E: Air Quality** provides further details on the model inputs.

7.3.21 Traffic emissions have been calculated using the Emission Factor Toolkit (EFT) v10.1[19], which utilises NO_x emission factors taken from the European Environment Agency (EEA) COPERT 5 emission tool. The traffic data were entered into the EFT to provide 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, PM_{10}, (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.

7.3.22 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.

7.3.23 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 HDVs, which recent research suggests are performing well). Whilst there has been uncertainty over NO_x emissions from vehicle exhausts (particularly from Euro 5 and 6 Light Duty Vehicles (LDVs)) 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

[19] Department of the Environment, Food and Rural Affairs (Defra) (2020). 'Emissions Factor Toolkit (Version 10.1)' Online, available at: https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

NO_x and PM speed emission coefficient equations for Euro 5 and 6 vehicles taken from the EEA COPERT 5 emission calculation tool, reflecting emerging evidence on the real-world emission performance of these vehicles.

7.3.24 Generally, concentrations of air pollutants in the UK are anticipated to decrease in the coming years; as such, in most cases, the earlier the year that is assessed, the more worst-case the assessment is. The earliest year that the Proposed Development could potentially be occupied by is 2022, however, full build out is not expected until 2026; as such, in order to take account of uncertainties relating to future year vehicle emissions and background pollutant concentrations, the assessment has been carried out utilising 2022 emission factors and background concentrations combined with traffic data from 2026 (which includes full development flows). This approach is considered to be conservative in predicting future concentrations.

Air Quality Impacts Significance Criteria

7.3.25 The relevant NAQOs are set out in **Table 7-1** and **Table 7-2**. The predicted pollutant concentrations in the future year (2022) at each identified sensitive receptor have been compared to the relevant NAQOs and any exceedances identified.

7.3.26 Analysis of long-term monitoring data suggests that if the annual mean NO_2 concentration is less than 60 µg/m^3 then the one-hour mean NO_2 NAQO is unlikely to be exceeded where road transport is the main source of pollution. Therefore, in this assessment this concentration has been used to screen whether the 1-hour mean NAQO is likely to be achieved[10]. Furthermore, analysis of long-term monitoring data suggests that if the annual mean PM_{10} concentration is less than 32 µg/m^3 then the 24-hour mean PM_{10} NAQO is unlikely to be exceeded where road transport is the main source of pollution; therefore, in this assessment this concentration has been used to screen whether the 24-hour mean PM_{10} NAQO is likely to be achieved.

7.3.27 There is no official guidance in the UK on how to assess the significance of the air quality impacts of existing air quality on a new development. The assessment of proposed receptors within the Site has therefore been limited to predicting pollutant concentrations at worst-case receptors within the Site and comparing these predicted concentrations to the relevant NAQOs, with the overall significance being based on whether the NAQOs for each pollutant are exceeded or not.

7.3.28 There is no official guidance in the UK on how to assess the significance of the air quality impacts of a new development on existing receptors. The approach developed by EPUK and the IAQM[15], which considers the change in air quality as a result of a Proposed Development on existing receptors in combination with baseline concentrations at the receptors, has therefore been used. The guidance sets out three stages: determining the magnitude of change at each receptor, describing the impact, and assessing the overall significance. Impact magnitude relates to the change in pollutant concentration; the impact description relates this change to the air quality objective and is shown in **Table 7-3**.

Table 7-3 Impact Significance Criteria

Long term average Concentration at receptor in assessment year	% Changes in Concentration with development in relation to NAQO / Limit Value			
	1*	2-5	6-10	>10
> 110 % [a]	Moderate	Substantial	Substantial	Substantial
>102% - ≤110% [b]	Moderate	Moderate	Substantial	Substantial
>95% - ≤102% [c]	Slight	Moderate	Moderate	Substantial
>75% - ≤95% [d]	Negligible	Slight	Moderate	Moderate
≤75% [e]	Negligible	Negligible	Slight	Moderate

Where concentrations increase the impact is described as adverse, and where it decreases as beneficial.
% change rounded to nearest whole number. Where the % change is 0 (i.e. Less than 0.5%) the impact will be Negligible.
[a] NO_2 or PM_{10}: > 44 µg/m^3 annual mean; $PM_{2.5}$ >27.5 µg/m^3 annual mean; PM_{10} >35.2 µg/m^3 annual mean (days).
[b] NO_2 or PM_{10}: > 40.8 – ≤ 44 µg/m^3 annual mean; $PM_{2.5}$ > 25.5 – ≤27.5 µg/m^3 annual mean; PM_{10} >32.64 – ≤35.2 µg/m^3 annual mean (days).
[c] NO_2 or PM_{10}: > 38 – ≤40.8 µg/m^3 annual mean; $PM_{2.5}$ >23.75 – ≤25.5 µg/m^3 of annual mean; PM_{10} >30.4 – ≤32.64 µg/m^3 annual mean (days).
[d] NO_2 or PM_{10}: >30 - ≤38µg/m^3 annual mean; $PM_{2.5}$ >18.75 - ≤23.75 µg/m^3 annual mean; or <24 - ≤ 30.4 µg/m^3 annual mean (days).
[e] NO_2 or PM_{10}: ≤30 µg/m^3 annual mean; $PM_{2.5}$ ≤18.75 µg/m^3 annual mean; PM_{10} ≤24 µg/m^3 annual mean (days).

7.3.29 The guidance states that the overall assessment of significance should be based on professional judgement, taking into account factors including:

- the number of properties affected by ‘slight’, ‘moderate’ or ‘substantial’ adverse air quality impacts and a judgement on the overall balance;
- the magnitude of the changes and the descriptions of the impacts at the receptors findings;
- whether or not an exceedance of an NAQO or limit value is predicted to arise in the operational study area (where there are significant changes in traffic) where none existed before or an exceedance area is substantially increased;
- the uncertainty, comprising the extent to which worst-case assumptions have been made; and
- the extent to which an NAQO or limit value is exceeded.

7.3.30 Where impacts can be considered in isolation at an individual receptor, ‘moderate’ or ‘substantial’ adverse impacts may be considered to be a ‘significant' environmental effect, whereas ‘negligible’ or ‘slight adverse’ impacts would not be considered ‘significant’. The overall effect however, needs to be considered in the round taking into account the changes at all of the modelled receptor locations, with a judgement made as to whether the overall air quality effect of the development is ‘significant’ or not.

Limitations and Assumptions

7.3.31 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.

7.3.32 There has been an acknowledged disparity between national road transport emissions projections and measured annual mean concentrations of nitrogen oxides (NO_x) and NO_2 for many years. Recent monitoring has shown that reductions in concentrations are now being measured in many parts of the country[20], 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.

7.3.33 The complete development modelling has been based on 2022 emission factors (representing year of potential first occupation) and background concentrations, whilst utilising traffic flows for 2026; this is likely to result in an overestimation of predicted impacts during the first year of the Proposed Development's occupation, this providing a conservation assessment approach. The model has been verified against 2019 monitoring data. This is considered to provide an appropriately conservative assessment taking into account the uncertainties regarding future vehicle emission factors.

7.4 Baseline Assessment and Identification of Key Receptors

EU Limit Values

7.4.1 The study area does not contain any measured exceedances of the EU Limit Values, or any exceedances predicted by Defra's pollution climate mapping (PCM) model[21], either in the 'existing' year (2019, annual mean NO_2 concentration of 21.12 µg/m^3) or in the future year (2022, annual mean NO_2 concentration of 18.36 µg/m^3).

LAQM

7.4.2 RBC has investigated air quality within its area as part of its responsibilities under the LAQM regime. Reading has declared an AQMA (Reading AQMA) as a result of exceedances of the annual mean NO_2 NAQO. Reading AQMA covers the majority of the town centre and the road network including Junction 11 of the M4 motorway. The Site is located approximately 1 km to the north of this AQMA (see **Figure 8.1**).

Local Monitoring Data

NO_2

7.4.3 RBC carries out monitoring at three automatic monitoring stations, with an additional automatic monitoring station operated by DEFRA; the nearest of these, RD1, is located approximately 2.3 km from the Proposed Development. RBC also deploys NO_2 diffusion tubes at a number of locations, the nearest being 1.6 km away. Recent monitoring results for the most representative and closest monitoring locations to the Site are shown in **Table 7-4** and **Table 7-5** and shown in **Appendix 8.5**.

[20] Air Quality Consultants Ltd. (2020). 'Nitrogen Oxides Trends in the UK 2013 to 2019'

[21] Department of the Environment, Food and Rural Affairs (DEFRA) (2020) '2020 NO_2 and PM Projections Data (2018 Reference Year)' [online] Available at: https://uk-air.defra.gov.uk/library/no2ten/2020-no2-pm-projections-from-2018-data

7.4.4 Measured concentrations at the closest diffusion tube monitoring location to the Site (DT58) have exceeded the annual mean NAQO from 2014 – 2019. Exceedances of the annual mean NAQO have also been measured at diffusion tube monitoring sites DT54 (2014), DT55 (2014 – 2016 and 2018), DT56 (2014 – 2017) and DT57 (2014) as well as at the RD1 automatic monitoring site (2014, 2018).

7.4.5 No exceedances of the 1-hour mean NAQO have been measured by automatic monitoring site RD1 from 2014 – 2019. Furthermore, measured annual mean concentrations at all diffusion tube monitoring sites from 2014 - 2019 are below 60 µg/m^3, indicating that it is unlikely that any exceedances of the 1-hour mean NAQO have occurred during this period.

7.4.6 Concentrations of annual mean NO_2 have fluctuated over the years at monitoring sites shown in **Table 7.4,** however a generally decreasing trend in roadside measured concentrations is evident from 2014 to 2019 as concentrations in 2019 are all lower than those measured in 2014. The same decreasing trend in concentrations is also evident in many other parts of the country[22]. A decreasing trend in concentrations is also apparent at the urban background AURN site within Reading where measured NO_2 concentrations have decreased consistently between 2016-2019.

[22] Air Quality Consultants Ltd. (2020). 'Nitrogen Oxides Trends in the UK 2013 to 2019'

Table 7-4 Measured Annual Mean NO_2 Concentrations (2014 – 2019)

Site ID	Site Type	Within an AQMA	Annual Mean (µg/m³)					
			2014	2015	2016	2017	2018	2019
Automatic Monitoring Site								
RD1 – Caversham Road	Roadside	Yes	**41**	38	39	37	**40**	35
AURN	Urban Background	Yes	27	22	34	29	26	22†
Diffusion Tube Monitoring Sites								
DT54 - 14 Church Road	Roadside	Yes	**42**	35	37	36	37	33
DT55* - Caversham Café	Roadside	Yes	**45**	**42**	**42**	37	**42**	35
DT56* - Baron Cadogan PH	Roadside	Yes	**50**	**44**	**46**	**44**	31	36
DT57*- 45 Prospect Street	Roadside	Yes	**44**	39	38	37	36	33
DT58* - 59 Prospect Street	Roadside	Yes	**58**	**49**	**48**	**45**	**46**	**41**
DT59* - 60 Prospect Street	Roadside	Yes	38	35	34	33	34	29

Exceedances of the annual mean NO_2 NAQO are highlighted in bold.
2015 – 2019 data taken from the RBC Air Quality Annual Status Report (ASR) for 2020[23].
2014 data taken from the RBC Air Quality Annual Status Report for 2019[24]
* Used for model verification.
† Low Data Capture

Table 7-5 Measured Number of Hours of NO_2 Concentrations >200 µg/m³ (2014 – 2019)

Site ID	Number of Hours >200µg/m³					
	2014	2015	2016	2017	2018	2019
RD1 – Caversham Road	0	1	0	0	7	0
NAQO	**18**					

2015 – 2019 data taken from the RBC Air Quality Annual Status Report (ASR) for 2020[27]
2014 data taken from the RBC Air Quality Annual Status Report for 2019[28]*

[23] Reading Borough Council (2020). '2020 Air Quality Annual Status Report.'

[24] Reading Borough Council (2019). '2019 Air Quality Annual Status Report.'

PM_{10} and $PM_{2.5}$

7.4.7 The results of the PM_{10} monitoring at monitoring location RD1 (Caversham Road) are shown in **Table 7-6.** Measured PM_{10} concentrations are below the relevant NAQOs from for the duration of the monitoring period presented.

Table 7-6 Measured PM_{10} Concentrations (2014 – 2019)

Site ID	2014	2015	2016	2017	2018	2019
Annual Mean PM_{10} (µg/m^3)						
RD1- Caversham Road	33	28	20	23	24	24
NAQO	**40**					
Number of Days >50µg/m^3 [a]						
RD1- Caversham Road	31(**51**)	8(41)	5	7	3	11
NAQO	**35 (50)**					

2014 – 2019 data taken from the RBC Air Quality ASR for 2018 (RBC, 2020)[23].
2014 data taken from the RBC Air Quality Annual Status Report for 2019[28]
[a] If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

7.4.8 $PM_{2.5}$ monitoring has been undertaken at the Automatic Urban and Rural Network (AURN) urban background site in Reading, and the results are shown below in **Table 7.7** below. Measured $PM_{2.5}$ concentrations have been well below the annual mean NAQO for the duration of the monitoring period presented.

Table 7-7 Measured $PM_{2.5}$ Concentrations (2014 – 2019)

Site ID	Annual Mean $PM_{2.5}$ (µg/m^3)					
	2014	2015	2016	2017	2018	2019
AURN	10	7	9	10	7	8
NAQO	**20**					

2014 – 2019 data taken from the RBC Air Quality ASR for 2018 (RBC, 2020)[23]
2014 data taken from the RBC Air Quality Annual Status Report for 2019[28]

Predicted Background Concentrations

7.4.9 Estimated background concentrations for the Study Area have been obtained from the 2018-based national maps (which were the latest available at the time the assessment was undertaken) provided by DEFRA[17]. The mapped background concentrations have not been calibrated against background concentrations measured at the AURN automatic monitoring site due to low data capture from the AURN site. The calibrated DEFRA background concentrations for the study area/identified receptors area are provided in **Table 7-8**.

7.4.10 The background concentrations are all well below the annual mean NAQOs both in the 'existing' year (2019) and the future year (2022).

Table 7-8 DEFRA Annual Mean Background Concentrations

Year	Location	Annual Mean (µg/m^3)		
		NO_2	PM_{10}	$PM_{2.5}$
2019	Existing receptors R1-R4 & R10-R12	13.52	15.00	10.58
	Existing receptors R5, R9, R18 & R19 Proposed Development receptors PR1 – PR3	12.93	14.84	10.50
	Existing receptors R6 – R8	15.56	15.68	11.17
	Existing receptors R13 – R17	22.71	17.63	12.56
2022	Existing receptors R1-R4 & R10-R12	12.26	14.34	10.07
	Existing receptors R5, R9, R18 & R19 Proposed Development receptors PR1 – PR3	11.71	14.18	10.00
	Existing receptors R6 – R8	14.11	14.99	10.65
	Existing receptors R13 – R17	20.71	16.87	11.98
NAQOs		**40**	**40**	**20**

Sensitive Receptor Locations

7.4.11 Relevant sensitive human receptor locations are places where members of the public might be expected to be regularly present over the averaging period of one or more of the NAQOs. The NO_2, PM_{10} and $PM_{2.5}$ annual mean NAQO sensitive locations include existing and proposed residences and an existing nursery, and the 1-hour mean NO_2 NAQO sensitive locations will also include an existing outdoor play area. When identifying these receptors, particular attention has been paid to assessing impacts close to junctions, traffic lights and roundabouts where traffic may become congested, where there is a combined effect of several road links and routes along which substantial volumes of traffic generated by the Proposed Development will travel.

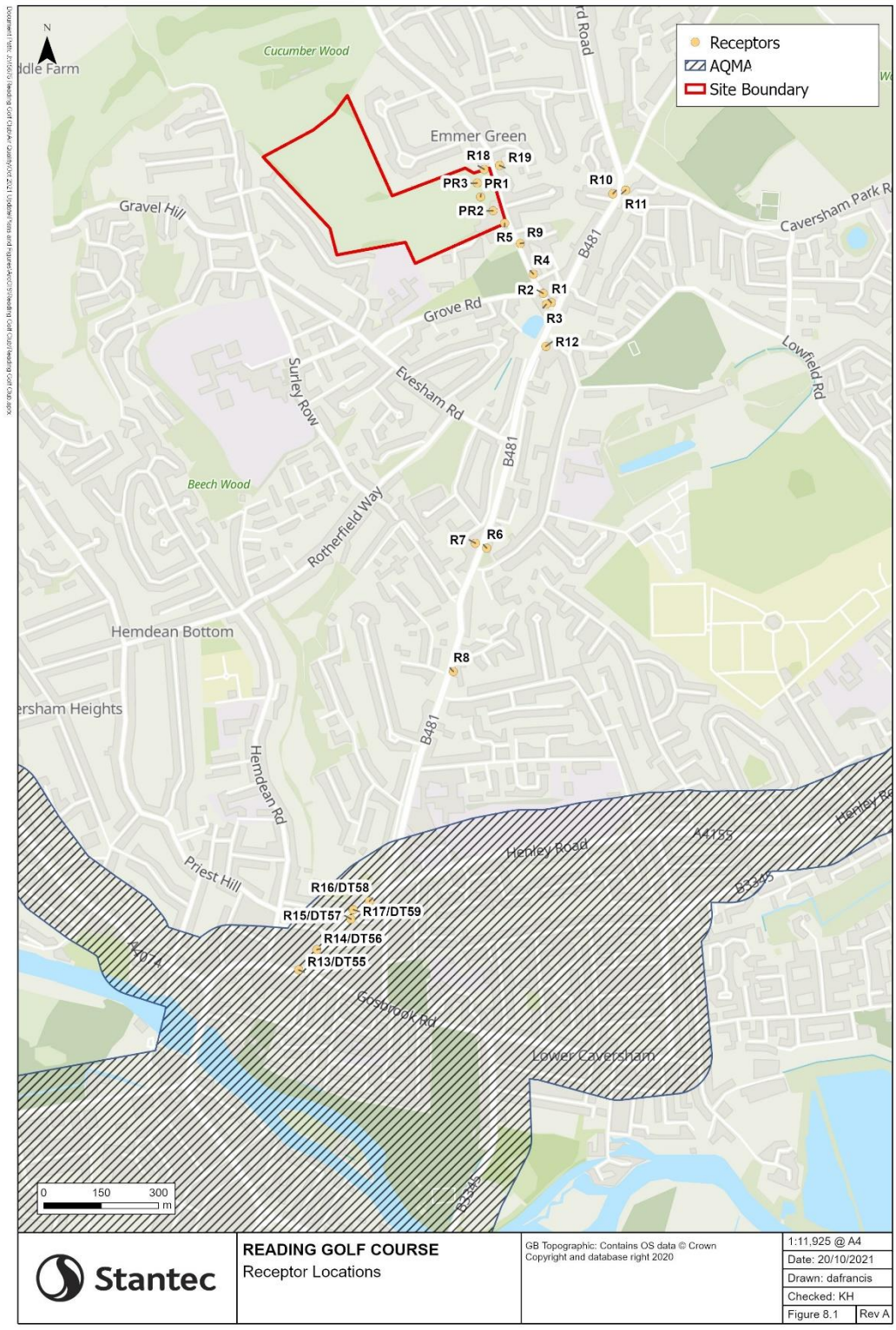
7.4.12 Based on the criteria outlined above, 19 existing sensitive receptors within the study area (including five receptors (receptors R13 – R17) that are located within Reading AQMA) have been identified as worst-case existing sensitive receptors, and a further three receptors have been identified at locations within the Proposed Development itself. The identified receptors have been chosen to represent locations where impacts are likely to be the greatest. Receptor locations are described in **Volume 4, Appendix E: Air Quality** and shown in **Figure 8.1**.

7.4.13 Concentrations have also been predicted at five diffusion tube monitoring sites (DT55, DT56, DT57, DT58 and DT59) in order to verify the modelled results (see **Table 7-4** and **Volume 4, Appendix E: Air Quality** for monitor locations). **Volume 4, Appendix E: Air Quality** provides further details on the verification method.

Table 7-9 Receptor Locations

Receptor	Description	X Coordinate	Y Coordinate	Height (m)
Existing Receptors				
R1	Houses on Kidmore Road/B481	472074.56	176531.2	1.5
R2	Residences Above Shop Kidmore Road	472053.16	176555.5	3.0
R3	White Horse Pub Residences	472061.19	176526.9	3.0
R4	30 Kidmore Road	472027.59	176605.9	1.5
R5	Lyefield Court Corner	471952.34	176739	1.5
R6	12 Buckingham Drive	471905.44	175889.6	1.5
R7	19 Buckingham Drive	471876.22	175902.2	1.5
R8	56 Peppard Road	471818.19	175567	1.5
R9	64 Kidmore End Road	471993.31	176685.8	1.5
R10	12 Wetherby Close	472235.5	176815.8	1.5
R11	Birchwood Close	472269.06	176825.6	1.5
R12	217 Peppard Road	472060.41	176416.9	1.5
R13	42 Church Street (First Floor Exposure)	471414.19	174786.7	3.0
R14	The Baron Cadogan public house [a]	471461.94	174839.9	1.5
R15	45 Prospect Street	471550.78	174919.8	1.5
R16	59 Prospect Street	471599	174966	1.5
R17	60 Prospect Street (basement level exposure)	471557	174944	0.0
R18	23 Kidmore Road End	471899.19	176879.8	1.5
R19	98 Kidmore End Road	471939	176890	1.5
Proposed Development Receptors				
PR1	Proposed plot 223 east corner facade	471890	176808	1.5
PR2	Proposed plot 2 north corner facade	471922	176771	1.5
PR3	Proposed plot 215 north east corner facade	471881	176844	1.5

Figure 8.1 Receptor Locations



7.5 Identification and Description of Changes Likely to Generate Effect

Construction Phase

Screening Assessment

7.5.1 There are a number of existing sensitive human receptors (including residential properties and schools) located within 350 m of the Site boundary and / or within 50 m of the routes along which material may be tracked by demolition and construction vehicles. As such, further assessment of the risk of dust soiling and PM_{10} emissions is required.

7.5.2 There are no sensitive ecological receptors located within either 250 m of the Site boundary or within 50 m of the routes along which material may be tracked by demolition and construction vehicles (the closest designated ecological site being located >4 km from the Site). As such, the potential for ecological impacts as a result of dust soiling can be screened out as being 'not significant'.

Further Assessment

Dust Emission Magnitude

7.5.3 The dust emissions magnitude of demolition, earthworks and construction activities and as a result of trackout have been determined based the criteria shown in **Table 7.2.1**, **Volume 4, Appendix E: Air Quality**.

7.5.4 Proposed demolition activities comprise the demolition of an existing one-storey golf club building, with a building volume of less than 20,000 m^3. Based on this, the dust emission magnitude of demolition activities is judged to be 'small'.

7.5.5 Proposed earthworks activities comprise the breaking up of a paved area and general landscaping across the site. The Site area is greater than 100,000 m^2 in area and soil at the Site is considered to be moderately dusty (loamy, some clayey[25]). Based on this, the dust emission magnitude of earthworks activities is judged to be 'large'.

7.5.6 Construction activities comprise the construction of 223 residences and associated parking facilities. The building volume of the Proposed Development is anticipated to be between 25,000 m^3 and 100,000 m^3. Based on this, the dust emission magnitude of construction activities is judged to be 'medium'.

7.5.7 The number of HDVs that will exit the Site on a daily basis is unknown, however, given the large size of the Site it is anticipated to be greater than 50 HDVs per day. Based on this, the dust emission magnitude of trackout is judged to be 'large'.

Area Sensitivity

7.5.8 The area sensitivity to dust soiling and human health impacts has been determined based on the criteria shown in **Table 7.2.3** and **Table 7.2.4**, **Volume 4, Appendix E: Air Quality**.

7.5.9 Residential properties and nurseries are classed as being 'high sensitivity' receptors to dust soiling, based on the IAQM guidance[16] (see **Table 7.2.2**, **Volume 4, Appendix E: Air**

[25]Cranfield University 2020. The Soils Guide. Available: www.landis.org.uk. Cranfield University, UK. Last accessed 12/03/2020

Quality.2). There are more than 100 residential properties located within 50 m of the Site boundary; as such, the sensitivity of the area surrounding the Site to dust soiling is judged to be 'high'.

7.5.10 The IAQM guidance states that trackout may occur for distance of up to 500 m from medium sites. As the demolition and construction traffic routing is currently unknown, the worst-case assumption has been made that all main roads may potentially be used by HDVs leaving the Site entrance(s). There are more than ten residential properties located within 20 m of roads along which material may be tracked; as such, the sensitivity to dust soiling as a result of trackout is judged to be 'high'.

7.5.11 The IAQM also defines residential properties and nurseries as being 'high sensitivity' receptors to human health impacts (see Table B 4, Appendix B). Annual mean PM_{10} concentrations at existing residential properties within the study area are anticipated to be similar to the maximum of the predicted concentrations at receptors 1, 2 and 3 in 2019 (i.e. 16.2 µg/m^3). Based on the predicted existing PM_{10} concentrations and the number of sensitive receptors within 20 m of the Site boundary and roads along which material may be tracked, the sensitivity to human health impacts of both the area surrounding the Site and the area surrounding roads along which material may be tracked are judged to be 'low'.

Risk of Impacts

7.5.12 The risk of construction dust impacts, without mitigation, have been defined based on the criterion shown in **Table 7.2.5**, **Volume 4, Appendix E: Air Quality** and are presented in **Table 7-9**.

Table 7-90 Risk of Construction Dust Impacts without Mitigation

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium Risk	High Risk	Medium Risk	High Risk
Human Health	Negligible Risk	Low Risk	Low Risk	Low Risk

Operational Phase

Site Suitability

Screening Assessment

7.5.13 The Site is located adjacent to a busy road. As such, a more detailed assessment of site suitability has been undertaken.

Detailed Assessment

7.5.14 Predicted concentrations at modelled receptor locations (see **Table 7-** and **Figure 8.1**) are presented in **Table 7-10**. Predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ are well below the relevant NAQOs at all worst-case receptors, therefore, air quality within the Proposed Development, without mitigation, will be acceptable

Table 7-101 Predicted Concentrations within the Site

Receptor	Annual Mean ($_{10}$)		
	NO_2	PM_{10}	$PM_{2.5}$
PR1	11.9	14.2	10.0
PR2	12.0	14.2	10.0
PR3	11.9	14.2	10.0
NAQOs	**40**	**40**	**25**

Operational Phase Road Traffic Impacts

Screening Assessment

7.5.15 The Proposed Development will generate additional traffic during the operational phase, which will result in an increase of over 100 LDV AADT along several roads located within an AQMA, thus exceeding the EPUK / IAQM screening criteria (see **Volume 4, Appendix E: Air Quality**). As such, it is not possible to screen out the potential for significant impacts from operational traffic generated by the Proposed Development on existing sensitive properties and, therefore a detailed assessment has been undertaken (see Paragraph 7.5.16 and 7.5.20).

Detailed Assessment

7.5.16 Predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ at existing receptors, both without and with the Proposed Development in place, are presented in **Table 7-11, Table 7.13** and **Table 7-13**. The 'without development' scenario predicted concentrations include background concentrations and emissions from existing traffic, and the 'with development' scenario predicted concentrations include background concentrations, emissions from existing traffic and emissions from operational traffic generated by the Proposed Development.

Table 7-112 Predicted Concentrations of NO_2 (µg/m³), % Change and Impact at each Receptor

Receptor	2022 Without Development	2022 With Development	Change (as % of NAQO)	Impact Descriptor
R1	15.2	15.6	1%	Negligible
R2	13.7	13.9	1%	Negligible
R3	13.9	14.0	0%	Negligible
R4	13.8	14.1	1%	Negligible
R5	12.2	12.4	0%	Negligible
R6	17.3	17.4	0%	Negligible
R7	15.7	15.7	0%	Negligible
R8	18.2	18.4	0%	Negligible
R9	12.9	13.3	1%	Negligible
R10	14.3	14.4	0%	Negligible
R11	15.0	15.1	0%	Negligible
R12	15.4	15.5	0%	Negligible
R13	32.1	32.2	0%	Negligible
R14 [a]	30.9	31.1	0%	Negligible
R15	31.3	31.4	0%	Negligible
R16	35.2	35.4	1%	Negligible
R17	30.8	30.9	0%	Negligible
R18	11.9	11.9	0%	Negligible
R19	12.0	12.0	0%	Negligible
Objectives	**40**		-	

[a] Only the 1-hour mean NO_2 NAQO is applicable at this receptor location.

Table 7-123 Predicted Concentrations of PM_{10} (µg/m³), % Change and Impact at each Receptor

Receptor	2022 Without Development	2022 With Development	Change (as % of NAQO)	Impact Descriptor
R1	14.9	15.0	0%	Negligible
R2	14.6	14.7	0%	Negligible
R3	14.7	14.7	0%	Negligible
R4	14.7	14.7	0%	Negligible
R5	14.3	14.3	0%	Negligible
R6	15.8	15.8	0%	Negligible
R7	15.4	15.4	0%	Negligible
R8	16.1	16.1	0%	Negligible
R9	14.4	14.5	0%	Negligible
R10	14.8	14.8	0%	Negligible
R11	14.9	15.0	0%	Negligible
R12	15.0	15.0	0%	Negligible
R13	18.8	18.9	0%	Negligible
R15	19.3	19.4	0%	Negligible
R16	19.4	19.5	0%	Negligible
R17	19.2	19.3	0%	Negligible
R18	14.2	14.2	0%	Negligible
R19	14.2	14.3	0%	Negligible
Objectives	**40**		-	

Table 7-134 Predicted Concentrations of $PM_{2.5}$ (µg/m³), % Change and Impact at each Receptor

Receptor	2022 Without Development	2022 With Development	Change (as % of NAQO)	Impact Descriptor
R1	10.4	10.4	0%	Negligible
R2	10.2	10.3	0%	Negligible
R3	10.3	10.3	0%	Negligible
R4	10.3	10.3	0%	Negligible
R5	10.1	10.1	0%	Negligible
R6	11.1	11.1	0%	Negligible
R7	10.9	10.9	0%	Negligible
R8	11.3	11.3	0%	Negligible
R9	10.1	10.2	0%	Negligible
R10	10.3	10.3	0%	Negligible
R11	10.4	10.4	0%	Negligible
R12	10.5	10.5	0%	Negligible
R13	13.1	13.1	0%	Negligible
R15	13.4	13.4	0%	Negligible
R16	13.5	13.5	0%	Negligible
R17	13.3	13.3	0%	Negligible
R18	10.0	10.0	0%	Negligible
R19	10.0	10.0	0%	Negligible
Objectives	**20**		-	

7.5.17 Predicted NO_2 concentrations in 2022 are below the annual mean NO_2 NAQO, both with and without the Proposed Development, at all receptors. Furthermore, as predicted annual mean NO_2 concentrations are less than 60 µg/m³ at all receptor locations, both with and without the Proposed Development, it is unlikely that any exceedances of the 1-hour mean NO_2 NAQO will occur.

7.5.18 Predicted increases in annual mean NO_2 concentrations (when rounded to the nearest whole number) are 1% at five receptors and 0% at the remaining receptors; using the criteria set out in **Table 7-1** NO_2 impacts are described as being 'negligible' at all nineteen receptors.

7.5.19 Predicted concentrations of PM_{10} in 2022 are well below the annual mean NAQO, both with and without the Proposed Development, at all receptors. Furthermore, predicted annual mean PM_{10} concentrations are below 32 µg/m³ at all receptors, indicating that exceedances of the 24-hour mean PM_{10} NAQO are not likely. Predicted changes in annual mean PM_{10} concentrations (when rounded to the nearest whole number) are 0% at all receptors; using the criteria set out in **Table 7-1** PM_{10} impacts are described as being 'negligible' at all receptors.

7.5.20 Predicted concentrations of $PM_{2.5}$ in 2022 are well below the annual mean NAQO, both with and without the Proposed Development, at all receptors. Predicted changes in annual mean PM_{10} concentrations (when rounded to the nearest whole number) are 0% at all receptors; using the criteria set out in **Table 7-1** PM_{10} impacts are described as being 'negligible' at all receptors.

7.5.21 The assessment undertaken is considered to be highly conservative and robust as the concentrations presented in **Table 7-112, Table 7-123** and **Table 7-134** take into account 2026 traffic flows including traffic growth and completed development traffic, combined with 2022 emission factors and background concentrations for the opening year of the Proposed Development. Therefore, the volume of traffic assessed is unlikely to be on the road network in the 2022opening year of the Proposed Development as both traffic growth and development-related traffic will be less in this year than in 2026. As a result, concentrations are likely to be lower than in reality than those presented in **Table 7-112, Table 7-123** and **Table 7-134**.

7.6 Assessment of Likely Significant Effect

Construction Phase

Embedded Mitigation Measures

7.6.1 The Proposed Development does not include any embedded mitigation measures that are relevant to managing demolition and construction dust.

Anticipated Effects

7.6.2 The IAQM guidance recommends that no assessment of the significance of effects of demolition and construction dust emissions is made without mitigation in place, as mitigation is assumed to be secured by planning conditions, legal requirements or required by regulations.

Operational Phase

Embedded Mitigation Measures

7.6.3 The following measures have been proposed within the Proposed Development's Residential Travel Plan[26]:

- Active charging points for electric vehicles will be provided in excess of RBC parking standards which require 10% of car parking spaces within the communal parking areas;
- A car club vehicle will be provided for. The number of new car club spaces to be provided will be determined through Reserved Matters, but at least one space will be provided;
- A connected and walkable safe neighbourhood will be created with high quality links between the Site and existing facilities in the local, thus encouraging active travel. This shall include providing pedestrian and cycle access at the main vehicular site access on Kidmore End Road and at the secondary entrance, provision of a 3 m wide footway / cycleway along the eastern edge of the primary street and provision of foot / cycle paths throughout the development. Additionally, imprinted and potentially raised informal pedestrian crossing points are proposed at junctions with and on Kidmore End Road;

[26] Stantec (2020) 'Reading Golf Course; Residential Transport Plan'.

- Cycle parking will be provided in line with RBC's minimum cycle parking standards, and cycle parking and storage facilities will be designed with consideration of location, ease of use and security;
- Allowance has been made for the potential routing of a bus through to the Site;

Anticipated Effects

7.6.4 Predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ in 2022 are well below the relevant NAQOs at the identified sensitive receptors within the Proposed Development. As such, air quality for future residents and users of the Proposed Development will be acceptable, the Site is suitable for its intended end-use and the overall impacts on introduced sensitive receptors will be 'not significant'.

7.6.5 Operational traffic generated by the Proposed Development will not cause any exceedances of the relevant NAQOs at any of the identified worst-case existing receptors, and impacts will be 'negligible' at all receptors for NO_2, PM_{10} and $PM_{2.5}$ Taking this into account, it is judged that the overall impact of operational traffic generated by the Proposed Development on existing sensitive properties in the local area will be 'not significant'.

7.7 Scope for Additional Mitigation Measures

7.7.1 There is opportunity for the developer to provide a contribution to RBC to enable them to introduce a smarter signal operating scheme such as MOVA to improve the Henley Road/Prospect Street/Peppard Road junction, to improve traffic flow which is likely to be beneficial from an air quality perspective if congestion is relieved.

Potential Additional Mitigation Measures

Construction

7.7.2 The following standard mitigation measures from the IAQM guidance (IAQM, 2014) are recommended, taking into account the outcomes of the construction dust risk assessment (presented in **Table 7-9**).

Communication

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

Management

- Develop and implement a Dust Management Plan (DMP);
- 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 DMP and record results;
- Increase site inspection frequency during prolonged dry or windy conditions and when activities with high dust potential are being undertaken;
- Agree dust monitoring locations with the local authority and instigate monitoring three months in advance of works commencing in the area;
- 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 (CLP) 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; and
- No on-site bonfires and burning of waste materials on-site.

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; and
- Bag and remove any biological debris or damp down such material before demolition.

Earthworks

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

Construction

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless required for a particular process; and
- 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; and
- The Site access gate to be located at least 10 m from receptors where possible.

Operation

7.7.3 The Travel Plan[26] also allows for the following additional potential measures:

- Appointment of a Travel Plan Coordinator (TPC);
- Provision of Welcome Packs including information on sustainable travel in the local area to each residential unit;
- Provision of a ‘buddy-up’ system for residents to encourage residents to walk to work; and
- Provision of high-speed broadband in each residential unit to reduce residents’ need to travel.

Likely Effectiveness of Additional Mitigation Measures

Construction

7.7.4 The additional measures recommended, if properly implemented, are anticipated to be effective in ensuring that the residual effect of demolition and construction dust will be 'not significant'.

Operation

7.7.5 The likely effectiveness of transport related mitigation strategies is shown within **ES Volume 2 Chapter 8 Traffic and Transport**.

7.8 Residual Effects

7.8.1 **Table 7-14** provides a summary of the residual effects resulting from the Proposed Development after effective implementation of the embedded and additional mitigation measures proposed above.

Table 7-145 Significant Residual Effects

Phase	Resource or Receptor affected	Residual Effect
Construction	Existing sensitive properties located within 350 m of the Site boundary and / or within 50 m of routes used by demolition and construction traffic (up to 500 m from the Site entrance(s).	Not Significant
Operation	Introduced sensitive receptors within the Proposed Development.	Not Significant
	Sensitive existing properties located adjacent to roads where operational traffic generated by the Proposed Development exceeds the relevant screening criteria.	Not Significant

7.9 Cumulative Effects

7.9.1 Cumulative effects are the combined effects of several development schemes (in conjunction with the Proposed Development) which may, on an individual basis be insignificant but, cumulatively, have a significant effect.

7.9.2 This ES has given consideration to ‘Cumulative Effects’ for schemes located within a 3.5 km radius from the boundary of the Site; no ‘major development’ has been identified within this radius. Traffic generated by any further schemes has been considered within the Transport Chapter; thus, as the traffic data on which this assessment is based are taken from the Transport Chapter, these schemes will have been explicitly included within the air quality assessment modelled.

7.9.3 Taking the above into consideration, it is judged that the overall cumulative effects of the Proposed Development with committed developments in the local area will be ‘not significant’.

7.10 Summary and Conclusions

7.10.1 The air quality impacts associated with the proposed redevelopment of the Reading Golf Course, located within the boundary of the RBC have been assessed.

7.10.2 The construction works have the potential to create dust. During construction it is recommended that in accordance with the IAQM guidance a package of mitigation measures is put in place to minimise the risk of elevated PM_{10} concentrations and dust nuisance in the surrounding area. With mitigation in place the construction impacts are judged as 'not significant'.

7.10.3 Predicted concentrations of pollutants (NO_2, PM_{10} and $PM_{2.5}$) within the Site are anticipated to be below the relevant NAQOs. As such, new residents and users will experience acceptable air quality; the Site is suitable for its proposed end-use and the overall effect of existing air quality on new introduced sensitive locations will be 'not significant'.

7.10.4 During the operational phase the Proposed Development will generate road traffic, which has the potential to impact on the local area. However, the assessment demonstrates that development-generated traffic will not cause any exceedances of the NAQOs in the local area (including within Reading AQMA). Furthermore, predicted NO_2, PM_{10} and $PM_{2.5}$ impacts will be 'negligible' at all identified sensitive receptors. The assessment that has been undertaken is considered to be highly conservative and robust due to the use of 2026 traffic data (including traffic growth and completed development traffic) combined with 2022 emission factors. Therefore concentrations are likely to be lower in the 2022 opening year of the Proposed Development than presented in this Chapter.

7.10.5 Taking the overall negligible impact on existing properties as well as the wider conservative nature of the assessment methodology, it is judged that the overall effect of emissions from operational traffic generated by the Proposed Development on existing sensitive locations in the local area will be 'not significant', both with and without embedded and proposed additional mitigation measures.

7.10.6 The Proposed Development is therefore considered to be in accordance with the requirements of the NPPF, and relevant local and national planning policy and guidance regarding air quality.

7.10.7 **Table 7-15** summarises the topic effects resulting from the Proposed Development.

Table 7-156 Summary of Effects

Receptor/ Affected Group	Value or Sensitivity (Significance) of Receptor	Activity or Impact	Embedded Design Mitigation	Magnitude/ Spatial Extent/ Duration/ Likelihood of Occurrence	Significance of effect	Additional Mitigation	Residual Magnitude of Impact	Significance of Residual effect
Construction								
Existing sensitive properties	High	Dust deposition and elevated PM_{10} concentrations	None	Not defined Local Temporary Likely	- Not assessed without additional mitigation as per IAQM methodology	Standard measures in line with IAQM guidance	Not defined	Not Significant
Operation								
Existing and proposed sensitive properties	High	Exposure to increased concentrations of pollutants and / or concentrations of pollutants exceeding the relevant NAQOs	Numerous measures outlined in the Residential Travel Plan[26].	Existing receptors: negligible – slight adverse Site suitability: not defined Local Permanent Likely	Not Significant	Several potential measures outlined in the Residential Travel Plan[26].	Negligible and 'slight adverse' at 1 receptor (representing approximately 12 properties) for NO_2.	Not Significant
Cumulative Effects - Construction								
Existing sensitive receptors	High	Dust deposition and elevated PM_{10} concentrations	None	Not defined Local Temporary Unlikely	-	None	Not Significant	Not Significant

Cumulative Effects - Operation								
Existing and proposed sensitive properties	High	Exposure to increased concentrations of pollutants and / or concentrations of pollutants exceeding the relevant NAQOs	None	Existing receptors: negligible – slight adverse Site suitability: not defined Local Permanent Unlikely	Not Significant	None	Negligible	Not Significant