



Elettra Avenue, Waterloooville

Air Quality Assessment

On behalf of **Hargreaves**

Project Ref: 50641/3001 | Rev: Draft | Date: February 2021

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Document Control Sheet

Project Name: Elettra Avenue, Waterlooville

Project Ref: 50641/3001

Report Title: Air Quality Assessment

Doc Ref: Draft

Date: February 2021

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Revision	Date	Description	Prepared	Reviewed	Approved
Draft	February 2021	Draft for Client Comment	LS	KH	ET

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1 Introduction

1.1 Proposed Development

- 1.1.1 Hargreaves (the 'Applicant') has commissioned Stantec to undertake an air quality assessment to support a full planning application for a proposed development at Waterloo Park, Elettra Avenue, Waterlooville (the 'Site'). The Site is located within the administrative boundary of Havant Borough Council (HBC).
- 1.1.2 The 'Proposed Development' comprises the two drive-thru units, a retail unit and associated car and bicycle parking.

1.2 Scope of Assessment

- 1.2.1 This report describes existing air quality within the study area and assesses the impact of the construction and operation of the Proposed Development on air quality in the study area.
- 1.2.2 The main air pollutants of concern during the construction period are emissions of dust and fine particulate matter (PM₁₀) associated with on-site construction activities and off-site trackout. Additionally, there is the potential for emissions of nitrogen dioxide (NO₂) and fine particulate matter (PM₁₀ and PM_{2.5}) from construction related vehicles.
- 1.2.3 The main air pollutants of concern during the operational period are NO₂, PM₁₀ and PM_{2.5} emissions associated with proposed and existing road traffic.
- 1.2.4 The assessment has been prepared taking into account the requirements of relevant local and national guidance, policy and legislation.

2 Legislation, Policy and Guidance

2.1 Air Quality Regulations

- 2.1.1 The Air Quality (England) Regulations 2000 and the Air Quality (England) (Amendment) Regulations 2002 (AQR) define National Air Quality Objectives (NAQOs). The Air Quality Standards Regulations 2010 (with subsequent amendments most notably in 2016 and for the devolved administrations), transposed the European Union's (EU) 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 (EC) approval.
- 2.1.3 The Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019 amend the AQ Standards Regulations 2010 to reflect the UK's departure from the EU but do not change the numerical values of NAQOs.
- 2.1.4 The relevant objectives for this assessment are shown in **Table 2-1**.

Table 2-1 Relevant Air Quality Objectives / Limit Values

Pollutant	Time Period	Objectives	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

- 2.1.5 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.
- 2.1.6 The 2019 Clean Air Strategy includes a commitment to set a “*new, ambitious, long-term target to reduce people's exposure to PM_{2.5}*” which the proposed Environment Bill 2019-2021¹ commits the Secretary of State to setting.
- 2.1.7 For the purposes of this assessment the EU Directive Stage 2 limit value for PM_{2.5} is considered to be appropriate to apply and consideration given to future potential changes.

¹ Yet to be enacted

National Air Pollution Plan for NO₂ in the UK

- 2.1.8 The national Air Quality Plan for NO₂ (DEFRA, 2018a) sets out how the Government plans to deliver reductions in NO₂ throughout the UK, with a focus on reducing concentrations to below the EU Limit Values throughout the UK within the 'shortest possible time'.
- 2.1.9 The plan requires all LAs 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.

2.2 Air Quality Management

The Air Quality Strategy

- 2.2.1 Part IV of the Environment Act 1995 (Environment Act, 1995) required the Secretary of State to prepare and publish and 'strategy' regarding air quality.
- 2.2.2 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.
- 2.2.3 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 aims to create a stronger and more coherent framework for action to tackle air pollution (DEFRA, 2019a).

Local Air Quality Management

- 2.2.4 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.
- 2.2.5 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.
- 2.2.6 The Local Air Quality Management Technical Guidance 2016 (LAQM.TG(16); DEFRA, 2018b), 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 the objective (which vary from 15 minutes to a year) as summarised in **Table 2-2**.

Table 2-2 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.	

2.3 Planning Policy

National Planning 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 goes on 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”.

National Planning Practice Guidance

2.3.8 Paragraph 005, Reference 32-005-20191101 (revision date 01.11.2019), of the PPG 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."*

2.3.9 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 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."*

2.3.10 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."*

2.3.11 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

2.3.12 The Core Strategy, adopted in March 2011, and the Local Plan (Allocations), adopted in July 2014, form the HBC Adopted Local Plan. Core Strategy Policy DM10 on Pollution states (HBC, 2011):

“Development that may cause pollution of water, air or soil or pollution through noise, smell, smoke, fumes, gases, steam, dust, vibration, light, heat, electromagnetic radiation and other pollutants will only be permitted where all of the following relevant criteria can be met:

- 1. The health and safety of existing and future users of the site, or nearby occupiers and residents is not put at risk.*
- 2. National air quality standards or objectives would not be breached...”*

2.3.13 Policy DM12 on Mitigating the Impacts of Travel states:

“New developments will be required to mitigate their travel impact, including the environmental impacts of travel (such as noise, air and visual pollution) and impacts on amenity, health and climate change by ensuring that, where relevant, the following criteria are met:

- 1. Adequate provision is made for integrated and improved transport infrastructure or appropriate mitigation measures, through direct improvements and S106 contributions in accordance with the Hampshire County Council Transport Contributions Policy.*
- 2. The submission of a transport assessment and travel plan alongside any planning application on proposals for major development or where a proposal is likely to have significant transport implications.*
- 3. The submission of a transport statement must accompany planning applications to explain changes to travel demand.*
- 4. A bond is provided which will be used to mitigate negative travel impacts of the development, should the travel plan fail to achieve its targets. This bond will be held by the relevant local transport authority.*
- 5. In relation to outline planning applications, a framework for the preparation of travel assessments and travel plans will be submitted with the planning application proposals.”*

2.3.14 Havant Borough Council, in consultation with residents and businesses, is currently developing a Local Plan for Havant Borough up to 2036. The latest version of the emerging Local Plan, pre-submission version with changes (September 2020), contains Policy E22 on ‘Amenity and Pollution’ which states:

“Development proposals will be permitted where:

- a. Projected levels of noise, odour, vibration, light, water or air pollution do not have a likely significant negative effect on the amenity of existing and future users of the site, nearby occupiers or the wider environment; and*
- b. Measures are provided which are suitable for the purposes intended and will ensure that any likely significant negative effect on receptor(s) are mitigated to an acceptable level.*

2.3.15 The document also contains Policy E23 on ‘Air Quality’ which states:

“Offsetting Emissions

- a. Major development proposals will be expected to provide mitigation measures which offset emissions and are proportionate to the scale and nature of the development.*

Threshold Based Assessment

In addition to a., development of 150 or more (gross) residential units, 1,000 sqm or more of commercial floorspace, or which are likely to materially alter the traffic flow on the local highway network will be permitted where:

b. Projected levels of air pollution or emissions associated with the development would not result in a significant deterioration of current air quality at a location where national air quality objectives or limit values apply; or

c. Measures are provided which demonstrably mitigate the impact on air quality to an acceptable level.

2.4 Assessment Guidance

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

Relevant Local Guidance

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, 2018b). The document provides key guidance on 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 (EPUK / IAQM 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.

3 Methodology

- 3.1.1 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 (outlined in **Section 2** of this report), and whether or not additional mitigation is required.
- 3.1.2 This assessment first defines the 'study area' and outlines the baseline air quality (for both 'existing'² and relevant future years i.e. development construction, first occupation or completion) within this study area. The impact of construction and operational activities on existing sensitive receptors located within the study area has then been assessed.

3.2 Baseline Air Quality

- 3.2.1 Any exceedances of the EU Limit Values along roads within the study area have been identified using the 2020 NO₂ and PM Projections Data published by DEFRA (DEFRA, 2020a). Information on baseline air quality in the study area has been obtained by collating the results of monitoring carried out by HBC and their LAQM reports to identify potential AQMAs. Background concentrations for the study area have been defined using the national pollution maps published by DEFRA which cover the whole country on a 1x1 km grid (DEFRA, 2020b).

3.3 Construction Dust Impacts

- 3.3.1 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 human health (as a result of concentrations of PM₁₀).
- 3.3.2 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).
- 3.3.3 Separation distance is also an important factor. Large dust particles (greater than 30µm), 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 PM₁₀ occurs over a shorter distance due to the rapid decrease in concentrations with distance from the source due to dispersion.
- 3.3.4 The assessment of the risk of potential construction dust impacts has been undertaken with reference to relevant guidance (IAQM, 2014).

Screening Assessment

- 3.3.5 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.

² 2019 has been used as the 'existing' year as this is the latest year for which local monitoring data is available.

3.3.6 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

- 3.3.7 The risk of impacts associated with dust soiling and PM₁₀ caused by the Proposed Development has been determined (following the IAQM guidance (IAQM, 2014)) based on the dust emission class (or magnitude) for each activity arising from four activities in the absence of mitigation (demolition, earthworks, construction and trackout), the sensitivity of nearby receptors and the overall sensitivity of the area. The dust emission class, receptor sensitivity and the overall sensitivity of the area are determined using the criteria outlined in **Table B-1, Table B-2, Table B-3, Table B-4 and Table B-5 of Appendix B** (based on the IAQM guidance), indicative thresholds and professional judgement. 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 B-6** (based on the IAQM guidance). The risk of impact is then used to determine the mitigation requirements.
- 3.3.8 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.
- 3.3.9 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'.

3.4 Demolition and Construction Road Traffic Impacts

- 3.4.1 The potential for a significant overall effect on existing sensitive receptors within the study area as a result of emissions from construction traffic generated by the Proposed Development has been determined qualitatively, taking into consideration the screening criteria outlined in the EPUK / IAQM guidance (EPUK / IAQM, 2017) (see **Appendix C**), the anticipated routing of the generated traffic and the anticipated duration of impacts associated with the generated traffic.

3.5 Operational Road Traffic Emission Impacts

Screening Assessment

Impacts of Development-Generated Traffic on Existing Sensitive Human Receptors

- 3.5.1 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 **Appendix C** 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).

- 3.5.2 If it is not possible to screen out the potential for significant impacts, then a detailed assessment will be undertaken (see Paragraphs 3.5.3 to 3.5.9).

Detailed Assessment

Human Receptors

- 3.5.3 Concentrations of pollutants (NO₂, PM₁₀ and PM_{2.5}) have been predicted for a range of worst-case locations of relevant human receptor exposure at sensitive existing properties to allow comparison with the NAQOs and determination of the significance of impacts at each receptor.
- 3.5.4 Emissions from road vehicles and their resultant impact at receptor locations have been predicted using the ADMS-Roads dispersion model (v5.0.0.1). The model requires the user to provide various input data, including traffic flows (in AADT format), vehicle composition (i.e. the proportion of Heavy Duty Vehicles (HDVs)), road characteristics (including road width, gradient and street canyon dimensions, where applicable), and average vehicle speed. AADT flows and the proportions of HDVs, for roads within the study area have been provided by the Project's transport consultants, David Tucker Associates. Traffic data used in this assessment are summarised in **Appendix D**.
- 3.5.5 The model also requires meteorological data and has been run using 2019 meteorological data from the Southampton meteorological station, which are considered suitable for this area. **Appendix D** provides further details on the model inputs.
- 3.5.6 Traffic emissions have been calculated using the Emission Factor Toolkit (EFT) v10.1 (DEFRA, 2020c), which utilises NO_x emission factors taken from the European Environment Agency (EEA) COPERT 5.3 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, PM₁₀ and PM_{2.5} (exhaust and brake, tyre and road wear) for a specified year, road type, vehicle speed and vehicle fleet composition.
- 3.5.7 The EFT provides pollutant emission rates for 2018 through to 2030 and takes into consideration bespoke vehicle fleet information as well as the following information available from the National Atmospheric Emissions Inventory (NAEI):
- fleet composition data for motorways, urban and rural roads in the UK (excluding London);
 - fleet composition based on European emission standards from pre-Euro I to Euro6/VI (including Euro 6 subcategories);
 - scaling factors reflecting improvements in the quality of fuel and some degree of retrofitting; and
 - technology conversions in the national fleet.
- 3.5.8 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 LDVs it is important to note the EFT is not based on the Euro emission standards. Specifically, the latest version of the EFT (v10.1) includes updated NO_x and PM speed emission coefficient equations for Euro

5 and 6 vehicles taken from the EEA COPERT 5.3 emission calculation tool, reflecting emerging evidence on the real-world emission performance of these vehicles.

- 3.5.9 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 in operation is 2023. Therefore, in order to take account of uncertainties relating to future year vehicle emissions and background pollutant concentrations to provide a conservative assessment, the assessment has been carried out utilising 2023 emission factors, background concentrations, and traffic data (which includes completed development flows). This is considered a conservative assumption of emissions in the future.

3.6 Assumptions and Limitations

- 3.6.1 There are many components that contribute to the uncertainty in predicted concentrations. The model used in this assessment is/are dependent upon the traffic 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.
- 3.6.2 There has been an acknowledged disparity between national road transport emissions projections and measured annual mean concentrations of nitrogen oxides (NO_x) and NO₂ for many years. Recent monitoring has shown that reductions in concentrations are now being measured in many parts of the country (Air Quality Consultants Ltd., 2020), however, there is still some uncertainty regarding the rate at which emissions will reduce in the future and therefore some consideration must be given to the accuracy of any projection and to appropriately respond to this.
- 3.6.3 The complete development modelling has been based on 2023 emission factors, background concentrations and traffic data. 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.

3.7 Air Quality Impacts Significance Criteria

Human Receptors

- 3.7.1 The relevant NAQOs are set out in **Table 2-1** and **Table 2-2**. The predicted pollutant concentrations in the future year (2023) at each identified sensitive receptor have been compared to the relevant NAQOs and any exceedances identified.
- 3.7.2 Analysis of long-term monitoring data suggests that if the annual mean NO₂ concentration is less than 60 µg/m³ then the 1-hour mean NO₂ 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 one-hour mean objective is likely to be achieved (DEFRA, 2018b). Analysis of long-term monitoring data also suggests that if the annual mean PM₁₀ concentration is less than 32 µg/m³ then the 24-hour mean PM₁₀ 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 NAQO is likely to be achieved.
- 3.7.3 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 (EPUK / IAQM, 2017), 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 3-1**.

Table 3-1 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 NO₂ or PM₁₀: > 44 µg/m³ annual mean; PM_{2.5}>27.5 µg/m³ annual mean; PM₁₀>35.2 µg/m³ annual mean (days).

^b NO₂ or PM₁₀: > 40.8 – ≤ 44 µg/m³ annual mean; PM_{2.5}> 20.4 – ≤22 µg/m³ annual mean; PM₁₀>32.64 – ≤35.2 µg/m³ annual mean (days).

^c NO₂ or PM₁₀: > 38 – ≤40.8 µg/m³ annual mean; PM_{2.5}>19 – ≤20.4µg/m³ of annual mean; PM₁₀>30.4 – ≤32.64 µg/m³ annual mean (days).

^d NO₂ or PM₁₀: >30 – ≤38 µg/m³ annual mean; PM_{2.5}>15 – ≤19 µg/m³ annual mean; or <24 – ≤ 30.4 µg/m³ annual mean (days).

^e NO₂ or PM₁₀: ≤30 µg/m³ annual mean; PM_{2.5}≤15 µg/m³ annual mean; PM₁₀≤24 µg/m³ annual mean (days).

3.7.4 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;
- 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.

3.7.5 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' 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.

4 Baseline Environment

4.1 Site Context

- 4.1.1 The area surrounding the Site is commercial in nature, with the closest residential properties being located approximately 200 m to the east, adjacent to Hambledon Road. The Site is bound to the north, east and west by Elettra Avenue, and by vacant land to the south which is proposed to be developed into commercial uses as part of the Waterloo Park outline planning application (planning reference APP/18/01072), which is currently at the resolution to grant stage.

4.2 Study Area

- 4.2.1 The study area adopted for this assessment is as follows:

- for the construction dust risk assessment, the study area (based on IAQM, 2014 guidance) is defined as comprising 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 construction phase road traffic emission assessment, the study area (based on the EPUK / IAQM, 2017 guidance) includes all roads (and adjacent properties) predicted to exceed the screening criteria outlined in **Appendix C**
- for the operational phase road traffic emissions assessment, the study area (based on EPUK / IAQM, 2017 guidance) includes the Site, all roads (and adjacent properties) within 250 m of the Site boundary and any other roads (and adjacent properties) predicted to exceed the screening criteria outlined in **Appendix C**.

4.3 Sensitive Receptor Locations

- 4.3.1 Relevant sensitive human receptor locations are places where members of the public might be expected to be regularly present over the averaging period of the NAQOs. The NO₂, PM₁₀ and PM_{2.5} annual mean NAQO and 1-hour mean NO₂ NAQO sensitive locations include existing residential properties. 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.
- 4.3.2 Based on these criteria, thirteen existing residential properties within the study area have been identified as worst-case receptors for the assessment. The locations of these receptors have been chosen to represent locations where impacts from road traffic generated by the Proposed Development are likely to be the greatest i.e. as a result of development traffic at junctions. These locations are described in **Appendix D** and shown in **Figure 1, Appendix F**
- 4.3.3 Concentrations have also been predicted at one diffusion tube monitoring site located on London Road (Purbrook) in order to verify the modelled results. **Appendix D** provides further details on the verification method.

4.4 Ambient Air Quality

EU Limit Values

- 4.4.1 The study area does not contain any predicted or measured exceedances of an EU Limit Values either in the existing year (2019) or in the future year (2023). The study area is not within a zone where DEFRA have reported an exceedance of an EU Limit Values either in the existing baseline year or in future years.

LAQM

- 4.4.2 HBC has investigated air quality within its area as part of its responsibilities under the LAQM regime. To date, no AQMAs have been declared in the Borough. The closest AQMA to the Site is the Portsmouth City Council AQMA No.6, located more than 7.5 km southeast and declared due to exceedances of the annual mean NO₂ NAQO.

Local Monitoring Data

NO₂

- 4.4.3 HBC does not operate any automatic monitoring stations in the borough. However, the Council deploys NO₂ diffusion tubes at a number of locations, including four locations located within 3 km of the Site (see **Figure 2**). 2015 – 2019 monitoring results for locations within 3 km of the Site are shown in **Table 4-1**.

Table 4-1 Measured Annual Mean NO₂ Concentrations 2015 – 2019

Site ID	Site Type	Within AQMA	Annual Mean (µg/m ³)				
			2015	2016	2017	2018	2019
Site 18 - Waterlooville Precinct	Urban Background	No	17.8	20.7	20	20.6	17.8
Site 10 - Ramblers Way	Suburban	No	19.6	22.9	20.1	21.4	20.3
Site 25(B) - Stakes Road	Roadside	No	22.4	24.4	24.1	26.8	24.4
Site 8 - London Road (Purbrook)	Roadside	No	23.5	26.8	26.3	23.5	27.4*
NAQO			40				

Exceedances of the NAQO are highlighted in bold.

2015 – 2018 data taken from the 2019 Air Quality Annual Status Report (ASR) (HBC, 2019).

2019 raw data provided by HBC Environmental Health Officer (HBC, 2021). This data has been bias adjusted using the national bias adjustment factor of 0.91 for diffusion tubes analysed by Gradko, 20% TEA in water.

* Used for model verification.

- 4.4.4 Measured concentrations at the closest monitoring location, Waterlooville Precinct (site 18), located approximately 850 m southeast of the Site, have been well below the annual mean NAQO between 2015 and 2019. Measured concentrations at remaining monitoring locations have also been well below the annual mean NAQO. Furthermore, measured concentrations at these monitoring locations are below 60 µg/m³, indicating that it is unlikely that any exceedances of the 1-hour mean NAQO have occurred. There is no clear trend in concentrations over time.

PM₁₀ and PM_{2.5}

- 4.4.5 HBC does not currently undertake PM₁₀ or PM_{2.5} monitoring within the Borough.

4.5 Predicted Background Concentrations

- 4.5.1 Estimated background concentrations for the Site have been obtained from the latest 2017-based national maps provided by DEFRA (DEFRA, 2020b). The DEFRA background concentrations for the modelled receptor locations are provided in **Table 4-2**.
- 4.5.2 The background concentrations are all well below the relevant NAQOs both in the 'existing' and future years.

Table 4-2 Estimated Annual Mean Background Concentrations

Year	Location	Annual Mean ($\mu\text{g}/\text{m}^3$)		
		NO ₂	PM ₁₀	PM _{2.5}
2019	467_109 ^a	14.3	15.1	10.2
	467_110 ^b	12.8	14.4	10.1
	468_109 ^c	14.3	14.8	10.5
	467_107 ^d	14.5	15.0	10.7
2023	467_109 ^a	12.4	14.4	9.6
	467_110 ^b	11.2	13.6	9.5
	468_109 ^c	12.4	14.0	9.9
	467_107 ^d	12.5	14.2	10.1
NAQOs		40	40	20

^a Receptor location R6;

^b receptor locations R1 – R5;

^c receptor locations R7 – R14;

^d location of monitoring site (London Road Purbrook) used for verification.

4.6 Predicted Baseline Concentrations

Human Receptors

- 4.6.1 The ADMS-Roads model has been used to predict baseline NO₂, PM₁₀ and PM_{2.5} concentrations at each of the existing receptor locations identified in **Appendix D**. The results for the baseline scenarios are presented in **Table 4-3**.

Table 4-3 Predicted Baseline Concentrations of NO₂, PM₁₀ and PM_{2.5} in 2019 and 2023

Receptor	Annual Mean ($\mu\text{g}/\text{m}^3$)					
	NO ₂		PM ₁₀		PM _{2.5}	
	2019	2023	2019	2023	2019	2023
R1	25.8	20.4	16.6	15.9	11.4	10.8
R2	33.7	26.2	18.1	17.3	12.3	11.6
R3	25.1	19.9	16.5	15.7	11.4	10.7
R4	26.5	20.9	16.8	16.0	11.5	10.8
R5	24.2	19.3	16.4	15.6	11.3	10.6
R6	24.5	19.8	17.0	16.3	11.3	10.7
R7	37.5	29.3	18.5	17.7	12.7	12.0
R8	27.3	21.9	16.9	16.2	11.7	11.1
R9	39.5	30.9	19.2	18.4	13.1	12.4
R10	36.9	28.9	18.6	17.8	12.7	12.0
R11	34.7	27.2	18.2	17.4	12.5	11.8
R12	29.3	23.2	17.2	16.4	11.9	11.2
R13	35.9	28.1	18.2	17.4	12.5	11.8
R14	29.0	22.8	17.3	16.5	11.9	11.3
NAQOs	40		40		20	

- 4.6.2 The annual mean NO₂, PM₁₀ and PM_{2.5} NAQOs are not predicted to be exceeded at any of the existing receptor locations in 2019 or 2023. Furthermore, predicted concentrations of NO₂ are less than 60 µg/m³ during 2019 and 2023, indicating that it is unlikely that any exceedances of the 1-hour mean NAQO occurred in 2019 or will occur in 2023. Predicted concentrations of PM₁₀ are lower than 32 µg/m³ during 2019 and 2023, indicating that it is unlikely that any exceedances of the 24-hour mean NAQO occurred during 2019 or will occur in 2023.
- 4.6.3 Overall, baseline concentrations of all of the pollutants considered are predicted to decrease between 2019 and 2023 as vehicle emission factors and background concentrations are assumed to improve, despite the traffic increase in the network.

5 Predicted Impacts

5.1 Construction Dust Impacts

Screening Assessment

- 5.1.1 There are a number of existing sensitive human receptors (including residential and commercial properties) located within 350 m of the site boundary and within 50 m of the routes that will be used by demolition and construction vehicles. As such, further assessment of the risk of dust soiling and PM₁₀ emissions is required.
- 5.1.2 There are no sensitive ecological receptors located within either 250 m of the Site boundary or within 50 m of the routes used by demolition and construction vehicles on the public highway. The closest designated ecological site, Lye Heath Marsh, is located more than 2 km from the Site boundary. 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

- 5.1.3 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 B-1, Appendix B**
- 5.1.4 There is no demolition proposed onsite. Therefore, there will be no risk of dust impacts associated with demolition and this activity has not been considered further in this assessment.
- 5.1.5 Proposed earthworks activities will primarily involve the excavation of material, haulage, tipping, stockpiling and landscaping. The Site is approximately 11,900 m² in area and the soil type at the Site is considered to be moderately dusty as it is deep, argillic to arenaceous soil with a clayey loam to sandy loam texture (British Geological Society, 2021). Based on this, the dust emission magnitude of earthworks activities is judged to be 'large'.
- 5.1.6 Construction activities comprise the construction of two single-storey drive-thru units, with a gross internal area (GIA) of 332 m² and 167 m² respectively, as well as a single-storey, 1,914 m² retail unit. The building volume is therefore estimated to be less than 25,000 m³. Based on this, the dust emission magnitude of construction activities is judged to be 'small'.
- 5.1.7 The number of HDVs that will exit the Site on a daily basis is unknown, however, given the large size of the Site, and small scale of construction activities, the number of HDVs is anticipated to range between 10 - 50 HDVs per day. Based on this, the dust emission magnitude of trackout is judged to be 'medium'.

Area Sensitivity

- 5.1.8 The area sensitivity to dust soiling and human health impacts has been determined based on the criteria shown in **Table B-3, Table B-4, Table B-5, Appendix B**
- 5.1.9 Residential properties and car showrooms are classed as being 'high sensitivity' receptors to dust soiling, based on the IAQM guidance (IAQM, 2014) (see **Table B-3, Appendix B**). Commercial buildings (i.e. retail and offices) are considered to be 'medium sensitivity' receptors. The closest residential properties to the Site are located more than 150 m away, adjacent to Hambledon Road, however, there is a car showroom located approximately 60 m from the Site. The closest commercial buildings are located within 20 m of the Site. As such, the sensitivity of the area surrounding the Site to dust soiling is judged to be 'medium'.

- 5.1.10 The IAQM guidance states that trackout may occur for distance of up to 200 m from 'medium' sites. The worst-case assumption has been made that all main roads may potentially be used by HDVs leaving the Site entrance. There are no residential properties within 20 m of roads along which material may be tracked, however there are approximately eight residential properties located within 50 m. There is a car showroom located within 20 m of roads along which material may be tracked, and a number of commercial units located within 20 m. As such, the sensitivity to dust soiling of the area surrounding roads along which material may be tracked is judged to be 'medium'.
- 5.1.11 The IAQM also defines residential properties as being 'high sensitivity' receptors to human health impacts and commercial properties as being 'medium sensitivity' (see **Table B-4, Appendix B**). PM₁₀ concentrations at existing residential properties within the study area are anticipated to be similar to the predicted 2019 PM₁₀ concentrations at receptors 1 – 6 (i.e. 18.1 µg/m³). Based on the predicted existing PM₁₀ concentrations and the number of sensitive receptors within 20 m of the site boundary and roads along which material may be, the sensitivity to human health impacts of the areas surrounding the Site and the area surrounding roads along which material may be tracked are judged to be 'low'.

Risk of Impacts

- 5.1.12 The risk of construction dust impacts, without mitigation, have been defined based on the criteria shown in **Table B-6, Appendix B** and are presented in **Table 5-1**.

Table 5-1 Risk of Construction Dust Impacts without Mitigation

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

5.2 Demolition and Construction Traffic Impacts

Screening Assessment

- 5.2.1 Vehicle movements associated with construction activities will vary through the construction programme, with short periods of peak HGV movements associated with the delivery of materials during the construction phase. However, when the HGV movements are averaged over a full year period (AADT), these will be significantly lower than peak movements. Together with the implementation of the Construction Environmental Management Plan (CEMP), the impact of construction vehicle movements on human health receptors in the area are considered to be temporary and 'not significant'. Moreover, vehicle movements associated with construction are likely to be significantly lower than the number of vehicle movements associated with operation of the Development, which have been taken into account in this assessment.

5.3 Operational Phase Road Traffic Impacts

Screening Assessment

- 5.3.1 The Proposed Development will generate additional traffic during the operational phase, which will result in an increase of over 500 AADT along several roads located outside of any AQMAs, thus exceeding the EPUK / IAQM screening criteria (see **Appendix C**). 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 following section).

Detailed Assessment – Excluding Waterloo Park Outline Application

- 5.3.2 The Proposed Development forms part of the Waterloo Park site, for which a planning application was submitted in 2018 (planning reference APP/18/01072). The Waterloo Park outline application is currently at the resolution to grant stage. The EPUK / IAQM guidance recommends that where there is an extant permission for a site, that impacts be assessed for the new permission against the current baseline for the site, disregarding the extant permission. Therefore, impacts have initially been assessed for the Proposed Development, excluding the Waterloo Park outline application.
- 5.3.3 Predicted concentrations of NO₂, PM₁₀ and PM_{2.5} at existing receptors, both without and with the Proposed Development in place, are presented in **Table 5-2**, **Table 5-3** and **Table 5-4**. The 'without development' scenario predicted concentrations include background concentrations and emissions from existing traffic (excluding the Waterloo Park outline application), and the 'with development' scenario predicted concentrations include background concentrations, emissions from existing traffic (excluding the Waterloo Park outline application) and traffic generated by the Proposed Development.

Table 5-2 Predicted Concentrations of NO₂ (µg/m³), % Change and Impact at each Receptor

Receptor	2023 Without Development (excluding Waterloo Park outline application)	2023 With Development (excluding Waterloo Park Outline application)	Change (as % of NAQO)	Impact Descriptor
R1	20.4	20.7	1%	Negligible
R2	26.2	26.6	1%	Negligible
R3	19.9	20.3	1%	Negligible
R4	20.9	21.4	1%	Negligible
R5	19.3	19.7	1%	Negligible
R6	19.8	20.1	1%	Negligible
R7	29.3	29.6	1%	Negligible
R8	21.9	22.0	0%	Negligible
R9	30.9	31.1	1%	Negligible
R10	28.9	29.1	0%	Negligible
R11	27.2	27.4	0%	Negligible
R12	23.2	23.4	0%	Negligible
R13	28.1	28.3	0%	Negligible
R14	22.8	23.1	1%	Negligible
NAQO	40		-	

Table 5-3 Predicted Concentrations of PM₁₀ (µg/m³), % Change and Impact at each Receptor

Receptor	2023 Without Development (excluding Waterloo Park outline application)	2023 With Development (excluding Waterloo Park Outline application)	Change (as % of NAQO)	Impact Descriptor
R1	15.9	15.9	0%	Negligible
R2	17.3	17.4	0%	Negligible
R3	15.7	15.8	0%	Negligible
R4	16.0	16.1	0%	Negligible
R5	15.6	15.7	0%	Negligible
R6	16.3	16.4	0%	Negligible

Receptor	2023 Without Development (excluding Waterloo Park outline application)	2023 With Development (excluding Waterloo Park Outline application)	Change (as % of NAQO)	Impact Descriptor
R7	17.7	17.8	0%	Negligible
R8	16.2	16.2	0%	Negligible
R9	18.4	18.5	0%	Negligible
R10	17.8	17.9	0%	Negligible
R11	17.4	17.4	0%	Negligible
R12	16.4	16.4	0%	Negligible
R13	17.4	17.5	0%	Negligible
R14	16.5	16.6	0%	Negligible
NAQO	40		-	

Table 5-4 Predicted Concentrations of PM_{2.5} (µg/m³), % Change and Impact at each Receptor

Receptor	2023 Without Development (excluding Waterloo Park outline application)	2023 With Development (excluding Waterloo Park Outline application)	Change (as % of NAQO)	Impact Descriptor
R1	10.8	10.8	0%	Negligible
R2	11.6	11.6	0%	Negligible
R3	10.7	10.8	0%	Negligible
R4	10.8	10.9	0%	Negligible
R5	10.6	10.7	0%	Negligible
R6	10.7	10.7	0%	Negligible
R7	12.0	12.0	0%	Negligible
R8	11.1	11.1	0%	Negligible
R9	12.4	12.4	0%	Negligible
R10	12.0	12.1	0%	Negligible
R11	11.8	11.8	0%	Negligible
R12	11.2	11.2	0%	Negligible
R13	11.8	11.8	0%	Negligible
R14	11.3	11.3	0%	Negligible
NAQO	20		-	

5.3.4 The predicted NO₂, PM₁₀ and PM_{2.5} concentrations in the opening year of the Proposed Development (2023), both without and with the Proposed Development in place, are below the relevant NAQOs at all existing receptors. Furthermore, predicted annual mean NO₂ concentrations are below 60µg/m³ at all receptors, indicating that exceedances of the 1-hour mean NO₂ NAQO are unlikely, and the predicted annual mean PM₁₀ concentrations are below 32 µg/m³ at all receptors, indicating that exceedances of the 24-hour mean PM₁₀ NAQO are unlikely.

5.3.5 The changes in annual mean NO₂ concentrations (when rounded to the nearest whole number) range from 0-1%. A change of 1% occurs at receptor locations R1 – R7, R9 and R14. The change at the remaining receptors is 0%. Using the criteria set out in **Table 3-4**, the impacts on NO₂ concentrations are described as being 'negligible' at all modelled receptor locations.

- 5.3.6 The changes in annual mean PM₁₀ and PM_{2.5} concentrations (when rounded to the nearest whole number) are 0% at all receptors. Using the criteria set out in **Table 3-1**, the impacts on PM₁₀ and PM_{2.5} concentrations are all described as 'negligible'.

Detailed Assessment – Including Waterloo Park Outline Application

- 5.3.7 An additional scenario has been modelled to quantify the impacts of the Proposed Development with the Waterloo Park outline application in place. Predicted concentrations of NO₂, PM₁₀ and PM_{2.5} at existing receptors, both without and with the Proposed Development in place, are presented in **Table 5-5**, **Table 5-6** and **Table 5-7**. The 'without development' scenario predicted concentrations include background concentrations and emissions from existing traffic (including the Waterloo Park outline application), and the 'with development' scenario predicted concentrations include background concentrations, emissions from existing traffic (including the Waterloo Park outline application) and traffic generated by the Proposed Development.

Table 5-5 Predicted Concentrations of NO₂ (µg/m³), % Change and Impact at each Receptor

Receptor	2023 Without Development (including the Waterloo Park outline application)	2023 With Development (including the Waterloo Park outline application)	Change (as % of NAQO)	Impact Descriptor
R1	21.1	21.1	0%	Negligible
R2	27.2	27.1	0%	Negligible
R3	20.7	20.7	0%	Negligible
R4	21.7	21.8	0%	Negligible
R5	19.9	20.1	0%	Negligible
R6	20.3	20.5	0%	Negligible
R7	30.0	30.1	0%	Negligible
R8	22.2	22.2	0%	Negligible
R9	31.4	31.4	0%	Negligible
R10	29.3	29.4	0%	Negligible
R11	27.7	27.7	0%	Negligible
R12	23.5	23.6	0%	Negligible
R13	28.6	28.6	0%	Negligible
R14	23.1	23.3	0%	Negligible
NAQO	40		-	

Table 5-6 Predicted Concentrations of PM₁₀ (µg/m³), % Change and Impact at each Receptor

Receptor	2023 Without Development (including the Waterloo Park outline application)	2023 With Development (including the Waterloo Park outline application)	Change (as % of NAQO)	Impact Descriptor
R1	16.0	16.0	0%	Negligible
R2	17.6	17.5	0%	Negligible
R3	15.9	15.9	0%	Negligible
R4	16.2	16.2	0%	Negligible
R5	15.8	15.8	0%	Negligible
R6	16.4	16.5	0%	Negligible
R7	17.9	17.9	0%	Negligible
R8	16.2	16.2	0%	Negligible

Receptor	2023 Without Development (including the Waterloo Park outline application)	2023 With Development (including the Waterloo Park outline application)	Change (as % of NAQO)	Impact Descriptor
R9	18.5	18.5	0%	Negligible
R10	17.9	17.9	0%	Negligible
R11	17.5	17.5	0%	Negligible
R12	16.4	16.5	0%	Negligible
R13	17.5	17.5	0%	Negligible
R14	16.6	16.6	0%	Negligible
NAQO	40		-	

Table 5-7 Predicted Concentrations of PM_{2.5} (µg/m³), % Change and Impact at each Receptor

Receptor	2023 Without Development (including the Waterloo Park outline application)	2023 With Development (including the Waterloo Park outline application)	Change (as % of NAQO)	Impact Descriptor
R1	10.9	10.9	0%	Negligible
R2	11.7	11.7	0%	Negligible
R3	10.8	10.8	0%	Negligible
R4	11.0	11.0	0%	Negligible
R5	10.7	10.8	0%	Negligible
R6	10.7	10.8	0%	Negligible
R7	12.1	12.1	0%	Negligible
R8	11.1	11.1	0%	Negligible
R9	12.4	12.4	0%	Negligible
R10	12.1	12.1	0%	Negligible
R11	11.8	11.8	0%	Negligible
R12	11.3	11.3	0%	Negligible
R13	11.9	11.9	0%	Negligible
R14	11.3	11.3	0%	Negligible
NAQO	20		-	

- 5.3.8 The predicted NO₂, PM₁₀ and PM_{2.5} concentrations in the opening year of the Proposed Development (2023), both without and with the Proposed Development in place, are below the relevant NAQOs at all existing receptors. Furthermore, predicted annual mean NO₂ concentrations are below 60µg/m³ at all receptors, indicating that exceedances of the 1-hour mean NO₂ NAQO are unlikely, and the predicted annual mean PM₁₀ concentrations are below 32 µg/m³ at all receptors, indicating that exceedances of the 24-hour mean PM₁₀ NAQO are unlikely.
- 5.3.9 The changes in annual mean NO₂, PM₁₀ and PM_{2.5} concentrations (when rounded to the nearest whole number) are 0% at all receptors. Using the criteria set out in **Table 3-1**, the impacts on PM₁₀ and PM_{2.5} concentrations are all described as 'negligible'.

5.4 Impact Significance

- 5.4.1 The IAQM guidance recommends that no judgement of the significance of effects of construction dust without mitigation is made, as mitigation is assumed to be secured by planning conditions, legal requirements or required by regulations (IAQM, 2014). Following the implementation of appropriate mitigation measures (as described in **Section 6.1**) the residual effects will be 'not significant'.
- 5.4.2 Overall, taking into account the conservative nature of the assessment, and the criteria set out in **Section 3.7**, the operational air quality effects of the Proposed Development are considered to be 'not significant' on the basis that:
- Road traffic emissions associated with the Proposed Development will not cause any exceedances of the NAQOs.
 - Impacts as a result of road traffic emissions associated with the operation of the Proposed Development will be 'negligible' at all receptors.

6 Mitigation

6.1 Construction

6.1.1 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 5-1**).

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.
- Agree dust monitoring locations with the local authority and instigate monitoring 3 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 comply with the London Low Emission Zone and the NRMM standards, where applicable.
- 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.

Construction

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless required for a particular process.

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.

6.2 Operation

- 6.2.1 The operational air quality effects of the Proposed Development on human health are considered to be 'not significant'. Nonetheless, a Travel Plan will be prepared for the Proposed Development including measures to encourage sustainable transport modes for trips to and from the Site, thereby reducing vehicle emissions associated with the Development.

7 Summary and Conclusions

- 7.1.1 The air quality impacts associated with the Proposed Development of the Site at Elettra Avenue, Waterloooville, located within the administrative boundary of Havant Borough Council, have been assessed.
- 7.1.2 HBC have not declared any AQMAs in the Borough. The closest AQMA to the Site is the Portsmouth City Council AQMA No.6, located more than 7.5 km southeast.
- 7.1.3 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 PM₁₀ concentrations and dust nuisance in the surrounding area. With mitigation in place the construction impacts are judged as 'not significant'.
- 7.1.4 Concentrations of NO₂, PM₁₀ and PM_{2.5} have been predicted for a number of worst-case locations representing existing properties adjacent to the road network. Predicted concentrations are well below the relevant NAQOs at all of the existing receptor locations with the Proposed Development in place and impacts at discrete receptor locations are all described as 'negligible'. Therefore, the operational air quality effects of the Proposed Development are considered to be 'not significant'.
- 7.1.5 Mitigation measures to reduce the impacts of the development on air quality concentrations are not required, however additional transport-related mitigation measures will be implemented through a Travel Plan to reduce vehicle trips, and thereby road traffic emissions, from the Development.
- 7.1.6 Overall, 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.

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Appendix A Glossary

Abbreviations	Meaning
AADT	Annual Average Daily Traffic
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
ASR	Air Quality Annual Status Report
AURN	Automatic Urban and Rural Network
CAZ	Clean Air Zone
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
EFT	Emission Factor Toolkit
EPUK	Environmental Protection UK
HBC	Havant Borough Council
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
LA	Local Authority
LAQM	Local Air Quality Management
NAEI	National Atmospheric Emission Inventory
NAQO	National Air Quality Objective as set out in the Air Quality Strategy and the Air Quality Regulations
NO ₂	Nitrogen Dioxide
NO _x	Oxides of nitrogen 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
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
SPG	Supplementary Planning Guidance
UNECE	United Nations Economic Commission for Europe
ULEZ	Ultra-Low Emission Zone
WHO	World Health Organisation

Appendix B IAQM Dust Guidance (2014) Approach

Table B-1 Dust Emission Magnitude Classification

Activity	Dust Emission Magnitude		
	Large	Medium	Small
Demolition	Total building volume of >50,000 m ³ , potentially dusty construction material, on-site crushing and screening, demolition activities >20 m above ground	Total building volume of 20,000 – 50,000 m ³ , potentially dusty construction material, demolition activities 10 – 20 m above ground level	Total building volume of <20,000 m ³ , construction material with low potential for dust release, demolition activities <10 m above ground, demolition during wetter months
Earthworks	Total site area of >10,000 m ² , potentially dusty soil type, >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes	Total site area of 2,500 - 10,000 m ² , moderately dusty soil type, 5 - 10 heavy earth moving vehicles active at any one time, formation of bunds 4 - 8 m in height, total material moved 20,000 - 100,000 tonnes	Total site area of <2,500 m ² , soil type with large grain size, <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <20,000 tonnes. Earthworks during wetter months
Construction	Total building volume >100,000 m ² , on-site concrete batching, sandblasting	Total building volume 25,000 - 100,000 m ² , potentially dusty construction material, on-site concrete batching	Total building volume <25,000 m ² , construction material with low potential for dust release
Trackout	>50 HDV outwards movements in any one day, potentially dusty surface material, unpaved road length >100 m	10 - 50 HDV outwards movements in any one day, moderately dusty surface material, unpaved road length 50 - 100 m	<10 HDV outwards movements in any one day, surface material with low potential for dust release, unpaved road length <50 m

Table B-2 Receptor Sensitivity

Receptor Sensitivity	Impact		
	High	Medium	Low
High	An area where: - Users can reasonably expect enjoyment of a high level of amenity; - The appearance, aesthetics of value of their property would be diminished by soiling; - The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Examples include dwellings, museums and other culturally important collections, medium and long-term car showrooms.	Locations where members of the public are exposed over a time period relevant to the air quality objective for PM₁₀ (in the case of the 24-hour objective, a relevant location would be one where individuals may be exposed for eight hours or more per day. Examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	Locations with an international or national designation <i>and</i> the designated features may be affected by dust soiling; OR Locations where there is a community of particularly dust sensitive species such as vascular species included in the Red Data List for Great Britain. Indicative examples include a SAC designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.
Medium	An area where: - Users would expect to enjoy of a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; - The appearance, aesthetics of value of their property could be diminished by soiling; - The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods, as part of the normal pattern of use of the land. Examples include parks and places of work.	Locations where people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM₁₀ (in the case of the 24-hour objective, a relevant location would be one where individuals may be exposed for eight hours or more per day. Examples include office and shop workers, but will generally not include workers occupationally exposed to for PM₁₀, as protection is covered by Health and Safety at Work legislation.	Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; OR Locations with a national designation where the features may be affected by dust deposition. Indicative example is a SSSI with dust sensitive features.

Low	An area where: - The enjoyment of amenity would not reasonably be expected; - Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; - There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Examples include playing fields, farmland (unless commercially sensitive horticultural), footpaths, short-term car parks and roads.	Locations where human exposure is transient. Examples include public footpaths, playing fields, parks and shopping streets.	Locations with a local designation where the features may be affected by dust deposition. Indicative example is a LNR with dust sensitive features.
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Table B-3 Sensitivity of an Area to Dust Soiling Effects

Receptor Sensitivity	Number of Receptors	Distance from Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10 – 100	High	Medium	Low	Low
	1 – 10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table B-4 Sensitivity of an Area to Human Health Impacts

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

Table B-5 Sensitivity of an Area to Ecological Impacts

Receptor Sensitivity	Distance from Source (m)	
	<20	<50
High	High Risk	Medium Risk
Medium	Medium Risk	Low Risk
Low	Low Risk	Low Risk

Table B-6 Risk of Dust Impacts Calculation Matrix

Sensitivity of Area		Dust Emission Magnitude		
		Large	Medium	Small
Demolition	High	High Risk	Medium Risk	Medium Risk
	Medium	High Risk	Medium Risk	Low Risk
	Low	Medium Risk	Low Risk	Negligible Risk
Earthworks	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible Risk
Construction	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible Risk
Trackout	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Low Risk	Negligible Risk
	Low	Low Risk	Low Risk	Negligible Risk

Appendix C EPUK IAQM Guidance (2017) Screening Criteria

The Development Will:	Indicative Criteria to Proceed to an Air Quality Assessment
Cause a significant change in LDV traffic flows on local roads with relevant receptors.	A change of LDV flow of: >100 AADT within or adjacent to an AQMA; and >500 AADT elsewhere.
Cause a significant change in HDV flows on local roads with relevant receptors.	A change of HDV flow of: >25 AADT within or adjacent to an AQMA; and >100 AADT elsewhere.
Realign roads i.e. changing the proximity of receptors to traffic lanes.	Where the change is 5 m or more and the road is within an AQMA.
Introduce a new junction or remove an existing junction near to relevant receptors.	Applies to junctions that cause traffic to significantly change vehicle acceleration / deceleration, e.g. traffic lights, or roundabouts.
Introduce or change a bus station.	A change of bus flows of: >25 AADT within or adjacent to an AQMA; and >100 AADT elsewhere.
Have an underground car park with extraction system.	The ventilation extract for the car park will be located within 20 m of a relevant receptor; and The car park will have >100 movements per day (total in and out).

The screening criteria presented is amended from Table 6.2 of the EPUK / IAQM guidance (EPUK / IAQM, 2017). Only the screening criteria relevant to changes in transport (including both traffic and the transport network) are outlined.

Appendix D Model Inputs and Results Processing

D.1 Summary of Model Inputs

Meteorological Data	2019 hourly meteorological data from the Southampton station has been used in the model. The wind rose is shown in Appendix D.4
ADMS	Version 5.0.0.1
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: 2019
Latitude	50.5°
Surface Roughness	A value of 0.5 for parkland and open suburbia was used to represent the modelled area. A value of 0.3 was used to represent the meteorological station site.
Minimum Monin-Obukhov length	A value of 30 for 'mixed urban/industrial' 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)	V10.1, August 2020. (DEFRA, 2020c)
NO _x to NO ₂ Conversion	NO _x to NO ₂ calculator version 8.1, August 2020 (DEFRA, 2020d)
Background Maps	2018 reference year background maps (DEFRA, 2020b)
National Diffusion Tube Bias Spreadsheet	V09/20, published September 2020

D.2 Receptor Locations

Receptor	Description	X Coordinate	Y Coordinate	Height (m)	No. Properties Represented
R1	74, Hambledon Road	467712.7	110087.3	1.5	One residential property
R2	70, Hambledon Road	467722.4	110074.9	1.5	One residential property
R3	64, Hambledon Road	467729.8	110055.8	4.5	One residential property
R4	64, Hambledon Road	467738.1	110044.9	1.5	One residential property
R5	60, Hambledon Road	467750.4	110016.9	1.5	Two residential properties
R6	2, Fennell Close	467762.5	109996.5	1.5	One residential property
R7	Churchill House Retirement Home	468316	109558.7	1.5	Ground floor residential properties Apsley Lodge
R8	Flat 2nd Floor, 326 London Road	468351.7	109513.4	4.5	First floor properties 326 London Road
R9	Homewater House, Hulbert Road	468386.5	109538.4	0	Ground floor residential properties, Homewater House

Receptor	Description	X Coordinate	Y Coordinate	Height (m)	No. Properties Represented
R10	Homewater House, Hulbert Road	468383	109552.1	0	Ground floor residential properties, Homewater House
R11	Homewater House, Hulbert Road	468384.1	109561.2	0	Ground floor residential properties, Homewater House
R12	Victoria Court, A3 London road	468397.4	109591.3	1.5	Ground floor residential properties, Victoria Court
R13	39, Freshfield Gardens	468353	109591.6	1.5	One residential property
R14	Nelson House, 47 London Road	468032.1	109178.8	1.5	Ground floor residential properties - Nelson House.

D.3 Traffic Data

Link Number	Location	2019 Baseline		2023 Without Development (excluding Waterloooville Park Outline Application)		2023 Without Development (excluding Waterloooville Park Outline Application)		2023 Without Development (Including Waterloooville Park Outline Application)		2023 With Development (Including Waterloooville Park Outline Application)	
		AADT	HDV (%)	AADT	HDV (%)	AADT	HDV (%)	AADT	HDV (%)	AADT	HDV (%)
1	Elettra Avenue	12272	1.7	12887	1.7	15637	1.4	16624	2.1	17587	2.0
2	Hambledon Road North	20383	3.8	21404	3.8	21577	3.8	22040	3.8	21891	3.8
3	Hambledon Road South	38500	2.0	40429	2.0	42309	1.9	42521	2.1	43513	2.1
4	Milton Road	15312	2.5	16079	2.5	16301	2.5	17088	2.5	16733	2.5
5	A3 Maurepas Way South	19479	3.2	20420	3.2	21041	3.1	21048	3.2	21405	3.1
6	A3 Maurepas Way East	30717	1.2	32201	1.2	32938	1.2	33666	1.4	33778	1.4
7	A3 London Road (North of Hulbert Road)	24051	1.2	25212	1.2	25461	1.2	25652	1.3	25713	1.3
8	B2150 Hulbert Road	37949	1.2	39850	1.2	40299	1.2	40876	1.3	40887	1.3
9 ^a	A3 London Road (South of Maurepas Way)	19059	1.4	19980	1.4	20601	1.4	20607	1.5	20965	1.5

^a 2019 baseline data obtained from DfT website (DfT, 2021).

D.4 Windrose

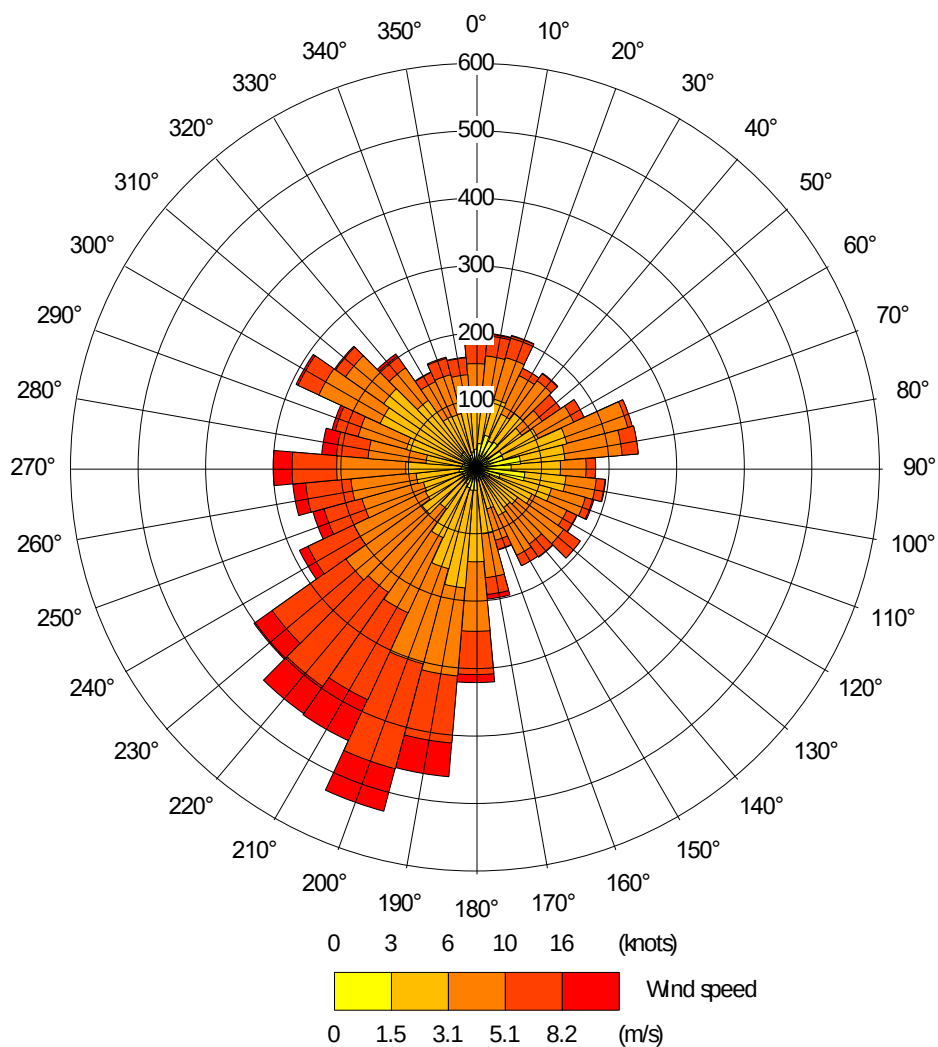


Figure D-1: Windrose for Southampton

Appendix E Model Verification

NO₂

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 2019 annual mean road-NO_x contribution at the London Road (Purbrook) monitoring site (identified in **Table 4-1**) which is the closest roadside monitoring location to the Site.

The model output of road-NO_x has been compared with the 'measured' road-NO_x, which was determined from the measured NO₂ concentration using the NO_x from NO₂ calculator (DEFRA, 2020d) and the adjusted background NO₂ concentrations from the DEFRA background map (DEFRA, 2020b).

An adjustment factor was determined as follows:

- Measured NO₂: 27.4 µg/m³
- Measured road-NO_x: 25.1 µg/m³
- Modelled road-NO_x: 9.5 µg/m³
- Road-NO_x adjustment factor: $25.1 / 9.5 = 2.64^*$

*Based on unrounded numbers.

This factor implies that the model is under-predicting the road-NO_x contribution. This is a common experience with this and most other models.

PM₁₀ and PM_{2.5}

HBC does not undertake any monitoring of PM₁₀ or PM_{2.5}. Therefore, the adjustment factor calculated of NO₂ has been applied to the modelled road-PM₁₀ and road-PM_{2.5} concentrations.

Appendix F Figures

