

Air Quality Assessment

Land North of Summer Lane, Pagham

January 2026

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1. Introduction

Background

- 1.1 Phlorum Limited has been commissioned by Northgate Properties Limited, on behalf of LJ&P Langmead Farm Partnership ("the Client") to undertake an air quality assessment to support a planning application for a residential development ("the proposed development") on land to the north of Summer Lane, Pagham, within the administrative boundary of Arun District Council (ADC). The National Grid Reference for the centre of the Phase 4b site ("the application site") is 488715, 098640. The location of the site is shown in Figure 1. The location of the site is displayed in Figure 1.
- 1.1 It is understood that the current proposals comprise residential development of up to 120 dwellings including means of access into the site (not internal roads), with all other matters (relating to appearance, landscaping, scale and layout) reserved.
- 1.2 Land use in the vicinity of the site is predominantly agricultural with residential uses located to the east and south. The main sources of air pollution in the area are vehicles travelling on the local road network.
- 1.3 ADC has not declared an Air Quality Management Area (AQMA) within their authoritative boundary. However, nearby Chichester District Council (CDC) has one AQMA, St Pancras AQMA, which is located approximately 6.3km north of the application site. This AQMA was declared in 2007, due to exceedances of the annual mean Air Quality Standard (AQS) for nitrogen dioxide (NO₂).

Scope of Assessment

- 1.4 The focus of this report will be to assess the proposed development's sensitivity to, and impact on, local air quality. Both the operational and construction phases will be considered in the context of relevant policy and guidance. An emissions mitigation assessment is also presented.

2. Policy Context

The UK Air Quality Strategy

- 2.1 The UK Air Quality Strategy (UKAQS)¹ sets out Air Quality Standard (AQS) concentrations for a number of key pollutants that are to be achieved at sensitive receptor locations across the UK by corresponding Air Quality Objective (AQO) dates. The sensitive locations at which the standards and objectives apply are those where the population are reasonably expected to be exposed to said pollutants over the particular averaging period.
- 2.2 For those objectives to which an annual mean standard applies, the most common sensitive receptor locations used to compare concentrations against the standards are areas of residential housing. It is reasonable to expect that people living in their homes could be exposed to pollutants over such a period of time.
- 2.3 Schools and children's playgrounds are also often used as sensitive locations for comparison with annual mean objectives due to the increased sensitivity of young people to the effects of pollution (regardless of whether or not their exposure to the pollution could be over an annual period). For shorter averaging periods of between 15 minutes, 1 hour or 1 day, the sensitive receptor location can be anywhere where the public could be exposed to the pollutant over these shorter periods of time. A summary of the AQSs and AQOs relevant to this assessment are included in Table 2.1, below.

Table 2.1: UK Air Quality Standards and Objectives

Pollutant	Averaging Period	Air quality standard ($\mu\text{g.m}^{-3}$)	Air quality objective
Nitrogen dioxide (NO_2)	1 hour	200	200 $\mu\text{g.m}^{-3}$ not to be exceeded more than 18 times a year
	Annual	40	40 $\mu\text{g.m}^{-3}$
Particulate Matter (PM_{10})	24-hour	50	50 $\mu\text{g.m}^{-3}$ not to be exceeded more than 35 times a year
	Annual	40	40 $\mu\text{g.m}^{-3}$
Particulate Matter ($\text{PM}_{2.5}$)	Annual	20	20 $\mu\text{g.m}^{-3}$

¹ Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2) July 2007.

- 2.4 The objectives adopted in the UK are based on the Air Quality (England) Regulations 2000², as amended, for the purpose of Local Air Quality Management. These Air Quality Regulations have been adopted into UK law from the limit values required by European Union Daughter Directives on air quality.
- 2.5 The AQS for PM_{2.5} was amended as part of the Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020³.
- 2.6 In 2023, the Department for Environment, Food & Rural Affairs (Defra) published the *Environmental Improvement Plan 2023*⁴, which sets a target of 10 µg.m⁻³ for annual mean concentrations of PM_{2.5} to be achieved by 2040, with an interim target of 12 µg.m⁻³ to be achieved by 2028.
- 2.7 Obligations under the Environment Act 1995 require local authorities to declare an AQMA at sensitive receptor locations where an objective concentration has been predicted to be exceeded. In setting an AQMA, the local authority must then formulate an Air Quality Action Plan (AQAP) to seek to reduce pollution concentrations to values below the objective levels.
- 2.8 ADC has not declared any AQMAs and therefore no AQAP is in place. ADC has, however, produced an Air Quality Strategy⁵, which has been referred to where relevant when undertaking this assessment.

National Planning Policy Framework

- 2.9 The National Planning Policy Framework (NPPF)⁶, which was updated in December 2024, sets out the Government's planning policy for England. At its heart is an intention to promote more sustainable development. A core principle in the NPPF that relates to air quality effects from development is that planning should "contribute to conserve and enhance the natural and local environment" as demonstrated at paragraph 187:

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

preventing new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability [...]"

- 2.10 With regard to assessing cumulative effects the NPPF states the following at paragraph 198:

2 The Air Quality (England) (Amendment) Regulations 2002 - Statutory Instrument 2002 No.3043.

3 The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020.

4 Defra. (2023). *Environmental Improvement Plan 2023*.

5 Arun District Council. (2023). *Air Quality Strategy 2023*.

6 Ministry of Housing, Communities & Local Government. (2024). *National Planning Policy Framework*.

"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."

- 2.11 With regard to a compliance with relevant limit values and national objectives for air pollutants, along with assessing cumulative effects the NPPF states the following at paragraph 199:

"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."

- 2.12 With regard to promoting sustainable transport, paragraph 110 states:

"The planning system should actively manage patterns of growth in support of these objectives. 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. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making".

- 2.13 The NPPF offers a broad framework but does not afford a detailed methodology for assessments. Specific guidance for air quality continues to be provided by organisations such as the Department for Environment, Food and Rural Affairs (Defra), Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM).

National Planning Practice Guidance

- 2.14 Reference ID 32 (Air Quality) of the National Planning Practice Guidance (PPG)⁷ provides guiding principles on how planning can take account of the impact of new development on air quality. The PPG summarises the importance of air quality in planning and the key legislation relating to it.
- 2.15 As well as describing the importance of International, National and Local Policies (detailed elsewhere in this report), it summarises the key sources of air quality information. It also explains when air quality is likely to be relevant to a planning decision, stating:

“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; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; 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;*
-  *Have a potential adverse effect on biodiversity, especially where it would affect sites designated for their biodiversity value.”*

⁷ Planning Practice Guidance (PPG) 32. (2019). *Air Quality*. Available from: <http://planningguidance.planningportal.gov.uk/blog/guidance/air-quality/>.

- 2.16 Details are also provided of what should be included within an air quality assessment. Key considerations include:
- Baseline local air quality;
 - Whether the proposed development could significantly affect local air quality during construction/operation; and
 - Whether the development is likely to expose more people to poor air quality.
- 2.17 Examples of potential air quality mitigation measures are also provided in the PPG.

Local Planning Policy

- 2.18 The Arun Local Plan 2011-2031⁸ provides the local policy framework against which planning applications are assessed in the district. It contains policy of direct relevance to air quality and this assessment, including:

Policy QE SP1: Quality of the Environment

“The Council requires that all development contributes positively to the quality of the environment and will ensure that development does not have a significantly negative impact upon residential amenity, the natural environment or upon leisure and recreational activities enjoyed by residents and visitors to the District. [...]”

Policy QE DM3: Air Pollution

“All major development proposals will be required to assess the likely impacts of the development on air quality and mitigate any negative impacts by:

- a. Ensuring the development is located within easy reach of established public transport services;*
- b. Maximising provision for cycling and pedestrian facilities;*
- c. Encouraging the use of cleaner transport fuels on site, through the inclusion of electric car charging points; and*
- d. Contributing towards the improvement of the highway network where the development is predicted to result in increased congestion on the highway network.*

⁸ Arun District Council. (2018). *Arun Local Plan 2011-2031*.

Development proposed nearby any Air Quality Management Area (AQMA) declared within the District within the Plan period, will require an air quality assessment to identify likely impacts of development upon the designated area. Developers will be required to ensure delivery of the actions set out within any Air Quality Action Plan. [...]

Developments shall also be consistent with all other Local Plan policies."

3. Baseline Air Quality

- 3.1 This chapter is intended to establish baseline air quality conditions in the vicinity of the site.

Establishing Baseline Conditions

- 3.2 Baseline air quality conditions in the vicinity of the site are established through the compilation and review of appropriately sourced background concentration estimates and local monitoring data. This information provides context on existing air quality and local air quality trends.
- 3.3 Defra provides estimated background concentrations of the UKAQS pollutants at the UK Air Information Resource (UK-AIR) website⁹. These estimates are produced using detailed modelling tools and are presented as concentrations at central 1km² National Grid square locations across the UK. At the time of writing, the most recent background maps were from November 2024 and based on monitoring data from 2021.
- 3.4 Being background concentrations, the UK-AIR data are intended to represent a homogenous mixture of all emissions sources within the general area of a particular grid square location. Concentrations of pollutants at various sensitive receptor locations can, therefore, be calculated by modelling the emissions from a nearby pollution source, such as a busy road, and then adding this to the appropriate UK-AIR background datum.
- 3.5 Monitoring data from local pollutant monitoring networks are also considered an appropriate source for the purposes of describing baseline air quality. To this end, the most recent available data from ADC's *2025 Air Quality Annual Status Report (ASR)*¹⁰ have been included and referenced where relevant. Furthermore, given the close proximity of the application site to the boundary of CDC, data from CDC's most recently published ASR¹¹ has also been assessed where appropriate

UK-AIR Background Pollution

- 3.6 UK-AIR predicted annual mean background concentrations of NO₂, PM₁₀ and PM_{2.5} for 2021 to 2030 are presented in Table 3.1 below. These data were taken from the central grid square location closest to the application site (i.e. National Grid Reference: 488500, 098500).

9 Department for Environment, Food & Rural Affairs. (2024). *UK Air Information Resource Website*. (UK-AIR).

10 Arun District Council. (2025). *2025 Air Quality Annual Status Report (ASR)*.

11 Chichester District Council. (2025). *2025 Air Quality Annual Status Report*.

Table 3.1: Background Concentrations of Pollutants at the Application Site

Pollutant	Predicted Annual Mean Background Concentration ($\mu\text{g.m}^{-3}$)									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
NO ₂	7.3	7.1	7.0	6.8	6.6	6.4	6.2	6.0	5.8	5.6
PM ₁₀	11.3	11.2	11.1	11.0	10.9	10.8	10.7	10.7	10.6	10.5
PM _{2.5}	6.1	6.1	6.0	5.9	5.8	5.8	5.7	5.6	5.5	5.5

- 3.7 The data in Table 3.1 show that annual mean background concentrations of NO₂, PM₁₀ and PM_{2.5}, in the vicinity of the application site between 2021 and 2030 are predicted to be well below their respective annual mean AQSS.
- 3.8 The data show that in 2025, NO₂, PM₁₀ and PM_{2.5} concentrations are predicted to be below their respective AQSS by approximately 83.5%, 72.5% and 71% respectively. Therefore, annual mean background pollutant concentrations are likely to be below their respective AQSS at the site and in the surrounding area.
- 3.9 By the proposed development's projected completion year of 2030, background concentrations are predicted to decrease further. Additionally, background concentrations of PM_{2.5} are projected to be well below the 2028-based interim target of 12 $\mu\text{g.m}^{-3}$ outlined in the *Environmental Improvement Plan 2023*⁴ throughout the 2021 to 2030 period.
- 3.10 Concentrations of all pollutants are predicted to decline each year. These reductions in background pollutant concentrations are principally due to the forecast effect of the roll out of cleaner vehicles, but also due to local, UK national and international plans to reduce emissions across all sectors.

Local Sources of Monitoring Data

- 3.11 Local air quality monitoring is also considered an appropriate source of data for the purposes of describing baseline air quality. At the time of writing, the most recent ASRs^{10,11} released by ADC and CDC included local pollutant monitoring data from the year 2024.

Automatic Monitoring

NO₂

- 3.12 ADC do not undertake automatic (continuous) pollutant monitoring within their district. CDC undertook automatic (continuous) pollutant monitoring of NO₂ at two locations in 2024. The most recent available annual mean data from these automatic monitoring station are included in Table 3.2 below.

Table 3.2: NO₂ Monitoring Data from CDC's Automatic Monitoring Stations

Monitor	Type	Distance to site (km)	Annual mean NO ₂ concentration (µg.m ⁻³)				
			2020	2021	2022	2023	2024
CI1	S	5.7	23.0	24.0	22.4	20.4	20.2
CI5	R	6.8	19.0	23.0	23.5	21.5	19.1

Note: "S" = Suburban; "R" = Roadside.

- 3.13 The data presented in Table 3.2 show that annual mean concentrations of NO₂ recorded at both automatic monitoring stations were consistently below the 40 µg.m⁻³ AQS between 2020 and 2024.
- 3.14 In 2024, CI1, a suburban monitor located near Chichester's Stockbridge Roundabout, recorded an annual mean NO₂ concentration of 20.2 µg.m⁻³; below the 40 µg.m⁻³ AQS for NO₂ by 49.5%.

PM₁₀

- 3.15 CDC undertook automatic (continuous) monitoring of PM₁₀ at one location in 2024. The most recent available annual mean data from this automatic monitoring station has been included in Table 3.3 below.

Table 3.3: PM₁₀ Monitoring Data from CDC's Automatic Monitoring Stations

Monitor	Type	Distance to site (km)	Annual mean PM ₁₀ concentration (µg.m ⁻³)				
			2020	2021	2022	2023	2024
CI1	S	5.7	18.0	20.0	23.6	-	14.9

Note: "S" = Suburban.

- 3.16 The data presented in Table 3.3 show that annual mean concentrations of PM₁₀ recorded at automatic monitoring station CI1 were consistently below the 40 µg.m⁻³ AQS between 2020 and 2024.
- 3.17 In 2024, CI1 recorded an annual mean PM₁₀ concentration of 14.9 µg.m⁻³; below the 40 µg.m⁻³ AQS by approximately 63%.

PM_{2.5}

- 3.18 CDC undertook automatic (continuous) monitoring of PM_{2.5} at one location in 2024. The annual mean concentration of PM_{2.5} recorded at automatic monitoring station CI1 was below the 20 µg.m⁻³ AQS in 2024 by 58.5%. The measured annual mean concentration was also below the 2028-based interim target of 12 µg.m⁻³, established in the *Environmental Improvement Plan 2023*⁴, by approximately 31%.

Non-Automatic Monitoring

- 3.19 ADC and CDC operate non-automatic, diffusion tube networks to monitor NO₂ concentrations in strategic locations across the districts.

- 3.20 The most recent available annual mean NO₂ monitoring data for diffusion tubes located within 5km of the application site are presented in Table 3.4 below.

Table 3.4: Monitoring Data from ADC's NO₂ Diffusion Tubes

Monitor	Type	Distance to Site (km)	Annual Mean NO ₂ Concentration (µg.m ⁻³)				
			2020	2021	2022	2023	2024
37	S	0.6	-	-	-	11.0	10.4
21	R	4.5	19.2	21.2	24.6	22.8	20.1
12	R	4.6	17.8	19.6	23.4	21.5	19.0
27	UC	4.6	14.8	15.0	18.7	16.7	15.1

Note: "S" = Suburban; "R" = Roadside; "UC" = Urban Centre.

- 3.21 The data in Table 3.4 show that annual mean concentrations of NO₂ recorded at diffusion tubes within 5km of the site were consistently below the 40 µg.m⁻³ annual mean AQS between 2020 and 2024.
- 3.22 The closest diffusion tube to the site, 37, is positioned 0.7m from the kerb of Pagham Road. The tube is located approximately 0.6km south of the application site. In 2024, this diffusion tube recorded an annual mean NO₂ concentration of 10.4 µg.m⁻³; approximately 74% below the 40 µg.m⁻³ annual mean AQS.

Summary

- 3.23 UK-AIR background concentrations and local air quality monitoring results in the vicinity of the application site have been well below relevant AQSs in recent years, suggesting that concentrations of NO₂, PM₁₀ and PM_{2.5} across the application site are also likely to be below relevant AQSs.

4. Assessment Methodology

Guidance

- 4.1 Defra's latest Local Air Quality Management Technical Guidance (LAQM(TG22))¹² was followed in carrying out the assessment.
- 4.2 The IAQM's latest *Guidance on the assessment of dust from demolition and construction*¹³ was also used to assess the risk of dust emissions during the construction phase of the proposed development.
- 4.3 The Greater London Authority's (GLA) Supplementary Planning Guidance on *The Control of Dust and Emissions During Construction and Demolition*¹⁴ has also been referred to, which is considered best practice guidance for the UK. It details a number of mitigation measures that should be adopted to minimise adverse impacts from dusts and fine particles.
- 4.4 The latest EPUK & IAQM guidance on *Planning for Air Quality*¹⁵ was also referred to throughout the assessment. The criteria used to describe operational phase air quality impacts were derived from this guidance, and have been included in Appendix A.
- 4.5 ADC is a member of the Sussex-Air partnership, and therefore the *Air Quality and Emissions Mitigation Guidance for Sussex* (2021) (AQEMGFS)¹⁶ has been followed when undertaking the emissions mitigation assessment and discussing potential mitigation measures, where required.

Construction Phase

- 4.6 The construction phase of the proposed development will involve a number of activities that could potentially produce polluting emissions to air. Predominantly, these will be emissions of dust. However, they could also include releases of odours and/or more harmful gases and particles.

12 Department for Environment, Food & Rural Affairs. (2022). Part IV of the Environment Act 1995 as amended by the Environment Act 2021. Environment (Northern Ireland) Order 2002 Part III. Local Air Quality Management Technical Guidance (TG22).

13 Institute of Air Quality Management. (2024). *Guidance on the assessment of dust from demolition and construction*.

14 Greater London Authority. (2014). *The Control of Dust and Emissions During Construction and Demolition*.

15 Environmental Protection UK & Institute of Air Quality Management. (2017). *Land-Use Planning & Development Control: Planning for Air Quality*.

16 Sussex-Air. (2021). *Air Quality and Emissions Mitigation Guidance for Sussex*.

- 4.7 The IAQM's latest guidance to assess the impacts of construction on human and ecological receptors has been followed in carrying out this air quality assessment. The guidance suggests that where a receptor is located within 250m (50m for statutory ecological receptors) of a site boundary and/or 50m of a route used by construction vehicles, up to 250m from the site entrance, a full dust risk assessment should be undertaken.
- 4.8 High sensitivity receptors are considered particularly sensitive when located within 20m of a works area. Figure 2 shows the area, and key receptors, that could be sensitive to dust that are located within 250m of the site boundary.
- 4.9 The Multi Agency Geographic Information for the Countryside (MAGIC) website¹⁷, which incorporates Natural England's interactive maps, has been reviewed to identify whether any statutory sensitive ecological receptors are situated within 50m of the site boundary or within 50m of any routes used by construction vehicles on the public highway, up to 250m from the site entrance.

Construction Significance

- 4.10 The IAQM guidance¹³ suggests that demolition, earthworks, construction and trackout should all be assessed individually to determine the overall significance of the construction phase.
- 4.11 In the IAQM dust guidance, the first step in assessing the risk of impacts is to define the potential dust emission magnitude. This can be considered 'Negligible', 'Small', 'Medium' or 'Large' for each of the construction stages. Whilst the IAQM provides examples of criteria that may be used to assess these magnitudes, the vast number of potential variables mean that every site is different and therefore professional judgement must be applied by what the IAQM refer to as a "technically competent assessor". The construction phase assessment therefore relies on the experience of the appraiser.
- 4.12 As such, attempts to define precisely what constitutes a *Negligible*, *Small*, *Medium* or *Large* dust emission magnitude should be treated with caution. Factors such as the scale of the work, both in terms of size and duration, the construction materials and the plant to be used must be considered.
- 4.13 The second step is to define the sensitivity of the area around the construction site. As stated in the IAQM guidance:

"the sensitivity of the area takes account of a number of factors:

-  *the specific sensitivities of receptors in the area;*
-  *the proximity and number of those receptors;*

17 Natural England and MAGIC partnership organisations. Multi Agency Geographic Information for the Countryside. Available from: <http://www.magic.gov.uk/> [Accessed October 2025].

- *in the case of PM₁₀, the local background concentrations; and*
- *site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust."*

- 4.14 Based on these factors, the area is categorised as being of 'Low', 'Medium' or 'High' sensitivity.
- 4.15 When dust emission magnitudes for each stage and the sensitivity of the area have been defined, the risk of dust impacts can be determined. The IAQM provides a risk of impacts matrix for each construction stage. The overall significance for the construction phase can then be judged from the stages assessed. Again, this is subject to professional judgement.
- 4.16 Combustion exhaust gases from diesel-powered plant and construction vehicles accessing the site will also be released. However, the volumes and periods over which these releases will occur are unlikely to result in any long-term impacts on local air quality and therefore this has been scoped out of the assessment.

Operational Phase

Pollutant Sources

- 4.17 Vehicle emissions will arise from the combustion of fossil fuels in vehicle engines and their subsequent release to atmosphere via tailpipe exhausts. The most significant pollutants released by cars and other vehicles are oxides of nitrogen (NO₂ / NO_x) and particulate matter (PM₁₀ and PM_{2.5}). Releases of carbon monoxide (CO) and some volatile hydrocarbons (e.g. benzene and 1,3-butadiene) are of less significance and are not considered further in this assessment.
- 4.18 As it is elevated annual mean concentrations of NO₂ and PM₁₀ that have resulted in the declaration of most AQMAs across the UK, these are the pollutants of most concern, and they have therefore been the focus of this air quality assessment. PM_{2.5}, which is another fraction of particulate matter, has also been considered.
- 4.19 Other (background) air pollutant sources contribute to local pollution. These include emissions from domestic, commercial, industrial, marine, or transboundary sources. These emissions are accounted for in this assessment within the background concentration estimates.

Background Concentrations

- 4.20 Background pollutant concentrations used in this assessment were obtained from the latest available UK-AIR background concentrations. The background concentrations were obtained from each individual 1km² UK-AIR grid square in which each discrete modelled receptor point is located.

ADMS-Roads Assessment

- 4.21 The latest EPUK & IAQM planning guidance¹⁵ provides indicative thresholds for changes in traffic flows which would require a detailed (dispersion modelling) air quality assessment to be undertaken.
- 4.22 When within, or adjacent to, an AQMA, these are a change in 24-hour Annual Average Daily Traffic (AADT) flows exceeding 100 Light-duty Vehicles (LDVs) and/or 25 Heavy-duty Vehicles (HDVs). When not within, or adjacent to, an AQMA these are a change in 24-hour AADT flows exceeding 500 LDVs and/or 100 HDVs. Changes below these thresholds can be reasonably considered to have an insignificant impact on local air quality, without the need for further assessment.
- 4.23 As the application site is not located within or near an AQMA, the 500 LDV and/or 100 HDV thresholds are applicable.
- 4.24 Traffic data provided by Highgate Transportation Ltd, the transport consultants for the project, indicate that the proposed development will generate AADT flows exceeding 500 LDVs (AADT) on Pagham Road between Summer Lane and Nyetimber Lane.
- 4.25 As existing highly sensitive residential receptors are located along this section of road, a detailed dispersion modelling assessment has been undertaken to assess the impact of scheme-generated traffic emissions on existing air quality along this stretch of road.
- 4.26 Further details regarding the traffic data used in this assessment are provided in Appendix B.

Model Specification

- 4.27 In order to assess the scheme's traffic-related air quality impacts, emissions from vehicles travelling on local roads have been assessed using a detailed dispersion model.
- 4.28 The model used was ADMS-Roads (version 5.1.0.2), which is produced by Cambridge Environmental Research Consultants (CERC) Limited and has been validated and approved by Defra for use as an assessment tool for calculating the dispersion of pollutants from traffic on UK roads. The latest Defra Emissions Factor Toolkit (version 13.1)¹⁸ was used to estimate vehicle emissions within the model. Details on model inputs are provided in Appendix B.

¹⁸ Defra. (2025). *Emissions Factor Toolkit (v13.1)*.

Meteorological Data

- 4.29 Detailed, hourly sequential, meteorological data are used by the model to determine pollutant transportation and levels of dilution by the wind and vertical air movements. Meteorological data used in the model were obtained from the Thorney Island meteorological station for 2024, as it was considered to provide the most representative data of similar conditions to the site and the surrounding area. The wind rose for this meteorological dataset is provided in Figure 3.
- 4.30 A surface roughness of 0.02m was applied to the Thorney Island meteorological station to represent its sparse rural coastal position, whilst a surface roughness of 0.5m was applied to the study area within the application site model, to reflect its more urban landscape.

Modelled Receptors

- 4.31 Discrete model receptors were positioned at the façades of existing sensitive receptors along Pagham Road. The sensitive receptor locations selected for use within this assessment were those highly sensitive uses in the local area situated closest to pollution sources (i.e. residences close to relevant roads). Receptors are, therefore, positioned in worst-case locations, for a conservative approach.
- 4.32 Receptors were modelled at “breathing height”, which is, by convention, 1.5m above ground level. Sensitive receptors modelled within this assessment are displayed in Figure 4, with details provided in Table 4.1, below.

Table 4.1: Modelled Receptors

Receptor ID	Details	Height (m)	UK Grid Reference	
			X	Y
1	Residence on Summer Lane	1.5	489123	98405
2	Residence on Pagham Road	1.5	489156	98424
3	Residence on Pagham Road	1.5	489146	98448
4	Residence on Pagham Road	1.5	489166	98455
5	Residence on Nyetimber Lane	1.5	489192	98527

Assessment Scenarios

- 4.33 Traffic data used within this assessment were provided in 24-hour AADT format for the proposed development’s predicted opening year (2030) and a 2024 baseline year. Road links modelled within this assessment are displayed in Figure 4, with model inputs, including traffic data and emission factors, provided in Appendix B.
- 4.34 The following scenarios were assessed:
- 🌿 2024 Baseline
 - 🌿 2030 Without Proposed Development; and

 2030 With Proposed Development.

Model Verification

- 4.35 It is recommended, following guidance set out in LAQM(TG22)¹², that the model results be compared with measured data to determine whether they need adjusting to reflect local air quality conditions more accurately. This process is known as verification and reduces the uncertainty associated with local effects on pollution dispersion and allows the model results to be more site-specific.
- 4.36 According to LAQM(TG22), no adjustment of the model is necessary where all modelled results lie within 25% of the concentrations monitored at local measurement sites.
- 4.37 A full model verification study has been undertaken using monitoring data from LDC's local air quality monitoring network. Full details of this model verification study are included in Appendix C. The model was found to under-predict NO₂ concentrations at local monitoring sites, which is not unusual and is likely the result of localised dispersion characteristics. To obtain more locally accurate results, an adjustment factor of 2.4 was applied to the model results.
- 4.38 Root Mean Square Error (RMSE) is used to define the average error or uncertainty of the model. According to LAQM(TG22), the RMSE should ideally be within 10% of the relevant AQS but is acceptable where it is within 25% of the AQS. The model verification process resulted in an RMSE of 2.0 µg.m⁻³, which is equivalent to 5% of the 40 µg.m⁻³ AQS for NO₂ and is therefore within the ideal 10% range.

Model Uncertainty

- 4.39 There are a number of inherent uncertainties associated with the air quality assessment process, including:
-  Model uncertainty – due to model formulations;
 -  Data uncertainty – due to inaccuracies in input data, including emissions estimates, background estimates and meteorology; and
 -  Variability – randomness of measurements used.
- 4.40 Using a validated air quality model such as ADMS-Roads, as well as undertaking model verification, takes into account much of this uncertainty. In addition, the most detailed available input data have been used and reviewed to ensure accuracy.
- 4.41 Defra's latest EFT (version 13.1)¹⁸ for road transport provides forecasts of NO_x, PM₁₀ and PM_{2.5} emissions up to 2031. This is widely used as an input for dispersion models such as ADMS-Roads, to estimate future pollutant concentrations close to new developments.

- 4.42 The latest version of the EFT was released in April 2025 and is expected to provide a far more reasonable match for real-world emissions in the current UK vehicle fleet than previous versions; however, it should be noted that there remains uncertainty regarding future emissions from the vehicle fleet.
- 4.43 To adequately account for this uncertainty when predicting future pollutant concentrations, the precautionary principle has been followed, and a conservative approach has been taken to the assessment as a whole.
- 4.44 Therefore, vehicle emission factors and background concentrations for 2024 have been used to predict pollutant concentrations in the development's projected opening year of 2030. The model assumes that there will be no improvement in vehicle fleet emissions or baseline air quality over the coming years, despite the decreasing trends in background pollutant concentrations evidenced by the data presented in Table 3.1, so is representative of a worst-case scenario.

Emissions Mitigation Assessment

- 4.45 Sussex-Air's AQEMGFS¹⁶ advocates that an Emissions Mitigation Assessment (EMA) should be undertaken to outline how air quality impacts from development emissions can be minimised.
- 4.46 The purpose of an EMA is to determine an 'appropriate scale and kind' of mitigation required from a development. An EMA sets out a methodology to assess the impact of a development's emissions on air quality and provides an approach to mitigating emissions for developments, even those which have no significant impact on local air quality.
- 4.47 As the proposed development is classified as a '*major*' development according to the Sussex AQEMGFS¹⁶, an EMA with a damage cost calculation was required. The damage cost calculation was undertaken following the Sussex AQEMGFS and Defra's latest *Damage Cost guidance*¹⁹. The latest Defra *Air Quality Damage Cost Appraisal Toolkit*²⁰ was utilised in the assessment.

Damage Cost Calculation

- 4.48 The emissions calculation utilised the latest Defra *Emissions Factors Toolkit* (EFT)¹⁸ to determine the total transport related emissions (NO_x & PM_{2.5}) that would be generated by the proposed development.

¹⁹ Defra. (2023). *Air quality appraisal: damage cost guidance*. Available from: <https://www.gov.uk/government/publications/assess-the-impact-of-air-quality/air-quality-appraisal-damage-cost-guidance>

²⁰ Defra. (2023). *Damage Cost Appraisal Toolkit*.

- 4.49 Defra provides 'damage costs', which are set of impact values, defined per tonne of pollutant for use in this calculation. Damage costs estimate the societal costs associated with changes in pollutant emissions and are then combined with the forecasted emissions changes to provide an approximate valuation of the cost (or benefit) to society caused by a development's associated traffic emissions.
- 4.50 Defra's Appraisal Toolkit²⁰, which incorporates the latest damage cost values, was used in the calculation. The principal of the calculation is summarised in the equation below:

$$EFT\ output \times Damage\ costs \times 5\ years = 5\ year\ exposure\ cost\ value\ (in\ £)$$

- 4.51 As a number of the inputs are based on assumptions, the resulting figure should be treated with caution, but it can be used to give an idea of the scale of a development in terms of total generated transport emissions and therefore a gauge of what level of mitigation might be appropriate.
- 4.52 It is usual for costs established in this way to be apportioned to low emission measures associated with a proposed development. In doing this it should be possible for damage costs to be offset.

5. Construction Phase Impacts

- 5.1 The construction phase of the proposed development will involve a number of activities that could produce polluting emissions to air. Predominantly, these will be emissions of dust.
- 5.2 The estimates for the dust emission magnitude for demolition, earthworks, construction and trackout below are based on the professional experience of Phlorum's consultants, information provided by the client and Google Earth imagery.

Dust Emission Magnitude

Demolition

- 5.3 As the site is currently a greenfield site with no existing structures, demolition will not be required. Therefore, the demolition phase is not considered further within this assessment.

Earthworks

- 5.4 The total site area is approximately 7.5 hectares, which falls within the IAQM's¹³ *Medium* dust emission magnitude category for earthworks.
- 5.5 It is estimated that between 5 and 10 heavy earth-moving vehicles are likely to operate on site at any one time, also falling within the IAQM's *Medium* dust emission magnitude category.
- 5.6 Considering the above, the overall dust emission magnitude for the earthworks phase is considered to be *Medium*, with reference to the IAQM guidance¹³.

Construction

- 5.7 During construction, activities that have the potential to cause emissions of dust may include concrete batching and sandblasting. Localised use of cement powder and general handling of construction materials also have the potential to generate dust emissions, as does the effect of wind-blow from stockpiles of friable materials. Piling is expected to occur on site during construction.
- 5.8 Construction materials to be used are expected to include timber framework, masonry construction, concrete and brick. Some of these materials have a *Medium* potential for dust release.
- 5.9 The volume of new structures to be constructed at the site is between 12,000 and 75,000m³, thereby falling into the IAQM's *Medium* dust emission magnitude category.

- 5.10 Therefore, the overall dust emission magnitude for the construction phase is considered to be *Medium* with reference to the IAQM guidance.

Trackout

- 5.11 Construction traffic, when travelling over soiled road surfaces, has the potential to generate dust emissions and to also add soil to the local road network. During dry weather, soiled roads can lead to dust being emitted due to physical and turbulent effects of vehicles.
- 5.12 During construction, it is anticipated that fewer than 20 heavy-duty vehicles would access the site per day, falling within the IAQM's *Small* dust emission magnitude category for trackout.
- 5.13 Unpaved road surfaces might be utilised by construction vehicles accessing the site, with the roads comprised of potentially dusty surface material; it is assumed that this would fall into the IAQM's *Medium* dust emission magnitude category.
- 5.14 Taking the above into consideration, the overall dust emission magnitude for the trackout phase is considered to be *Medium* with reference to the IAQM guidance.

Emission Magnitude Summary

- 5.15 A summary of the dust emission magnitude as a result of the activities of Earthworks, Construction and Trackout as specified in the IAQM guidance, and discussed above, are listed in Table 5.1 below.

Table 5.1: Dust Emission Magnitude for the Construction Activities, Based on the IAQM's Guidance.

Activity	Dust Emission Magnitude
Earthworks	Medium
Construction	Medium
Trackout	Medium

Sensitivity of the Area

- 5.16 Having established the emission magnitudes for each phase above, the sensitivity of the area must be considered to establish the significance of effects. The effect of dust emissions depends on the sensitivity of each receptor.
- 5.17 High sensitivity human receptors include residential dwellings, schools, and hospitals, but can also include locations such as car showrooms when considering the impacts of dust soiling.

- 5.18 The impacts of dust emissions from the sources discussed above have the potential to cause an annoyance to human receptors living in the local area. Within distances of 20m of the site boundary there is a high risk of dust impacts, regardless of the prevailing wind direction. Up to 100m from the construction site, there may still be a high risk, particularly if the receptor is downwind of the dust source.
- 5.19 With the exponential decline in dust concentrations with distance from dust generating activities, it is considered that for receptors more than 250m from the site boundary, the risk is negligible. Furthermore, the risks at over 100m only have the potential to be significant in certain weather conditions, e.g. downwind of the source during dry periods. Figure 2 shows the area located within 250m of the boundary of the application site that could be sensitive to dust soiling effects.
- 5.20 The approximate number of high sensitivity human receptors in the vicinity of the site are detailed in Table 5.2 below.

Table 5.2: Number of High Sensitivity Receptors Within 250m of the Site

Distance to Site (m)	Number of Receptors	Receptor Details
<20	45	Residential Dwellings
<50	100	Residential Dwellings
<100	>150	Residential Dwellings
<250	>300	Residential Dwellings

- 5.21 Figure 3 shows that the predominant wind direction at the closest relevant meteorological station at Thorney Island (2024) is from the south-west. There are multiple sensitive receptors located downwind in the prevailing wind direction within 20m of the site boundary, as detailed in Table 5.2. Therefore, the sensitivity of the area to dust soiling impacts can be defined as *High* with reference to the IAQM guidance¹³.
- 5.22 As presented in Table 3.1, UK-AIR predicted annual mean concentrations of PM₁₀ are below 24.0 µg.m⁻³ within the vicinity of the site between 2021 and 2030, indicating that PM₁₀ concentrations in the vicinity of the site and the surrounding area are likely to be below 24 µg.m⁻³, which represents the IAQM's threshold for an area to be considered *Low Sensitivity* for PM₁₀ related human health effects²¹. Therefore, the sensitivity of the area to human health impacts is defined as *Low* with reference to the IAQM guidance¹³.

21 The 24.0 µg.m⁻³ 'threshold' is taken from Table 3 of the IAQM's construction dust guidance. This threshold, along with the number of receptors, their sensitivity, and their distance from source (construction site), helps establish the sensitivity of an area in terms of potential human health impacts from exposure to PM₁₀. According to the guidance, baseline annual mean PM₁₀ concentrations below 24.0 µg.m⁻³ indicate that the sensitivity of the area in terms of human health impacts is *Low* in all cases except when there are a large number (>100) of highly sensitive receptors within 20m of the construction site.

- 5.23 Review of the MAGIC website¹⁷, which incorporates Natural England's interactive maps, has identified no statutory ecological receptors within 50m of the site, or 50m of roads to be used by construction traffic, up to 250m from the site entrance. The closest statutory ecological receptor to the application site is the Pagham Harbour Ramsar, SPA, SSSI and LNR, located approximately 0.7km to the southwest of the site boundary. Therefore, based on distance alone, the construction of the proposed development can be considered to have a *Negligible* impact on local ecological sites.

Risk of Impacts

- 5.24 Having established the potential dust emission magnitudes and sensitivity of the area, the risk of impacts can be determined in accordance with the IAQM guidance. These are summarised in Table 5.3 below.

Table 5.3: Summary of Dust Impact Risk by Construction Stage

Stage	Dust Impact Risk		
	Nuisance Dust	PM ₁₀ Health Effects	Ecological Impacts
Earthworks	Medium Risk	Low Risk	Negligible
Construction	Medium Risk	Low Risk	Negligible
Trackout	Medium Risk	Low Risk	Negligible

- 5.25 Overall, the proposed development is considered to be *Medium Risk* for nuisance dust soiling effects, *Low Risk* for PM₁₀ health effects and *Negligible Risk* for ecological impacts, in the absence of mitigation.

Site Specific Mitigation

- 5.26 The GLA guidance¹⁴ suggests a number of mitigation measures that should be adopted in order to minimise impacts from dusts and fine particles. Appropriate measures that could be included during construction of the proposed development include:
- 🌱 ideally cutting, grinding and sawing should not be conducted on-site and pre-fabricated material and modules should be brought in where possible;
 - 🌱 where such work must take place, water suppression should be used to reduce the amount of dust generated;
 - 🌱 skips, chutes and conveyors should be completely covered and, if necessary, enclosed to ensure that dust does not escape;
 - 🌱 no burning of any materials should be permitted on site;

- any excess material should be reused or recycled on-site in accordance with appropriate legislation;
 - developers should produce a waste or recycling plan;
 - following earthworks, exposed areas and soil stockpiles should be re-vegetated to stabilise surfaces, or otherwise covered with hessian or mulches;
 - stockpiles should be stored in enclosed or bunded containers or silos and kept damp where necessary;
 - hard surfaces should be used for haul routes where possible;
 - haul routes should be swept/washed regularly;
 - vehicle wheels should be washed on leaving the site;
 - all vehicles carrying dusty materials should be securely covered; and
 - delivery areas, stockpiles and particularly dusty items of construction plant should be kept as far away from neighbouring properties as possible.
- 5.27 In addition, the IAQM lists recommended mitigation measures for low, medium and high Dust Impact Risks. The highly recommended mitigation measures for *Medium Risk* sites are included in Appendix D of this report.
- 5.28 Where dust generation cannot be avoided in areas close to neighbouring properties, additional mitigation measures should be put in place, such as: windbreaks, sprinklers, and/or time/weather condition limits on the operation of some items of plant or the carrying out of activities that are likely to generate a particularly significant amount of dust.

Residual Effects

- 5.29 After the implementation of the mitigation measures listed above and in Appendix D, the significance of each phase of the construction programme will be reduced and the residual significance of impact for the construction phase is expected to be *Negligible*.

6. Operational Phase

Assessment of Site Suitability

- 6.1 The application site is located in a rural area at the far western end of Summer Lane. As a consequence, the site is well distanced from all local pollutant sources, and air pollutant concentrations at the application site are likely to be similar to the locally monitored background concentrations presented in Section 3 of this report.
- 6.2 At CDC's suburban automatic monitoring station, CI1, annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} were all at least 49% below their respective AQSs. At ADC's suburban diffusion tube 37, located 0.6km to the south on Pagham Rd, 2024 NO₂ concentrations were monitored to be even further below the annual mean AQS.
- 6.3 Defra's UK-AIR estimates for the 1km grid square in which the site is located also suggest that pollutant concentrations will be well below the thresholds across the application site.
- 6.4 As such, it is reasonable to anticipate that this site will be suitable for the introduction of new, sensitive residential receptors.

Air Quality Impacts at Existing Local Receptors

- 6.5 The proposed development is expected to generate volumes of traffic above traffic thresholds prescribed by the EPUK & IAQM guidance¹⁵ on Pagham Road, between Summer Lane and Nyetimber Lane.
- 6.6 Therefore, the air quality impacts of traffic generated by the proposed development at existing sensitive receptors located on this road were assessed using a detailed atmospheric dispersion model (ADMS-Roads). Results from the ADMS-Roads assessment are presented in Tables 6.1, 6.2 and 6.3 below. Modelled road links and receptor locations are displayed in Figure 4, with further details of the receptor locations modelled in this assessment provided in Table 4.1.

Nitrogen dioxide (NO₂)

- 6.7 Modelled annual mean NO₂ concentrations at local existing receptors located on the closest façades of existing sensitive uses to the adjacent road network, are shown in Table 6.1 below.

Table 6.1: Predicted Annual Mean Concentrations of NO₂

Receptor	Annual Mean NO ₂ Concentration (µg.m ⁻³)			Change due to Proposed Development		
	2024 Baseline	2030 Without Development	2030 With Development	µg.m ⁻³	As a % of the AQS	EPUK & IAQM Significance
1	9.4	10.7	11.2	0.6	1.4%	Negligible
2	14.0	19.9	20.9	0.9	2.3%	Negligible
3	13.1	18.3	19.2	0.8	2.1%	Negligible
4	10.5	13.2	13.7	0.4	1.1%	Negligible
5	12.1	14.6	15.2	0.6	1.6%	Negligible

Note: Any discrepancies are due to rounding.

- 6.8 The data in Table 6.1 show that modelled annual mean concentrations of NO₂ are predicted to be well below the 40 µg.m⁻³ AQS at all modelled receptors.
- 6.9 The highest predicted annual mean NO₂ concentration is 20.9 µg.m⁻³ at Receptor 2 (residence on Pagham Road), which is below the 40 µg.m⁻³ AQS for NO₂ by approximately 48%.
- 6.10 For the hourly AQS for NO₂ (200 µg.m⁻³ not to be exceeded more than 18 times per year), LAQM(TG22)¹² states that if the annual mean NO₂ concentration is below 60 µg.m⁻³, this AQS should be met. The data in Table 6.1 show that all modelled annual mean NO₂ concentrations are well below this threshold at all assessed receptor locations, and therefore it is anticipated that the hourly AQS would be achieved.
- 6.11 The largest predicted change in annual mean NO₂ concentrations due to the operation of the proposed development is 0.9 µg.m⁻³, at Receptor 2 (a change of 2.3% with respect to the 40 µg.m⁻³ AQS).
- 6.12 Modelled increases in annual mean NO₂ concentrations predicted at all existing receptors are considered to be *Negligible* with reference to the EPUK & IAQM impact descriptors, as included in Appendix A.

Particulate Matter (PM₁₀ and PM_{2.5})

- 6.13 Modelled results for annual mean PM₁₀ concentrations are presented in Table 6.2 below.

Table 6.2: Predicted Annual Mean Concentrations of PM₁₀

Receptor	Annual Mean PM ₁₀ Concentration (µg.m ⁻³)			Change due to Proposed Development		
	2024 Baseline	2030 Without Development	2030 With Development	µg.m ⁻³	As a % of the AQS	EPUK & IAQM Significance
1	10.8	11.3	11.4	0.2	0.4%	Negligible
2	12.5	14.9	15.3	0.4	1.0%	Negligible

Receptor	Annual Mean PM ₁₀ Concentration (µg.m ⁻³)			Change due to Proposed Development		
	2024 Baseline	2030 Without Development	2030 With Development	µg.m ⁻³	As a % of the AQS	EPUK & IAQM Significance
3	12.2	14.2	14.6	0.3	0.8%	Negligible
4	11.2	12.2	12.4	0.2	0.4%	Negligible
5	11.7	12.6	12.8	0.2	0.5%	Negligible

Note: Any discrepancies are due to rounding.

- 6.14 The data in Table 6.2 show that modelled annual mean PM₁₀ concentrations are predicted to be well below the 40 µg.m⁻³ AQS for PM₁₀ at all existing receptors.
- 6.15 The highest predicted annual mean PM₁₀ concentration is 15.3 µg.m⁻³ at Receptor 2; below the 40 µg.m⁻³ AQS by approximately 62%.
- 6.16 The largest predicted change in annual mean PM₁₀ concentration due to the operation of the proposed development is 0.4 µg.m⁻³, at Receptor 2L (a change of 1.0% with respect to the 40 µg.m⁻³ AQS).
- 6.17 Modelled increases in annual mean PM₁₀ concentrations predicted at all existing receptors are considered to be *Negligible* with reference to the EPUK & IAQM impact descriptors, as included in Appendix A.
- 6.18 For PM₁₀, the following equation can be used to derive the number of days that the daily mean AQS of 50 µg.m⁻³ (not to be exceeded more than 35 times per year) is likely to be exceeded:

$$\text{No. 24 hour exceedances} = -18.5 + 0.00145 \times \text{annual mean}^3 + \left(\frac{206}{\text{annual mean}} \right)$$

- 6.19 Using this equation, an annual mean PM₁₀ concentration of more than 32 µg.m⁻³ would likely result in an exceedance of the short-term AQS. The data in Table 6.5 show that annual mean PM₁₀ concentrations predicted at all existing receptors are comfortably below 32 µg.m⁻³, and therefore it is not likely that the short-term AQS for PM₁₀ would be exceeded.
- 6.20 Modelled results for annual mean PM_{2.5} concentrations are displayed in Table 6.3 below.

Table 6.3: Predicted Annual Mean Concentrations of PM_{2.5}

Receptor	Annual Mean PM ₁₀ Concentration (µg.m ⁻³)			Change due to Proposed Development		
	2024 Baseline	2030 Without Development	2030 With Development	µg.m ⁻³	As a % of the AQS	EPUK & IAQM Significance
1	6.6	6.9	7.0	0.1	0.4%	Negligible
2	7.5	8.8	9.0	0.2	1.0%	Negligible
3	7.4	8.4	8.6	0.2	0.9%	Negligible
4	6.9	7.4	7.5	0.1	0.4%	Negligible

Receptor	Annual Mean PM ₁₀ Concentration (µg.m ⁻³)			Change due to Proposed Development		
	2024 Baseline	2030 Without Development	2030 With Development	µg.m ⁻³	As a % of the AQS	EPUK & IAQM Significance
5	7.1	7.5	7.7	0.1	0.6%	Negligible

Note: Any discrepancies are due to rounding.

- 6.21 The data in Table 6.3 show that modelled annual mean PM_{2.5} concentrations are predicted to be well below the 20 µg.m⁻³ AQS at all modelled receptors scenarios.
- 6.22 The highest predicted annual mean PM_{2.5} concentration is 9.0 µg.m⁻³ at Receptor 2; below the 20 µg.m⁻³ AQS for PM_{2.5} by approximately 55%.
- 6.23 Additionally, the data indicate that concentrations of PM_{2.5} at existing receptor locations are expected to be below the 2028-based interim target of 12 µg.m⁻³, established in the *Environmental Improvement Plan 2023*⁴.
- 6.24 The largest predicted change in annual mean PM_{2.5} concentration due to the operation of the proposed development is 0.2 µg.m⁻³ predicted at Receptor 2 (a change of 1.0% with respect to the 20 µg.m⁻³ AQS).
- 6.25 Modelled increases in annual mean PM_{2.5} concentrations at all existing receptors are considered to be *Negligible* with reference to the EPUK & IAQM impact descriptors detailed in Appendix A.
- 6.26 Overall, there are no predicted exceedances of the long-term or short-term AQSs for NO₂, PM₁₀ or PM_{2.5} at any modelled existing receptor locations.

7. Emissions Mitigation Assessment

Damage Cost Calculation

7.1 Following the 2023 update to Defra's Damage Cost Calculation guidance¹⁹, the damage cost calculation below has been carried out to estimate the value of the impact of NO_x and PM_{2.5} emitted as a result of traffic generated by the proposed development. Defra's 2023 update of the calculation puts greater emphasis on PM_{2.5} as it is deemed to have greater health implications.

7.2 To evaluate the scale of a proposed development's total emissions, Defra recommends a damage cost calculation using the following formula:

$$\text{Road Transport Emission Increase (Cost, £)} =$$

$$\text{Estimated trip rate for 5 years} \times \text{Emission Rate/10km/vehicle type} \times \text{Damage Costs}$$

7.3 The latest Defra Emissions Factor Toolkit was used to determine the total transport related emissions that would be generated by the proposed development; the inputs used in the calculation are shown in Table 7.1, below. 2030 is the anticipated opening year of the proposed development, so the five-year period used in the calculation runs from 2030 to 2034 inclusive.

Table 7.1: Calculation Inputs

Input	Value	Unit	Source/guidance
Trip Length	10	km	AQEMGFS
Development Traffic Flow	643 LDVs	AADT	Traffic Data provided by the transport consultants for the project
EFT Road Type	Urban (not London)	-	EFT
EFT Year	2030 – 2034	-	In line with EFT estimates
Average Speed	50	km.hr ⁻¹	AQEMGFS
Appraisal period	5	years	AQEMGFS

7.4 The total emission 'damage' cost was calculated using Defra's appraisal toolkit with details presented in Tables 7.2 and 7.3 below.

7.5 The calculation accounts for an 'uplift factor' of 2% cumulatively per annum and a 'discount rate', in line with the latest 2023 guidance¹⁹. Central estimate damage costs for 'Road Transport Urban Medium' were based on Defra 2025 prices.

Table 7.2: Damage Cost Calculation for NO_x

	2030	2031	2032	2033	2034
NO _x increase (tonnes)	0.216	0.182	0.153	0.129	0.109
Central Damage cost (NO _x)	£9,603	£9,603	£9,603	£9,603	£9,603
Adjusted Damage cost (NO _x)	£2,077	£1,726	£1,427	£1,180	£983
Total	£7,394				

Table 7.3: Damage Cost Calculation for PM_{2.5}

	2030	2031	2032	2033	2034
PM _{2.5} increase (tonnes)	0.039	0.039	0.038	0.038	0.038
Central Damage cost (PM _{2.5})	£67,627	£67,627	£67,627	£67,627	£67,627
Adjusted Damage cost (PM _{2.5})	£2,634	£2,567	£2,504	£2,446	£2,392
Total	£12,543				

7.6 The total damage costs are summarised as follows:

NO_x emission 'damage' cost = £7,394 +

PM_{2.5} emission 'damage' cost = £12,543

TOTAL (cost, £) = £19,937

Mitigation

7.7 The resulting value of the 'damage cost', as calculated above, is indicative of the value of an appropriate package of mitigation measures to minimise any potential impacts from the proposed development. The mitigation package should at least equate to this 'damage cost'.

7.8 A range of mitigation measures are being considered for the proposed development that will contribute towards minimising potential air quality impacts and further offsetting the calculated 'damage cost'. These could include the following:

- 🌱 Electric vehicle (EV) charging points on site for every property with a garage or driveway.
- 🌱 Travel Plan, including mechanisms to discourage high emission vehicle use and encourage uptake of low emissions technologies;

- 🌱 A Travel Information Pack to each household on first occupation, containing information on local public transport and best value ticketing, the accessibility of nearby services and facilities (including cycle shops) and the health benefits of walking and cycling. It could contain links to travel related and foodstore delivery websites, taxi firms and the contact details of the Transport Consultant;
 - 🌱 Provision of travel vouchers to cover a range of sustainable travel incentives such as contribution towards a new bike and/or accessories, contribution towards a bus season ticket, cycle training, etc.;
 - 🌱 "Cable to property" broadband provision to enable working from home;
 - 🌱 Covered and secure cycle parking, in line with West Sussex County Council standards;
 - 🌱 Use of green infrastructure, including trees, to aid in absorption of dust and other air pollutants.
- 7.9 Over the 5-year period assessed, mitigation measures at the site are required to at least meet the calculated **£19,937** damage cost.
- 7.10 It is anticipated that the total cost of the above scheme of mitigation measures would fully offset the calculated 'damage cost'.

8. Discussion

Construction Phase Impacts

- 8.1 The construction phase of the proposed development could potentially give rise to emissions which could cause dust soiling effects on adjacent uses. Following IAQM guidance¹³, the construction phase of the proposed development can be considered to be *Medium Risk* with regard to dust soiling effects, *Low Risk* for PM₁₀ health effects and *Negligible Risk* for ecological impacts, in the absence of mitigation.
- 8.2 Following the implementation of the mitigation measures provided in Appendix D and listed in Section 5.26, emissions from the construction phase will be reduced and the residual significance of impact for the construction phase is expected to be *Negligible*, thus complying with the requirements of the NPPF⁶.

Operational Phase Impacts

- 8.3 Dispersion modelling of NO₂, PM₁₀ and PM_{2.5} emissions was carried out to predict pollutant concentrations at existing local sensitive receptor locations within Pagham, in the proposed development's projected opening year of 2030. The assessment used a highly conservative approach to assess air quality by:
- 🌿 Assessing receptors at worst-case locations (i.e. building façades closest to the adjacent road network);
 - 🌿 Use of vehicle emission factors for 2024 to predict pollutant concentrations in the development's projected opening year of 2030; and
 - 🌿 Assuming that there will be no improvement in background NO₂, PM₁₀ and PM_{2.5} concentrations beyond 2024.
- 8.4 The model results predict small increases in NO₂, PM₁₀ and PM_{2.5} concentrations as a result of the proposed development's operation at the existing receptors. However, all predicted changes in concentrations were considered to be negligible with reference to the EPUK & IAQM impact descriptors and are therefore not considered significant.
- 8.5 The results of the modelling assessment suggest that the operation of the proposed development would be unlikely to result in the exposure of proposed or existing sensitive receptors to levels of air pollution at risk of exceeding the UK AQSS.

- 8.6 Additionally, the proposed development itself is located in an urban background location where pollutant concentrations are anticipated to be well below all relevant AQs, so the site can be considered suitable for the introduction of new, sensitive residential receptors.

Emissions Mitigation Assessment

- 8.7 The Sussex-air emissions mitigation guidance requires an Emissions Mitigation Assessment for all *Major* classified developments, to help minimise the potential for incremental impacts on local air quality.
- 8.8 Following the latest Defra Damage Cost guidance and guidance from Sussex-Air, a 'damage cost' of £19,937 was calculated as a result of emissions of NO_x and PM_{2.5} expected to be generated by traffic associated with the scheme, in its first five operational years.
- 8.9 Current mitigation measures being considered to offset potential air quality impacts include the provision of EV charging points, provision of cycle storage facilities, implementation of a Travel Plan and the provision of welcome packs for new occupants, and the provision of travel vouchers to the first occupants.
- 8.10 It is anticipated that the proposed scheme of mitigation measures would fully offset any incremental impacts associated with the proposed development's operation.

9. Conclusions

- 9.1 UK Air Information Resource background concentrations and local air quality monitoring results from the wider area indicate that air quality in the local area is generally good, with pollutant concentrations across the site expected to be well below the relevant UK Air Quality Standard concentrations.
- 9.2 The construction phase of the development could give rise to emissions which could cause dust soiling effects on adjacent uses. However, by adopting appropriate mitigation measures to reduce emissions and their potential impact, there should be no significant residual effects, thus complying with the requirements of the National Planning Policy Framework.
- 9.3 Detailed pollutant dispersion modelling was undertaken to assess the proposed development's impact on air quality at existing sensitive receptor locations within Pagham.
- 9.4 The results of the modelling assessment found that the operation of the proposed development is not expected to significantly impact upon local air quality.
- 9.5 Therefore, the proposed development is expected to comply with all relevant local, regional and national air quality policy and, as such, air quality should not pose any significant obstacles to the planning process.

Figures and Appendices

Figure 1: Site Location Plan

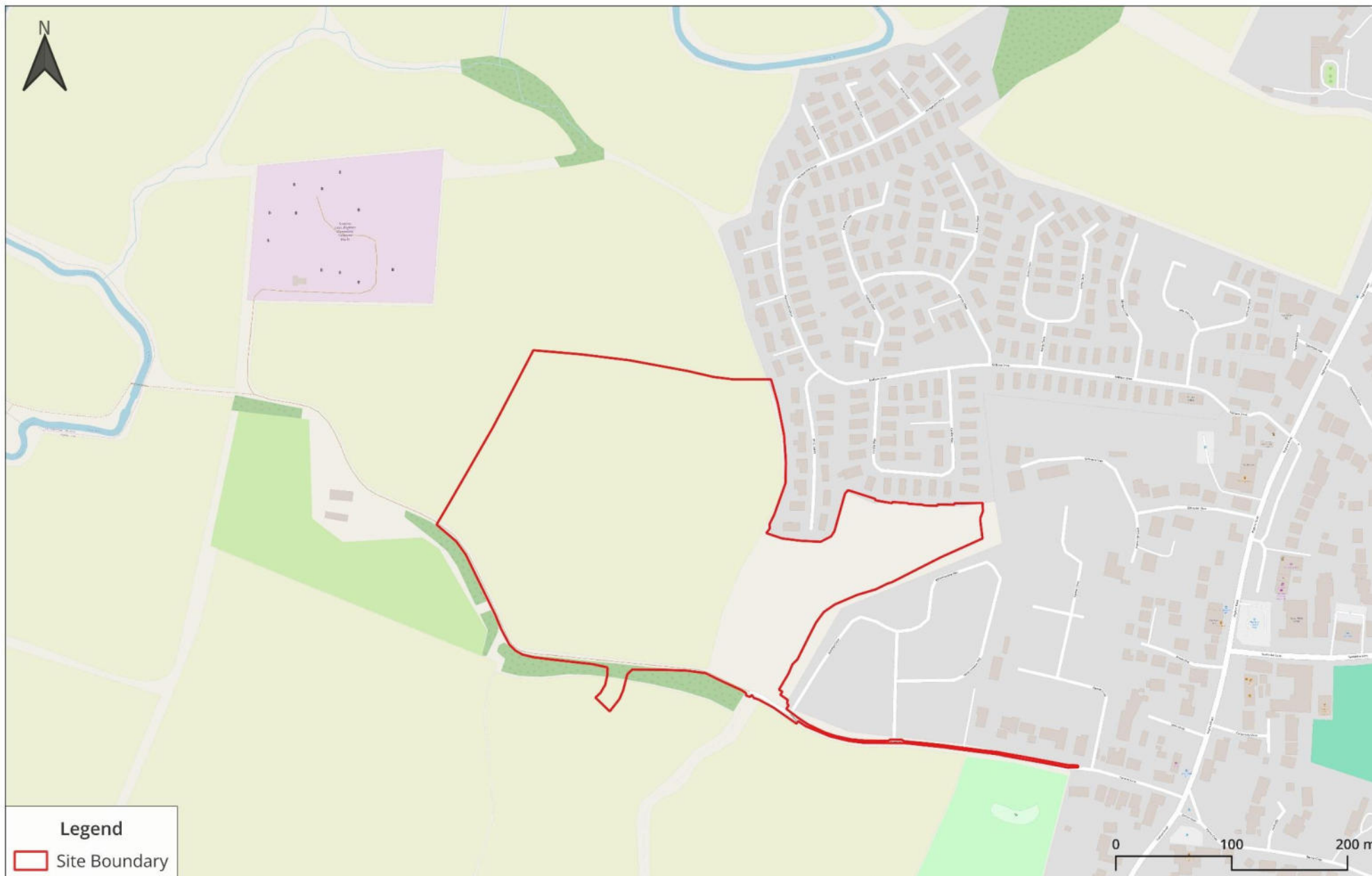


Figure 1: Site Location Plan

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Figure 2: Construction Phase

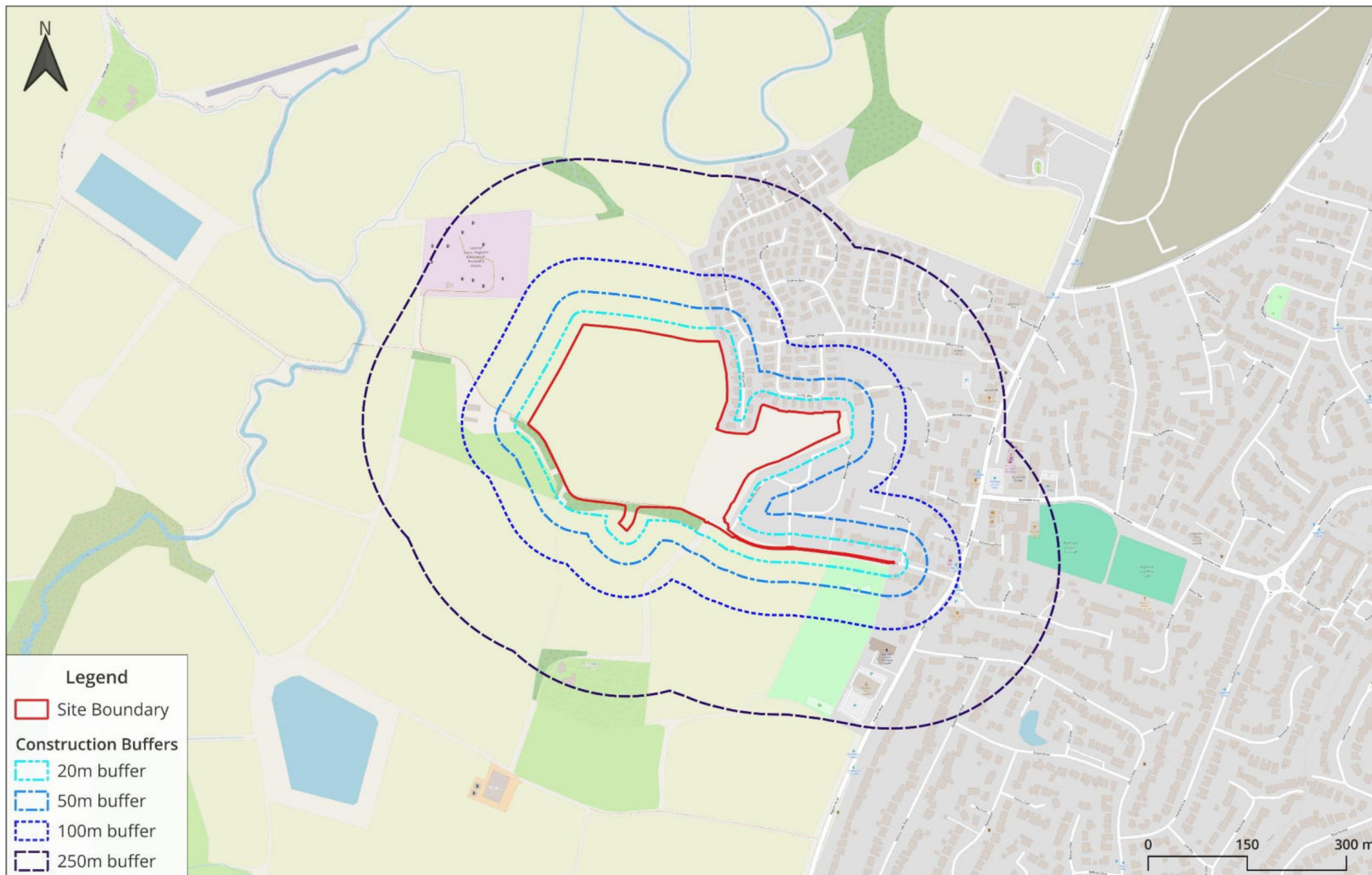


Figure 2: Construction Phase

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Figure 3: Wind Rose for Thorney Island (2024)

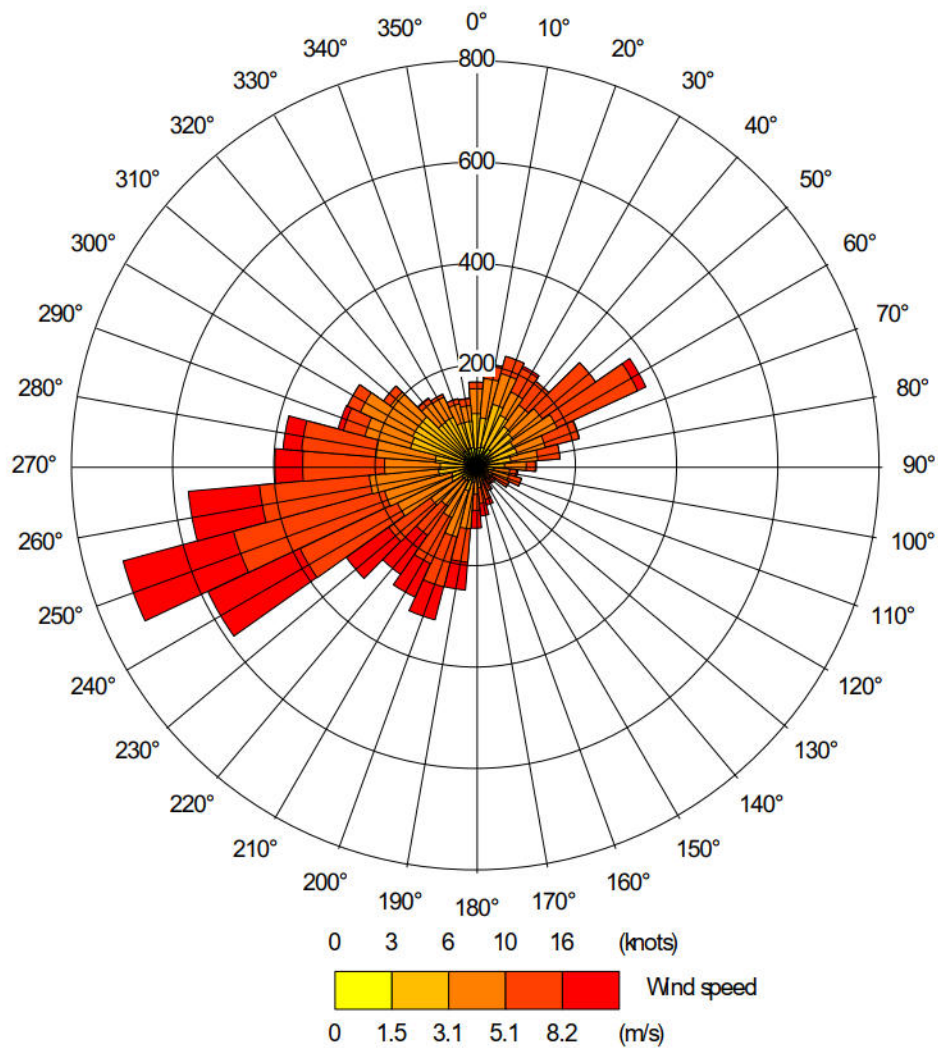


Figure 4: Modelled Roads and Receptors

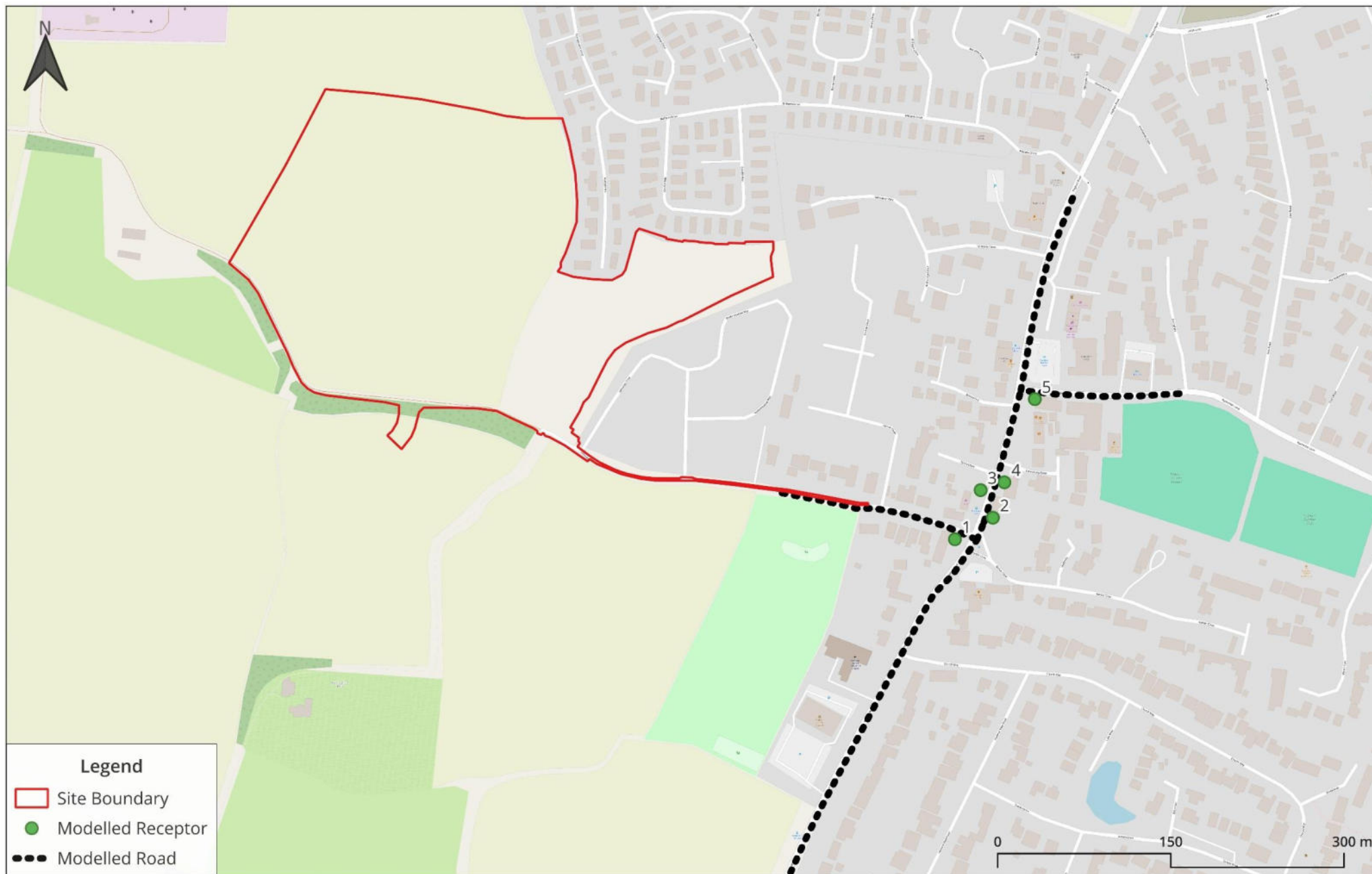


Figure 4: Modelled Roads and Receptors

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Appendix A: Assessment Significance Criteria

Assessment Significance Criteria

Table A.1: IAQM Impact Descriptors for Individual Receptors (Based on Table 6.3 from the EPUK & IAQM guidance¹⁵)

Long-term average concentration at receptor in assessment year	% Change in concentration relative to AQAL			
	1%	2-5%	6-10%	>10%
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

1. AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.
2. The Table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5%, will be described as Negligible.
3. The Table is only designed to be used with annual mean concentrations.
4. Descriptors for individual receptors only; the overall significance is determined using professional judgement (see Chapter 7). For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.
5. When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.
6. The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.
7. It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

Appendix B: Model Inputs

Traffic Data

Traffic data used within the ADMS-Roads assessment utilised data provided by the Highgate Transportation Ltd, the transport consultants for the project. The traffic data were projected forward from 2024 to the development's expected opening year of 2030 using a TEMPro growth factor provided by Highgate, alongside traffic from several committed developments.

Traffic data used within the modelling assessment are provided in Table B.1 below.

Table B.1: Traffic Inputs for the ADMS-Roads Assessment

Road	2024 Baseline		2030 Without Development		2030 With Development	
	AADT	% HDV	AADT	% HDV	AADT	% HDV
Pagham Road	4370	0.41%	8263	0.41%	8906	0.41%
Summer Lane	521	0%	560	0%	882	0%
Nyetimber Lane	2256	0%	2424	0%	2746	0%

Model Inputs

Operational phase model inputs are provided in Table B.2 below. These data relate to both the ADMS-Roads inputs for the operational phase modelling and model verification.

Table B.2: ADMS-Roads Modelling Inputs

Modelling Scenario	Emissions Dataset	Emission Factor Toolkit Year	Road Type
Model Verification (2024) and Baseline (2024)	UK EFT v13.1	2024	England (Urban)
With & Without Proposed Development (2030)	UK EFT v13.1	2024	England (Urban)

Appendix C: Model Verification Study

Model Verification

Model verification studies are undertaken in order to check the performance of dispersion models and, where modelled concentrations are significantly different to monitored concentrations, a factor can be established by which the modelled results can be adjusted in order to improve their reliability. The model verification process is detailed in LAQM(TG22)¹².

According to LAQM(TG22) no adjustment factor is necessary where the results of the model all lie within 25% of monitored concentrations.

Model verification can only be undertaken where there is sufficient roadside monitoring data in the vicinity of the subject scheme being assessed. LAQM(TG22) recommends that a combination of automatic and diffusion tube monitoring data are used; although this may be limited by data availability.

Four diffusion tube monitoring locations were selected for this model verification study. Diffusion tube 37 is located approximately 600m south of the application site boundary, adjacent to Pagham Road. Diffusion tubes 1 and 2 and 6 are located in Chichester, near Stockbridge Roundabout. The verification study was based on 2024 local air quality monitoring and traffic data. Traffic data were obtained from the Department for Transport's (DfT) website²², with data for Pagham Road provided by the transport consultant. Relevant monitoring locations with sufficient pollutant monitoring data located on roads with sufficient traffic data were included in the model verification.

Table C.1 compares monitored and modelled NO₂ concentrations at the four monitoring locations.

Table C.1: Monitored & Modelled Concentrations of NO₂ at Local Monitoring Sites

Monitor	Type	Annual Mean NO ₂ Concentrations (µg.m ⁻³)		
		Monitored	Modelled	% Difference
2	DT	26.0	17.9	-31.1%
6	DT	28.5	16.6	-41.7%
1	DT	20.8	13.3	-36.2%
37	DT	10.4	8.5	-18.2%

Note: "DT" = Diffusion Tube.

The data in Table C.1 show that the model is under-predicting concentrations at all locations to a varying degree. This is a pattern frequently seen in model verification studies, and is likely to be the result of local dispersion characteristics. It was decided to

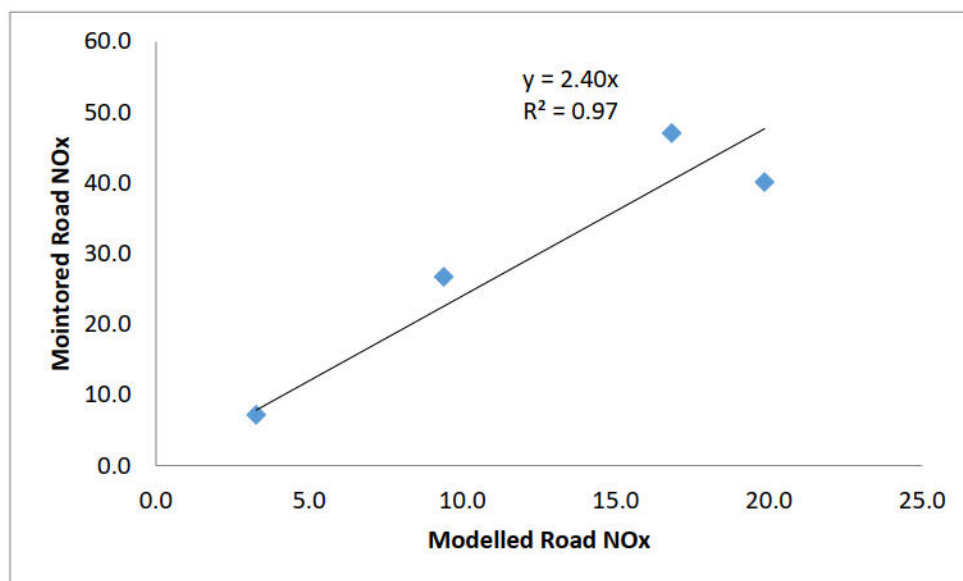
22 Department for Transport. (2024). Available from: <https://roadtraffic.dft.gov.uk/>.

proceed with adjustment as the model was systematically under predicting NO₂ concentrations. This was done in order to ensure more conservative and accurate results.

As it is primary NO_x, rather than secondary NO₂, emissions that are modelled, an adjustment factor must be derived for the road contribution of NO_x.

Plots of modelled versus monitored road NO_x concentrations on a graph shows a positive correlation. The graph is included in Figure C.1, below.

Figure C.1: Monitored and Modelled Road NO_x at Local Monitoring Sites (2024)



By plotting a trend line through the points on the graph, a factor of **2.4** was derived. Table C.2 shows total monitored versus modelled NO₂ following the adjustment of the road contribution of NO_x by this factor. It shows that, following this adjustment, all modelled concentrations of NO₂ are within 15% of monitored concentrations at these locations. As a result, the adjustment factor was considered appropriate for the adjustment of modelled road contributions of NO_x for the Proposed Development.

Table C.2: Monitored & Adjusted Modelled Concentrations of NO₂ at Local Monitoring Sites

Monitor	Type	Annual Mean NO ₂ Concentrations (µg.m ⁻³)		
		Monitored	Modelled	% Difference
2	DT	26.0	28.7	10.4%
6	DT	28.5	26.1	-8.5%
1	DT	20.8	19.1	-8.4%
37	DT	10.4	10.7	2.9%

Note: "DT" = Diffusion Tube.

Root Mean Square Error (RMSE) is used to define the average error or uncertainty of the model. According to LAQM(TG22), the RMSE should ideally be within 10% of the relevant AQS but is acceptable where it is within 25% of the AQS.

Comparison of the modelled and monitored NO₂ concentrations at local monitoring locations resulted in an RMSE of 2.0 µg.m⁻³, which equates to 5% of the 40 µg.m⁻³ annual mean AQS for NO₂ and is therefore, considered to be acceptable.

As there is insufficient PM₁₀ and PM_{2.5} monitoring data in the study area, it was not possible to perform model verification for these pollutants, so these were adjusted with the same factor used for NO₂.

Appendix D: Recommended Construction Phase Mitigation Measures for Medium Risk Sites

Appendix D: Recommended Construction Phase Mitigation

The mitigation measures set out in this appendix are those suitable for a *Medium Risk* site, in accordance with the assessment undertaken in Chapter 5. Please refer to the IAQM's *Guidance on the assessment of dust from demolition and construction* and *Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites* (2018)²³ for further, “desirable”, mitigation measures.

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.
- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this Appendix. The DMP may include monitoring of dust deposition, dust flux, real-time PM₁₀ continuous monitoring and/or visual inspections.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exception incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.

Monitoring

- Carry out regular site inspections to monitor compliance with the Dust Management Plan, record inspection results, and make an inspection log available to the local authority when asked.
- Increase the frequency of inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Agree dust deposition, dust flux, or real-time PM₁₀ continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it is a large site, before work on a phase commences. Further guidance is provided by the IAQM on monitoring during demolition, earthworks and construction.

Preparing and Maintaining the Site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible.

²³ Institute of Air Quality Management. (2018). *Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites*. https://iaqm.co.uk/text/guidance/guidance_monitoring_dust_2018.pdf

- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles 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 runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating Vehicle/Machinery and Sustainable Travel

- Ensure all vehicles switch off engines when stationary – no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Avoid bonfires and burning of waste materials.

Construction

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

Trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust

- and mud prior leaving the site where reasonably practicable).
- 🌿 Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
 - 🌿 Access gates to be located at least 10m from receptors where.



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