

11 AIR QUALITY

Introduction

- 11.1 This chapter of the ES assesses the likely significant effects of the Development on the environment in respect of air quality.
- 11.2 This chapter has been prepared by Phlorum Limited (see Appendix 1.2 Statement of Expertise).
- 11.3 This chapter should be read in conjunction with the following Figures and Appendices, which have been used to inform the assessment:
- Figure 11.1: Construction Phase Receptors;
 - Figure 11.2: Operational Phase Receptors – East Grinstead;
 - Figure 11.3: Operational Phase Receptors – Imberhorne Lane;
 - Figure 11.4: Operational Phase Receptors – South Godstone; and
 - Figure 11.5: Wind Rose for Charlwood (Gatwick) in 2019.
 - Appendix 11.1: ADMS Model Inputs;
 - Appendix 11.2: ADMS Model Verification; and
 - Appendix 11.3: IAQM 'Highly Recommended' Mitigation Measures for High Risk Sites.

Planning Policy Context

National Planning Policy

National Planning Policy Frameworkⁱ

- 11.4 The National Planning Policy Framework ('NPPF'), which was most recently revised in September 2023, 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', at paragraph 174:

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

- a. Protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);*
- b. Recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;*
- c. Maintaining the character of the undeveloped costs, while improving public access to it where appropriate;*
- d. Minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;*

- 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 instability. 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*
- f. *Remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.'*

11.5 The NPPF goes on to state the following at paragraph 185:

'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.'

11.6 With regard to compliance with relevant limit values and national objectives for pollutants, the NPPF states the following at paragraph 186:

'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 to 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.'

11.7 Regarding potential adverse effects generated by development, the NPPF states the following:

'[...] 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.'

11.8 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').

Planning Practice Guidanceⁱⁱ

11.9 Reference ID 32 *Air Quality* of the *National Planning Practice Guidance* ('PPG') 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.

11.10 As well as describing the importance of international, national and local policies, 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.'*

11.11 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 proposed development is likely to expose more people to poor air quality.

11.12 Examples of potential air quality mitigation measures are also provided in the PPG.

Local Planning Policy

11.13 Mid Sussex District Council's ('MSDC') District Planⁱⁱⁱ was adopted in 2018, and stipulates the visions, objectives and policies to improve the local area through to 2031. Policy DP29: Noise, Air and Pollution is of direct relevance to air quality and states that:

'The environment, including nationally designated environmental sites, nationally protected landscapes, areas of nature conservation or geological interest, wildlife habitats, and the quality of people's life will be protected from unacceptable levels of noise, light and air pollution by only permitting development where:

- *It does not cause unacceptable levels of air pollution;*
- *Development on land adjacent to an existing use which generates air pollution or odour would not cause any adverse effects on the proposed development or can be mitigated to reduce exposure to poor air quality to recognised and acceptable levels;*

- *Development proposals (where appropriate) are consistent with Air Quality Management Plans.'*

11.14 In November 2022, MSDC published the Consultation Draft (Regulation 18)^{iv} for its new District Plan, intent on guiding development through to 2039. Although the policies within the report are at draft stage, they should be given due consideration and have been acknowledged below.

11.15 Policy DPS6: Health and Wellbeing states:

'All new development must be designed to achieve healthy, inclusive and safe places, which enable and support healthy lifestyles and address health and wellbeing needs in Mid Sussex, as identified in the Joint Strategic Needs Assessment and West Sussex Joint Health and Wellbeing Strategy.

In order to maximise opportunities to enable healthy lifestyles, all new development must: [...]

Take opportunities to improve the factors that can contribute to poor health and social inequalities such as noise, air quality, crime, access to education and employment, and local amenity;'

11.16 Policy DPN6: Pollution states:

'Development should not result in pollution or hazards, including air, noise, vibration, light, water, soil, odour, dust or other pollutants, which negatively impact on people, including health and quality of life, and the natural environment, including nature conservation sites.

Mitigation measures may need to be implemented for development that is likely to increase levels of pollution, taking into account any cumulative impacts.

Development proposals will need to take into account the Council's published guidance'

11.17 Policy DPN9: Air Quality states:

'The natural environment and people's health and quality of life will be protected from unacceptable levels of poor air quality.

The use of active and sustainable travel measures and green infrastructure to reduce pollution concentrations and exposure is encouraged.

Development proposals will need to take into account the Council's air quality guidance.

The Council will require applicants to demonstrate that there is not unacceptable impact on air quality. The development should minimise any air quality impacts, including cumulative impacts from committed developments, both during the construction process and lifetime of the completed development, either through a redesign of the development proposal or, where this is not possible or sufficient, through appropriate mitigation.

Where sensitive development is proposed in areas of existing poor air quality and/ or where major development is proposed, including the development types set out in the Council's current guidance (Air Quality and Emissions Mitigation Guidance for Sussex (2021 or as updated)) an air quality assessment will be required.

Development proposals that are likely to have an impact on local air quality, including those in or within relevant proximity to existing or candidate Air Quality Management Areas (AQMAs) or designated nature conservation areas sensitive to changes in air quality, will need to demonstrate measures/mitigation that are incorporated into the design to minimise any impacts associated with air quality.

Mitigation measures will need to demonstrate how the proposal would make a positive contribution towards the aims of the Council's Air Quality Action Plan where it is relevant and be consistent with the Council's current guidance as stated above.

Mitigation measures will be secured either through a negotiation on a scheme, or via the use of planning condition and/ or planning obligation depending on the scale and nature of the development and its associated impacts on air quality.

In order to prevent adverse effects on the Ashdown Forest SPA and SAC, new development likely to result in increased traffic may be expected to demonstrate how any air quality impacts, including in combination impacts, have been considered in relation to the Ashdown Forest SAC. Any development likely to have a significant effect, either alone or in combination with other development, will be required to demonstrate that adequate measures are put in place to avoid or mitigate for any potential adverse effects.'

Supplementary Planning Documents

- 11.18 MSDC's Design Guide Supplementary Planning Document ('SPD')^v (2020) highlights key design principles to be considered for all new development. Within this, Principle DG48 encourages design measures which could minimise pollution impacts:

'Noise disturbance and air/light pollution can be reduced through careful design including the following measures:

- *Orientating or organising buildings so that the principal habitable rooms and sitting-out areas face away from the source of the pollution;*
- *Incorporating design features such as recessed balconies and acoustic lobbies;*
- *Constructing barriers such as garages or walls between the source of the pollution and dwellings;*
- *Using landscape features (including trees and earth mounding) to absorb noise/air pollution and deflect light; [...]*

Legislative Context

- 11.19 The UK Air Quality Strategy^{vi} ('UKAQS') sets out air quality standard ('AQS') concentrations for 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 these key pollutants over the particular averaging period.
- 11.20 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 an annual period.

- 11.21 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 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 AQS relevant to this assessment are included in Table 11.1, below.

Table 11.1: UK Air Quality Standards and Objectives

Pollutant	Averaging Period	Air Quality Standard (AQS) ($\mu\text{g.m}^{-3}$)	Air Quality Objective
Nitrogen Dioxide ('NO ₂ ')	1 Hour	200	200 $\mu\text{g.m}^{-3}$ not to be exceeded more than 18 times per 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 per year
	Annual	40	40 $\mu\text{g.m}^{-3}$
Particulate Matter ('PM _{2.5} ')	Annual	20	20 $\mu\text{g.m}^{-3}$

- 11.22 The objectives adopted in the UK are based on the Air Quality (England) Regulations 2000^{vii}, 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. The UKAQS for PM_{2.5} was recently amended as part of the Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020^{viii}.
- 11.23 Obligations under the Environment Act 1995^{ix} 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.

Assessment Methodology

Consultation

- 11.24 The EIA scoping exercise is summarised in Chapter 2 EIA Methodology of the ES. This chapter has been prepared based on the EIA Scoping Opinion adopted by MSDC (Appendix 2.2), in accordance with the requirements of the *Town and Country Planning (Environmental Impact Assessment) Regulations 2017* (as amended) (the 'EIA Regulations')^x.
- 11.25 MSDC's EIA Scoping Opinion stated that the latest Air Quality Annual Status Report ('ASR') should be reviewed when identifying baseline conditions. Additionally, the relevant IAQM guidance and '*Air Quality and Emissions Mitigation Guidance for Sussex*' (2021)^{xi} should be followed when assessing the Development's impacts on air quality, during both the construction and operational phases. The EIA Scoping Opinion also emphasised MSDC's air quality concerns along London Road, where a candidate AQMA is under consideration. This chapter has used the latest monitoring data^{xii}, relevant guidance, and has placed a focus on the areas of concern across London Road.

Guidance

- 11.26 The Defra Local Air Quality Management Technical Guidance (LAQM.TG(22))^{xiii} has been followed in undertaking the assessment. The latest EPUK and IAQM guidance on '*Planning for Air Quality*'^{xiv} has also been referred to.
- 11.27 Guidance published by the IAQM on the '*Assessment of Dust from Demolition and Construction*'^{xv} has also been used when assessing the construction phase of the Development. The Greater London Authority ('GLA') Supplementary Planning Guidance on the control of dust from construction^{xvi} has also

been referred to, which is considered best practice guidance for the UK. It details mitigation measures that should be adopted to minimise adverse impacts from dusts and fine particles.

- 11.28 MSDC is a participating member of the Sussex-Air partnership, a partnership introduced to better enable Local Authorities to improve air quality within their administrative boundaries, and fully encourages developments to follow the guidance set out in the '*Air Quality and emissions mitigation guidance for Sussex*' (2021)^{xi}. This has been followed alongside West Sussex County Council's Parking Guidance^{xvii}, within the 'Mitigation Measures' section of this chapter.

Identification of Baseline Conditions

- 11.29 The baseline air quality conditions in the vicinity of the Site have been established through the compilation and review of appropriately sourced background concentration estimates and local monitoring data. All local pollutant monitoring data within 5km of the Site have been reviewed to understand the existing local air quality conditions.
- 11.30 Defra provides estimated background concentrations of the UKAQS pollutants at the UK Air Information Resource ('UK-AIR') website^{xviii}. These estimates are produced using detailed modelling tools and are presented as concentrations at 1km² National Grid square locations across the UK. At the time of writing, the most recent background maps were from August 2020 and based on monitoring data from 2018. The central UK grid square location of 537500, 138500 has been used to provide estimates of background concentrations at the Site.
- 11.31 Being background concentrations, the UK-AIR data are intended to represent a combination 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.
- 11.32 Local pollutant monitoring networks are considered an appropriate source of data for the purposes of describing baseline air quality. MSDC automatic and non-automatic monitoring data were reviewed to establish baseline air quality. The most recent available data at the time of writing, from MSDC's 2022 annual status report^{xii}, have been included and assessed.

Construction Phase Assessment

- 11.33 The construction phase of the Development will involve 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.
- 11.34 The IAQM's guidance to assess the impacts of construction on human and ecological receptors has been followed in undertaking this assessment of the Development's likely significant effects on air quality. The guidance suggests that where a receptor is located within 350m (50m for statutory ecological receptors) of the Site boundary and/or 50m of a route used by construction vehicles, up to 250m from the Site entrance, a dust assessment should be undertaken. High sensitivity receptors are considered particularly sensitive when located within 20m of a construction works area. Figure 11.1 shows receptors that could be sensitive to dust that are located within 350m of the Site boundary.
- 11.35 The Multi Agency Geographic Information for the Countryside ('MAGIC')^{xix} website, which incorporates Natural England's interactive maps, has been reviewed to identify whether any statutory ecological sensitive 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.

Significance of Construction Phase Effects

- 11.36 The IAQM guidance suggests that demolition, earthworks, construction and trackout should all be assessed individually to determine the overall significance of the construction phase.
- 11.37 In the IAQM dust guidance, the first step in assessing the risk of impacts is to define the potential dust emission magnitude. This is defined as 'Negligible', 'Small', 'Medium' or 'Large' for each of the

construction stages. These are synonymous to the 'Negligible', 'Minor', 'Moderate' and 'Major' magnitude criteria set out in Chapter 2 EIA Methodology of the ES.

- 11.38 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.
- 11.39 As such, judgements to define what constitutes a negligible, small, medium or large dust emission magnitude should also account for other factors, as well as professional judgement. Factors such as the scale of the construction activities, both in terms of size and duration, the construction materials and the plant to be used must also be considered.
- 11.40 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 into account a number of factors:

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

11.41 Based on these factors, the area is categorised as being of 'Low', 'Medium' or 'High' sensitivity.

11.42 When the sensitivity of the area and dust emission magnitude for each phase has been defined, the risk of dust effects can be determined. The IAQM guidance provides a risk of effects matrix for each construction stage. These have been incorporated into Tables 11.2 to 11.4 below.

Table 11.2: Matrix for Determining the Risk of Dust Effects for Demolition Stage

Sensitivity of Area	Dust Emission Magnitude		
	Large (Major)	Medium (Moderate)	Small (Minor)
High	High Risk	Me Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible Risk

Table 11.3: Matrix for Determining the Risk of Dust Effects for Earthworks and Construction Stage

Sensitivity of Area	Dust Emission Magnitude		
	Large (Major)	Medium (Moderate)	Small (Minor)
High	High Risk	Me Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible Risk

Table 11.4: Matrix for Determining the Risk of Dust Effects for Trackout Stage

Sensitivity of Area	Dust Emission Magnitude		
	Large (Major)	Medium (Moderate)	Small (Minor)
High	High Risk	Me Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible Risk
Low	Low Risk	Low Risk	Negligible Risk

- 11.43 The overall risk of dust effects for the construction phase can then be judged from the construction stages assessed. This is again subject to professional judgement, but normally the highest risk stage will predominate.
- 11.44 Upon determination of the overall risk of dust effects, best practice mitigation measures will be included (commensurate to the level of risk), such as those recommended within this report and included within the associated Construction Environment Management Plan ('CEMP'), to ensure no residual dust effects during the construction phase.
- 11.45 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 significant peaks in local air pollution concentrations. An assessment of emissions from construction traffic has, therefore, been scoped out of this assessment.

Operational Phase Assessment

- 11.46 Emissions from the proposed energy strategy have been scoped out of this assessment, as the Development does not include any combustion sources.

Road Transport Sources

- 11.47 Vehicle emissions will arise from the combustion of fossil fuels in vehicle engines and their subsequent release to the 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 assessed further in this assessment.
- 11.48 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 assessment. PM_{2.5}, which is another fraction of particulate matter, has also been assessed.

Traffic Data

- 11.49 The latest EPUK and IAQM guidance provides indicative thresholds for changes in traffic flows which would require a detailed air quality assessment, when not in proximity to an existing AQMA. These comprise a change in 24-hour average annual daily traffic ('AADT') flows of >500 light duty vehicles ('LDV') and/or >100 heavy duty vehicles ('HDV'). Changes below these thresholds can be reasonably considered to have an insignificant impact on air quality.
- 11.50 Traffic data used within this assessment has been provided by the Applicant's Transport consultant. Traffic flows were provided in AADT format for all roads in the immediate vicinity of the Site (refer to Appendix 11.1), roads where a change of 500 light LDVs or 100 HDVs are predicted, and the A22 London Road, highlighted as an area of air quality concern by MSDC's Environmental Health Department. The above has defined the model domain for the operational phase assessment, as displayed in Figures 11.2, 11.3 and 11.4. The roads included within the model are also listed in Appendix 11.1.

- 11.51 The nearest AQMA, the Hazelwick AQMA in Crawley, is over 6km to the west of the Site. Traffic data received by the Transport Consultant has confirmed that generated flows will be sufficiently low enough to screen out air quality impacts here, using EPUK and IAQM guidance.
- 11.52 Traffic data was obtained from traffic surveys undertaken in 2021, which have been used directly to model a 2021 baseline scenario. Two further traffic scenarios were provided for the Development's proposed 2032 completion year: a 'Baseline' scenario inclusive of committed development flows and 'Without the Development', and a 'With the Development' scenario incorporating the additional flows predicted for the Development. Further details are provided in Appendix 11.1 and Chapter 9 Transport and Access of the ES.

Detailed Atmospheric Dispersion Modelling

- 11.53 In order to determine the effects on local air pollution concentrations from the operation of the Development, emissions from local roads have been assessed using a detailed atmospheric dispersion model. The model has considered both the changes in traffic flows caused by the Development on the local road network, and the proposed highway works (refer to Figures 11.2 and 11.3), where these could influence vehicle speeds or the proximity of kerbs to sensitive land-uses.
- 11.54 The need to carry out dispersion modelling to assess the suitability of the Site for the introduction of new sensitive human receptors has been screened out based on the Development's rural location because it is reasonable to anticipate the Site will be below the relevant AQSSs. A further detailed explanation is provided later in the 'Likely Significant Effects' section of this chapter.
- 11.55 The model used in this assessment was ADMS-Roads (version 5.0.1.3), which is produced by Cambridge Environmental Research Consultants Limited ('CERC') 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 ('EFT') version 11.0^{xx} was used to estimate vehicle emissions within the model.
- 11.56 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 Charlwood meteorological station for 2019. Charlwood, near Gatwick, was considered the closest relevant meteorological station to the Site. The surface roughness applied to the model for the Site was 0.6m. A surface roughness of 0.2 was applied to the meteorological station.
- 11.57 Discrete model receptors were positioned at the façades of existing receptors, predominantly residential dwellings, closest to the main pollution sources. The modelled roads and receptors are detailed fully in Appendix 11.1 and displayed within Figures 11.2, 11.3 and 11.4. The receptors were modelled at "breathing height" which is, by convention, 1.5m above ground level, unless otherwise indicated.

Model Verification

- 11.58 The best practice guidance set out in LAQM.TG(22) recommends that the model results should be compared with measured data to determine whether they need adjusting to more accurately reflect local air quality. 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.
- 11.59 A model verification study has been undertaken using local pollutant monitoring data from 2019 across the surrounding major road network. 2019 is the latest year with available air quality data, which was unaffected by the Covid-19 pandemic, so was considered most appropriate for verification. Following advice from the project Transport consultant, the surveyed 2021 traffic flows were used, as it is understood these are highly representative of flows expected in 2019. Full details of this study are included in Appendix 11.2. The model was found to be under-predicting concentrations, which is not unusual and is likely the result of the local dispersion environment; an adjustment factor of 1.67 was, therefore, applied to the model results.

- 11.60 Root Mean Square Error ('RMSE') is used to define the average error or uncertainty of the model. According to LAQM.TG(22), the RMSE should ideally be within 10% of the relevant AQS, but is acceptable where it is within 25% of the AQS. After application of the adjustment factor, the model verification process resulted in a post-adjusted RMSE of $3.4\mu\text{g.m}^{-3}$, which equates to 8.5% of the $40\mu\text{g.m}^{-3}$ AQS for NO_2 , and is therefore within the ideal 10% range.

Significance of Operational Phase Effects

- 11.61 The significance criteria for the ADMS-Roads assessment were derived from the EPUK and IAQM guidance. The guidance provides a descriptive means to communicate the numerical output of detailed modelling. The significance of effect of changes in long term average NO_2 , PM_{10} and $\text{PM}_{2.5}$ concentrations is derived from both the magnitude of change at a sensitive receptor and the ambient concentration at that receptor. The effect can either be 'adverse' or 'beneficial' and have a significance of 'negligible', 'slight', 'moderate' or 'substantial'. This is summarised in the matrix included in Table 11.5 below.

Table 11.5: EPUK & IAQM Operational Phase Significance Criteria

Long term average concentration at receptor in assessment year	Changes in concentration, relative to the AQS				
	<0.5%	0.5 – 1.5%	1.5 – 5.5%	5.5 – 10.5%	>10.5%
76-94% of AQS	Negligible	Negligible	Slight	Moderate	Moderate
95-102% of AQS	Negligible	Slight	Moderate	Moderate	Substantial
103-109% of AQS	Negligible	Moderate	Moderate	Substantial	Substantial
110% or more of AQS	Negligible	Moderate	Substantial	Substantial	Substantial

- 11.62 The impact descriptors described in Table 11.5 are synonymous to the 'negligible', 'minor', 'moderate' and 'major' criteria set out in Chapter 2 EIA Methodology of the ES. The IAQM impact descriptors are not, of themselves, a definitive guide to reaching a conclusion on significance. These impact descriptors are intended for application at a series of individual receptors. Whilst it may be that there are 'slight', 'moderate' or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances. The assessment of overall significance is based on professional judgement. The reasons for reaching an overall significance should be clear and set out logically, and take into consideration factors such as:

- The existing and future air quality in the absence of the Development;
- The extent of current and future population exposure to the impacts;
- The spatial and temporal extent of any impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

- 11.63 If the overall effect is judged by the assessor to be at least moderate, it is considered reasonable to expect the effect to be significant.

Emissions Mitigation Assessment

- 11.64 Sussex-Air's Air Quality Planning Guidance advocates that an emissions mitigation assessment ('EMA') should be undertaken to outline how air quality impacts from a development's emissions can be minimised.
- 11.65 As the Development is classified as being of a 'Major' scale, according to Sussex Air Guidance, an EMA with an emissions cost calculation is required to be undertaken. The emissions cost calculation has been undertaken following the Sussex Air Guidance and Defra guidance^{xxi} and utilised the latest Defra 'Air quality damage cost appraisal toolkit'^{xxii}.

Emissions Cost Calculation

- 11.66 The emissions calculation has utilised the latest Defra EFT to determine the total transport related emissions (NO_x and PM_{2.5}) that would be generated by the Development.
- 11.67 Defra provides damage costs, which are set of impact values, defined as 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 approximation valuation of the cost (or benefit) to society caused by development.
- 11.68 Defra's Appraisal Toolkit, which incorporates the latest damage cost values, was used in the calculation. The principle of the calculation is summarised in the equation below:

$$\text{EFT Output} \times \text{Damage Costs} \times 5 \text{ Years} = 5 \text{ Year Exposure Cost Value (in £)}$$

- 11.69 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.
- 11.70 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.

Limitations and Assumptions

- 11.71 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 assumptions in input data, including emissions estimates, background estimates and meteorology; and
 - Variability – randomness of measurements used.
- 11.72 Using a validated air quality model such as ADMS-Roads, as well as undertaking model verification, reduces much of this uncertainty. In addition, the most detailed available input data is used and reviewed to ensure accuracy.
- 11.73 Defra's latest EFT (version 11.0) for road transport provides forecasts of NO_x, PM₁₀ and PM_{2.5} emissions up to 2030. This is widely used as an input for dispersion models such as ADMS-Roads, to estimate future pollutant concentrations close to new developments.
- 11.74 The latest version of the EFT was released in November 2021 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.
- 11.75 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 this end, 2019 background concentrations were assumed for all future year scenarios, despite predicted improvements in air quality over time. Additionally, due to the effects of the Covid-19 pandemic, Defra^{xxiii} notes that there is a possibility that fleet compositions and turnover could be impacted. To account for this, Defra recommends consideration be given to a 'sensitivity test', in which fleet emissions are held back by at least one year. Acknowledging the uncertainties associated with predicting emissions several years into the future, this assessment assumes there will be no future improvement in the UK vehicle fleet beyond 2022. This is a full decade earlier than the anticipated year of completion and, subsequently, the future traffic scenario year, as per Chapter 9 Transport and Access of the ES.

- 11.76 To summarise, in this assessment, background concentrations will be kept constant from 2019, whilst emissions fleets will be kept constant from 2022, thus providing an assessment approach which can reasonably be considered absolute 'worst-case'.

Baseline Conditions

- 11.77 This section is intended to establish prevailing air quality conditions in the vicinity of the Site. Existing air quality is investigated through the compilation and review of appropriately sourced background concentration estimates and local monitoring data. It is through the establishment of existing conditions that the Development can be assessed against the context of local air quality.

UK-AIR Background Pollution

- 11.78 The UK-AIR predicted background concentrations for NO₂, PM₁₀ and PM_{2.5} for 2019 to 2024 are presented in Table 11.6. These data were taken from the central grid square location closest to the Site (i.e. grid reference: 537500, 138500).

Table 11.6: 2019 to 2024 UK-AIR Predicted Background Concentrations

Pollutant	Predicted annual mean background concentration (µg.m ⁻³)					
	2019	2020	2021	2022	2023	2024
NO ₂	9.5	9.1	8.8	8.5	8.3	8.0
PM ₁₀	14.0	13.8	13.6	13.4	13.3	13.1
PM _{2.5}	9.4	9.2	9.1	8.9	8.8	8.7

- 11.79 The data in Table 11.6 show that annual mean background concentrations of NO₂, PM₁₀ and PM_{2.5}, in the vicinity of the Site between 2019 and 2024, were predicted to be well below their respective AQs.
- 11.80 The data show that in 2022, NO₂, PM₁₀ and PM_{2.5} concentrations are predicted to be below their respective AQs by 78.7%, 66.4% and 55.3%, respectively. As such, annual mean background pollutant concentrations are likely to be below their respective AQs at the Site.
- 11.81 Concentrations of all pollutants were predicted to decline each year. These reductions are principally due to the forecast effect of the roll out of cleaner vehicles, but also due to UK national and international plans to reduce emissions across all sectors.

Local Sources of Monitoring Data

- 11.82 Air quality monitoring is considered an appropriate source of data for the purposes of describing baseline air quality. At the time of writing, the most recent ASR released by MSDC included 2021 data. Due to the Covid-19 pandemic and its associated 'lockdowns', 2020 is considered unlikely to be representative of typical travel behaviours, with subsequent decreases in pollutant concentrations anticipated. As such, more emphasis is placed on 2019 data within this chapter, as a 'worst case'.
- 11.83 MSDC has declared one AQMA within its administrative boundary, at the Stonepound Crossroads in Hassocks, approximately 23km to the south of the Site. The AQMA was declared in 2012 due to monitored exceedances of the annual mean AQs for NO₂. An updated AQAP^{xxiv} was provided for the AQMA in 2020, outlining actions and strategies to reduce pollution levels within and surrounding the AQMA.

Monitoring Network

- 11.84 MSDC does not undertake any automatic monitoring for air pollutants within its administrative boundary. Adjacent districts also do not carry out automatic monitoring within 5km of the Site.
- 11.85 However, both MSDC and the adjacent Tandridge District Council ('TDC') operate extensive non-automatic NO₂ diffusion tube networks. Recent data from all diffusion tubes located within 5km of the Site are included within Table 11.7, below. Tube locations are provided within their respective ASRs^{xii}.

Table 11.7: Monitoring Data from MSDC and TDC NO₂ Diffusion Tubes

ID	Location	Type	Approximate Distance to the Site (km)	Annual Mean Concentration (µg.m ⁻³)			
				2018	2019	2020	2021
MSAQ3 1	Imberhorne School	R	0.1	-	13.2	10.3	11.2
MSAQ3 6	London Road, East Grinstead	R	0.5	-	-	31.6	32.7
TD1	Copthorne Road, Felbridge	R	0.7	-	29.5	22.1	24.3
MSAQ3	London Road, East Grinstead	K	1.0	34.4	31.7	22.7	23.4
MSAQ3 8	London Road, East Grinstead	R	1.3	-	-	20.4	20.6
MSAQ2 9	London Road, East Grinstead	R	1.3	-	44.1	32.5	33.4
MSAQ3 9	White Lion Close, East Grinstead	R	1.4	-	-	23.6	25.0
TD39	Furzefield Road, Blackwell	K	1.5	25.1	23.4	17.8	21.6
MSAQ3 7	Station Road, East Grinstead	R	1.9	-	-	29.8	31.9
MSAQ5	Lewes Road, East Grinstead	S	3.7	30.0	28.6	20.9	22.5
MSAQ2 5	Erica Way, Copthorne	K	4.7	26.9	26.8	18.4	18.8

Note: R = Roadside; K = Kerbside, S = Suburban. **Bold** denotes exceedance of annual mean AQS.

- 11.86 The data in Table 11.7 show that between 2018 and 2021, annual mean concentrations of NO₂ have generally been well below the AQS in the vicinity of the Site. Additionally, for those diffusion tubes with multiple years of data, there is a clear overall declining trend in concentrations, indicative of overall improvements in air quality across MSDC, likely due to both local and national efforts to reduce emissions.
- 11.87 The highest recorded concentration was at MSAQ29, in 2019, with 44.1µg.m⁻³. This diffusion tube, located on a regularly congested stretch of the A22 London Road, recorded the only exceedance of the annual mean AQS within 5km of the Site. 2020 recorded concentrations were considerably lower than 2019 concentrations, though this is likely due to short-term impacts of the Covid-19 pandemic.
- 11.88 The closest monitoring location to the Site is at Imberhorne School, on Imberhorne Lane. In 2019, the diffusion tube recorded annual mean concentrations of only 13.2µg.m⁻³, which is 67% below the annual mean AQS. This suggests that air quality is likely to be good within the immediate vicinity of the Site. Given the similar concentrations at the diffusion tube to those predicted by Defra's UK-AIR in Table 11.7, it is reasonable to assume the UK-AIR concentrations are appropriately representative of 'background' concentrations across the Site.

Future Baseline

- 11.89 As is highlighted in Table 11.6, background pollutant concentrations are predicted to decline over time, due to the forecast effect of the roll out of cleaner vehicles, and UK national and international plans to reduce emissions across all sectors. It is likely for the same reason that declining trends in background pollutant concentrations are established within MSDC's local NO₂ monitoring network.
- 11.90 Despite anticipated improvements in air quality, this assessment assumes no improvement in 'background' concentrations over time (beyond 2019), and only a slight improvement in average vehicle fleet emissions. This is to ensure a highly conservative approach is taken, which accounts for

potential uncertainties when predicting future air quality, especially following the potential repercussions of the Covid-19 pandemic on fleet improvement rates and travel behaviours.

Likely Significant Effects

Construction Phase

- 11.91 The construction phase of the Development will involve activities that could produce polluting emissions to air. Predominantly, these will be emissions of dust. The estimates for the dust emission magnitude for demolition, earthworks, construction and trackout below are based on professional experience, information provided within Chapter 5 Construction Methodology and Phasing of the ES and Google Earth imagery.

Dust Emission Magnitude – Demolition

- 11.92 The Site is currently unoccupied. As such, no demolition is required as part of the Development and the overall dust emission magnitude for demolition is screened out of the assessment.

Dust Emission Magnitude – Earthworks

- 11.93 The total area of the Site is approximately 83.51 hectares, which falls into the IAQM's 'Large' dust emission category^{xiv}. Based on the scale of the Site alone, the dust emission magnitude during the earthworks stage is considered to be 'Large'.

Dust Emission Magnitude – Construction

- 11.94 During construction, activities that have the potential to cause emissions of dust might include concrete batching, sandblasting and piling. Localised use of cement powder and general handling of construction materials also have the potential to generate dust emissions, as does the effect of windblow from stockpiles of friable (easily crumbled) materials. The primary construction materials to be used will include brick, concrete, steel and timber. Concrete is generally considered to be a moderately dusty material.

- 11.95 Even if such construction methods and materials were not used for the Development, the total construction volume for the Development is anticipated to be in excess of 75,000m³. As such, the dust emission magnitude during the construction stage is considered to be 'Large'.

Dust Emission Magnitude – Trackout

- 11.96 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.

- 11.97 Temporary unpaved roads are anticipated to be utilized across the Site during construction, on what is understood to be slightly clayey soil. The number of HGVs accessing the Site each day is anticipated to be approximately 20 two-way (10 in and 10 out) per day (as set out in Chapter 5 Construction Methodology and Phasing of the ES), which falls into the 'Medium' dust magnitude category. Overall, given the scale of the Development, it is reasonable to anticipate that the overall dust emission magnitude during Trackout will be 'Large'.

Dust Emission Magnitude Summary

- 11.98 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 11.8 below.

Table 11.8: Dust Emission Magnitude for the Construction Activities, based on the IAQM's Guidance

Activity	Dust Emission Magnitude
Earthworks	Large
Construction	Large
Trackout	Large

Sensitivity of the Local Area

- 11.99 Having established the emission magnitude for dust 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.
- 11.100 High sensitivity human receptors include, for example, residential dwellings and schools when considering the impacts of dust soiling. Medium sensitivity receptors include areas where people would not reasonably be expected to be present for extended periods of time (e.g. places of work or parks).
- 11.101 The impacts of dust emissions from the sources discussed above have the potential to impact on human receptors living in the local area. Within a distance of 20m from the Site boundary, there is a high risk of dust impacts, regardless of the prevailing wind direction. Up to 100m from the Site, there may still be a high risk, particularly if the receptor is downwind of the dust source.
- 11.102 With the exponential decline in dust concentrations with distance from dust generating activities, it is considered that for receptors more than 350m 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.
- 11.103 The approximate number of high sensitivity human receptors in the vicinity of the Site is detailed in Table 11.9 below and shown in Figure 11.1.

Table 11.9: Approximate Number of High Sensitivity Receptors to Dust Close to the Site

Distance to Site (m)	Approximate number of receptors	Receptor Details
<20	8	Residential dwellings
<50	>100	50 residential dwellings and Imberhorne School
<100	>100	Residential dwellings and Imberhorne School
<350	>100	Residential dwellings and Imberhorne School

- 11.104 Figure 11.5 shows that prevailing winds predominantly travel from the south-west. As shown in Figure 11.1, there are high sensitivity receptors downwind of the Site, including a secondary school (Imberhorne School). As such, the sensitivity of the area to dust soiling effects is defined as 'High'.
- 11.105 A $24\mu\text{g.m}^{-3}$ PM_{10} 'threshold' is taken from Table 3 of the IAQM's construction dust guidance and used to establish the sensitivity of an area in terms of potential human health impacts from exposure to PM_{10} . According to the guidance, baseline annual mean PM_{10} concentrations below $24.0\mu\text{g.m}^{-3}$ 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.
- 11.106 UK-AIR predicted annual mean concentrations of PM_{10} are well below $24\mu\text{g.m}^{-3}$ at the Site. This provides a good indication that PM_{10} concentrations for both annual mean and daily mean

concentrations are likely to be below the respective AQSs at the Site and adjacent uses. As such, the sensitivity of the area to human health impacts is defined as 'Low'.

- 11.107 Defra's MAGIC website has been reviewed to identify whether any statutory ecological sensitive 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. The nearest statutory ecological receptor is the Hedgecourt Site of Special Scientific Interest ('SSSI'), approximately 1.9km to the north-west of the Site. Based on distance alone, there will be no construction dust impacts on ecological receptors.
- 11.108 Having established the likely 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 11.10.

Table 11.10: Summary of Impact Risk by Construction Stage based on the IAQM's Dust Guidance

Construction Stage	Impact Risk		
	Nuisance Dust	Ecology	PM ₁₀ Health Effect
Earthworks	High	Negligible	Low
Construction	High	Negligible	Low
Trackout	High	Negligible	Low

- 11.109 Overall, the Development is considered to present a High Risk for nuisance dust soiling effects, Low Risk for PM₁₀ health effects and a Negligible Risk for impacts on ecology, in the absence of mitigation. These are synonymous with Major Adverse, Minor Adverse and Negligible effects for nuisance dust soiling, PM₁₀ health effects and ecology, respectively.

Operational Phase

- 11.110 Results from the ADMS-Roads assessment of the Development are presented below. Modelled road links and receptor points R1 to R19 are displayed in Figures 11.2, 11.3 and 11.4.

Existing Receptors

- 11.111 Tables 11.11, 11.12 and 11.13 show predicted annual mean NO₂, PM₁₀ & PM_{2.5} concentrations, respectively, at existing sensitive receptors. Please note that any discrepancies in the below tables are due to rounding.

Table 11.11: Predicted Annual Mean NO₂ at Existing Receptors

Receptor	Annual Mean NO ₂ (µg.m ⁻³)			Changes due to the Development		
	2021 Baseline	2032 Baseline	2032 With Development	µg.m ⁻³	As a % of the AQS	EPUK/ IAQM Impact Descriptor
R1	22.5	19.7	19.8	0.2	0.5	Negligible
R2	24.1	20.9	21.0	0.2	0.5	Negligible
R3	19.1	18.0	18.1	0.2	0.4	Negligible
R4	18.7	16.2	16.4	0.2	0.5	Negligible
R5	17.9	15.7	15.9	0.2	0.4	Negligible
R6	27.7	24.3	24.4	0.1	0.2	Negligible
R7	23.6	21.0	21.1	0.2	0.4	Negligible
R8	28.8	24.6	24.8	0.2	0.5	Negligible

Receptor	Annual Mean NO ₂ (µg.m ⁻³)			Changes due to the Development		
	2021 Baseline	2032 Baseline	2032 With Development	µg.m ⁻³	As a % of the AQS	EPUK/ IAQM Impact Descriptor
R9	22.3	19.3	19.4	0.1	0.2	Negligible
R10	22.7	20.1	20.2	0.1	0.2	Negligible
R11	38.4	32.8	33.1	0.3	0.7	Negligible
R12	33.9	28.6	28.8	0.3	0.6	Negligible
R13	15.5	14.9	15.2	0.3	0.8	Negligible
R14	13.2	12.9	13.6	0.8	1.9	Negligible
R15	11.9	11.6	12.4	0.8	2.0	Negligible
R16	11.0	10.8	12.2	1.4	3.4	Negligible
R17	20.4	19.0	20.3	1.3	3.1	Negligible
R18	20.2	18.9	20.2	1.3	3.2	Negligible
R19	11.2	11.0	11.5	0.5	1.3	Negligible
R20	10.7	10.5	11.8	1.3	3.2	Negligible

11.112 The data in Table 11.11 show that annual mean concentrations of NO₂ are predicted to be below the 40 µg.m⁻³ AQS at all locations in all scenarios. The highest predicted concentration with the Development in 2032 is 33.1 µg.m⁻³ at receptor R11 (A22 London Road), which is 17.25% below the AQS.

11.113 For the hourly AQS for NO₂ (200 µg.m⁻³ not to be exceeded more than 18 times a year), LAQM.TG(22) states that if the annual mean is below 60 µg.m⁻³, this AQS should be met. The data in Table 11.11 show that all modelled annual mean NO₂ concentrations are below this threshold at all receptor points, in all scenarios, and therefore it is anticipated that the hourly AQS would be achieved.

11.114 The Development is predicted to lead to small increases in annual mean concentrations of NO₂ at all receptors; these increases are considered to be Negligible, with reference to the EPUK and IAQM impact descriptors. The highest increase of 1.4 µg.m⁻³ was modelled at receptor R16, near the Development's access road on Imberhorne Lane.

Table 11.12: Predicted Annual Mean PM₁₀ at Existing Receptors

Receptor	Annual Mean PM ₁₀ (µg.m ⁻³)			Changes due to the Development		
	2021 Baseline	2032 Baseline	2032 With Development	µg.m ⁻³	As a % of the AQS	EPUK/ IAQM Impact Descriptor
R1	16.4	16.4	16.5	0.0	0.1	Negligible
R2	16.8	16.7	16.8	0.1	0.1	Negligible
R3	15.3	15.4	15.5	0.0	0.1	Negligible
R4	15.3	15.3	15.4	0.1	0.1	Negligible
R5	15.2	15.2	15.2	0.0	0.1	Negligible
R6	17.6	17.7	17.7	0.0	0.1	Negligible
R7	16.8	16.9	16.9	0.0	0.1	Negligible
R8	18.0	18.1	18.1	0.0	0.1	Negligible
R9	16.7	16.7	16.7	0.0	0.0	Negligible
R10	16.6	16.6	16.7	0.0	0.0	Negligible

Receptor	Annual Mean PM ₁₀ (µg.m ⁻³)			Changes due to the Development		
	2021 Baseline	2032 Baseline	2032 With Development	µg.m ⁻³	As a % of the AQS	EPUK/ IAQM Impact Descriptor
R11	19.3	19.4	19.5	0.1	0.2	Negligible
R12	18.8	18.9	19.0	0.1	0.2	Negligible
R13	15.3	15.4	15.4	0.1	0.2	Negligible
R14	14.8	14.9	15.0	0.1	0.4	Negligible
R15	14.5	14.6	14.7	0.2	0.4	Negligible
R16	14.4	14.4	14.7	0.3	0.7	Negligible
R17	16.3	16.4	16.6	0.2	0.5	Negligible
R18	16.2	16.4	16.6	0.2	0.6	Negligible
R19	14.4	14.5	14.5	0.0	0.1	Negligible
R20	14.3	14.3	14.5	0.2	0.5	Negligible

11.115 The data in table 11.12 show that annual mean concentrations of PM₁₀ are predicted to be well below the 40 µg.m⁻³ AQS at all locations in all scenarios. The highest predicted concentration with the Development is 19.5 µg.m⁻³ at receptor R11 (A22 London Road), which is 51.25% below the AQS.

11.116 For PM₁₀, the following equation can be used to derive the number of days that the daily mean limit of 50µg.m⁻³ AQS is likely to be exceeded:

$$\text{No.24 hour exceedances} = -18.5 + 0.00145 \times [\text{annual mean}]^3 + (206 / (\text{annual mean}))$$

11.117 Using this equation, an annual mean concentration of approximately 32µg.m⁻³ might indicate an exceedance of the daily-mean AQS for PM₁₀. The data in Table 11.12 show that the highest annual mean PM₁₀ concentration predicted in the model with or without the Development was 19.5 µg.m⁻³. An exceedance of the daily mean AQS is therefore not likely with or without the Development.

11.118 The Development is predicted to lead to small increases in annual mean concentrations of PM₁₀ at all receptors; these increases are considered to be Negligible, with reference to the EPUK and IAQM impact descriptors.

Table 11.13: Predicted Annual Mean PM_{2.5} at Existing Receptors

Receptor	Annual Mean PM _{2.5} (µg.m ⁻³)			Changes due to the Development		
	2021 Baseline	2032 Baseline	2032 With Development	µg.m ⁻³	As a % of the AQS	EPUK/ IAQM Impact Descriptor
R1	10.9	10.8	10.9	0.0	0.1	Negligible
R2	11.1	11.0	11.0	0.0	0.1	Negligible
R3	10.3	10.3	10.4	0.0	0.1	Negligible
R4	10.3	10.3	10.3	0.0	0.2	Negligible
R5	10.2	10.2	10.2	0.0	0.1	Negligible
R6	11.5	11.5	11.5	0.0	0.1	Negligible
R7	11.0	11.0	11.1	0.0	0.1	Negligible
R8	11.7	11.7	11.7	0.0	0.1	Negligible
R9	11.2	11.2	11.2	0.0	0.1	Negligible
R10	11.3	11.3	11.3	0.0	0.0	Negligible

Receptor	Annual Mean PM _{2.5} (µg.m ⁻³)			Changes due to the Development		
	2021 Baseline	2032 Baseline	2032 With Development	µg.m ⁻³	As a % of the AQS	EPUK/ IAQM Impact Descriptor
R11	12.9	12.8	12.9	0.0	0.2	Negligible
R12	12.6	12.5	12.5	0.0	0.2	Negligible
R13	10.5	10.5	10.6	0.0	0.2	Negligible
R14	9.8	9.9	10.0	0.1	0.4	Negligible
R15	9.7	9.7	9.8	0.1	0.5	Negligible
R16	9.6	9.6	9.8	0.2	0.8	Negligible
R17	10.7	10.8	10.9	0.1	0.6	Negligible
R18	10.7	10.7	10.9	0.1	0.7	Negligible
R19	9.6	9.7	9.7	0.0	0.1	Negligible
R20	9.6	9.7	9.7	0.1	0.6	Negligible

11.119 The data in Table 11.13 show that annual mean concentrations of PM_{2.5} are predicted to be below the 20 µg.m⁻³ AQS at all locations in all scenarios. The highest predicted concentration with the Development is 12.9 µg.m⁻³ at receptor R11, which is 35.5% below the AQS.

11.120 The Development is predicted to lead to small increases in annual mean concentrations of PM_{2.5} at all receptors; these increases are considered to be Negligible, with reference to the EPUK and IAQM impact descriptors.

11.121 Tables 11.11, 11.12 and 11.13 have shown that all impacts at all modelled receptors are anticipated to be Negligible for NO₂, PM₁₀ and PM_{2.5}. As such, the Development will not have a significant adverse effect on air quality.

Proposed Receptors

11.122 During the operational phase of the Development, the vast majority of the Site of future residents and other users (which comprise sensitive receptors) will be located long distances from any major pollutant sources. The only pollution source which the Site borders is Imberhorne Lane. As shown in Tables 11.11, 11.12 and 11.13, pollutant concentrations along Imberhorne Lane (see receptors R14 – R19) are all anticipated to be well below the annual mean AQSs for NO₂, PM₁₀ and PM_{2.5}. As such, the Site is anticipated to be suitable for the introduction of new receptors, and impacts of local air quality on proposed receptors are considered to be negligible, which is not significant.

Mitigation Measures

Construction Phase

11.123 The GLA guidance suggests 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 Development include:

- 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 the 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.

11.124 In addition, the IAQM lists recommended mitigation measures for low, medium and high dust impact risks. The highly recommended mitigation measures for the Development, which is a high risk site, are included in Appendix 11.3. Chapter 5 Construction Methodology and Phasing of the ES also provides details of the construction methodology, phasing and CEMP. The CEMP to be produced will incorporate the measures included above and within Appendix 11.3, which will be secured separately through an appropriately worded planning condition attached to the planning consent and implemented throughout the construction phase.

11.125 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.

Operational Phase

Emissions Mitigation Assessment

11.126 The results of the modelling assessment have established that the Development is not anticipated to have a significant adverse effect under the requirements of the EIA Regulations, and additional mitigation measures are therefore not required.

11.127 Nonetheless, in line with Sussex-Air guidance, it is necessary to produce an emissions mitigation assessment for the Development. The resulting value of the 'emissions cost' is indicative of the value of an appropriate package of mitigation to offset any potential incremental impacts from the Development.

11.128 Following the December 2022 update to Defra's emissions cost calculation guidance, the emissions 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 the Development.

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

Road Transport Emission Increase (Cost, £) =

Estimated trip rate for 5 years × Emission Rate/10km/vehicle type × Damage Costs

11.130 The latest Defra Emissions Factor Toolkit was used to determine the total transport related emissions that would be generated by the Development; the inputs used in the calculation are shown in Table 11.14.

Table 11.14: Approximate Number of High Sensitivity Receptors Close to the Site

Input	Value	Unit	Source/ Guidance
Trip Length	10	km	Sussex-Air guidance
Net Traffic Flow LDV (HDV)	1,920	AADT	The Applicant's Transport Consultant
EFT Road Type	Urban (not London)	-	EFT
EFT Year	2030	-	Latest available EFT Estimated Year
Average Speed	50	km.hr ⁻¹	Sussex-Air guidance
Appraisal period	5	years	Sussex-Air guidance
Trip Length	10	km	Sussex-Air guidance

11.131 The total emission 'damage' cost has been calculated using Defra's appraisal toolkit and is presented in Tables 11.15 and 11.16.

11.132 The calculation accounts for an 'uplift factor' of 2% cumulatively per annum and a 'discount rate', in line with the latest 2021 guidance. Central estimate damage costs for 'Road Transport' were based on Defra 2023 prices.

Table 11.15: Emission Cost Calculation for NO_x

	2032	2033	2034	2035	2036
NO _x increase (tonnes)	0.69916	0.69916	0.69916	0.69916	0.69916
Central Damage cost (NO _x)	£11,359	£11,359	£11,359	£11,359	£11,359
Adjusted Damage cost (NO _x)	£7,942	£7,824	£7,709	£7,595	£7,482
Total	£38,551				

Table 11.16: Emission Cost Calculation for PM_{2.5}

	2032	2033	2034	2035	2036
PM _{2.5} increase (tonnes)	0.12023	0.12023	0.12023	0.12023	0.12023
Central Damage cost (PM _{2.5})	£81,313	£81,313	£81,313	£81,313	£81,313
Adjusted Damage cost (PM _{2.5})	£9,776	£9,632	£9,489	£9,349	£9,211
Total	£47,458				

11.133 The total damage costs are summarised as follows:

NO _x emission 'damage' (cost, £)	= £38,551 +
PM _{2.5} emission 'damage' (cost, £)	= £47,458
TOTAL (cost, £)	= £86,009

Mitigation

11.134 The resulting value of the 'emissions cost', as calculated above, is indicative of the value of an appropriate package of mitigation to offset any potential impacts from the Development. The mitigation package should at least equate to this 'emissions cost'.

11.135 For all residential developments considered as 'Major' under the AQEMGFS, the following mitigation measures should be included as a minimum:

- All gas-fired boilers are expected to meet a minimum standard of <40mgNO_x/kWh, with consideration given to renewable energy sources;
- Meet electric vehicle (EV) charging point guidance set out in the West Sussex County Council's Parking Guidance.

11.136 The Applicant proposes to provide EV Charging in line with the requirements of the new approved '*Document S: Infrastructure for Charging Electric Vehicles*'^{xxv}. This will include an EV charging point for every home with on-Site parking. For the non-residential buildings where there are more than 10 parking spaces, at least one EV charging point (and cable routes for at least one in every five remaining spaces) will be installed. The total number of active charging points will be over and above the requirements of the County's parking guidance.

11.137 It is anticipated that the above provision will contribute a substantial proportion of the calculated emissions cost of £86,009.

11.138 Regarding the energy strategy, the Development is to utilise Air Source Heat Pumps ('ASHPs') for each dwelling to provide heating and hot water. The energy strategy is not anticipated to burn fossil fuels for any aspect of the Development, therefore complying with Sussex-Air requirements.

11.139 The Development will also include cycle storage infrastructure to encourage active travel, broadband provision to residences to encourage home working, and green infrastructure. Should the mitigation measures listed within paragraphs 11.135, 11.136 and 11.137 not equate to the calculated emissions cost, the Development will need to include further mitigation measures, which could be secured at the detailed design stage through planning conditions attached to the planning consent, if necessary.

Residual Effects

Construction Phase

11.140 Following the implementation of the mitigation measures set out in the 'Mitigation Measures' section of this chapter, including the measures to be incorporated into the CEMP, the residual effect of each stage of the construction phase is expected to be Negligible.

Operational Phase

11.141 The operational phase is anticipated to have a Negligible effect on air quality, which is not significant. As such, residual effects remain as assessed, and are Negligible and not significant.

Cumulative Effects

Construction Phase

- 11.142 There is a potential for significant cumulative dust impacts on sensitive receptors which are located within 350m of the Development and the committed developments set out in Chapter 2 EIA Methodology of the ES. However, as is required by best practice guidance, it is assumed that these committed developments will incorporate an appropriate level of dust mitigation during construction, for example by implementing CEMPs, as will be the case for the Development, to minimise the risk of dust emissions. Therefore, effects will be negligible and therefore, there will be no significant cumulative effects during the Development's construction phase.

Operational Phase

- 11.143 Road traffic data from the committed developments were included in the traffic data used in this assessment. Therefore, the cumulative effects of the Development and the committed developments outlined in Chapter 2 EIA Methodology of the ES during the operational phase have already been considered in this assessment. Therefore, effects will be negligible and therefore, there will be no significant cumulative effects during the Development's operational phase.

Summary

- 11.144 This assessment has considered air quality impacts during both the construction and operational phases of the Development.
- 11.145 The construction of the Development could give rise to emissions of dust which could cause dust soiling effects on adjacent uses. However, by adopting the appropriate mitigation measures set out in this chapter, including the measures to be incorporated into the CEMP to reduce emissions and their potential impacts, there should be no significant residual effects.
- 11.146 Emissions from vehicles and plant during construction also have the potential to cause impacts; however, these impacts are predicted to be Negligible, based on the small number of vehicle movements and limited timescales for the construction phase. As such, emissions resulting from the construction phase of the Development are predicted to be insignificant.
- 11.147 Regarding the operational phase, a detailed dispersion modelling assessment has been undertaken to assesses the Development's impact on, and sensitivity to, local air quality. The Development is predicted to have a Negligible impact on local annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} at local sensitive receptors, which is not significant.
- 11.148 Additionally, no sensitive receptors within the Development will be exposed to concentrations exceeding the relevant AQSs. As such, air quality at the Site will have a Negligible impact on proposed receptors, which is not significant.
- 11.149 Therefore, the Development is not expected to introduce new sensitive receptors into an area of existing poor air quality, nor is it anticipated to significantly impact local air quality.
- 11.150 Air quality related mitigation measures that will help to encourage a modal shift towards more sustainable forms of transport are proposed for the Development, including the provision of EV charging points and cycle storage infrastructure. Should the monetary costs associated with the mitigation package not equate to the emissions cost calculated in this report (£86,009), more mitigation measures will be required. This is to be agreed with MSDC at the detailed design stage, if necessary.
- 11.151 Overall, the Development is expected to comply with all national and local planning policy, from an air quality perspective, as it should not expose any new or existing receptors to unacceptable air quality.
- 11.152 Table 11.17 contains a summary of the likely significant effects of the Development.

Table 11.17: Table of Significance – Air Quality

Potential Effect	Nature of Effect (Permanent/ Temporary)	Significance (Major/Moderate/Minor) (Beneficial/Adverse/ Negligible)	Mitigation / Enhancement Measures	Geographical Importance*							Residual Effects (Major/Moderate/Minor) (Beneficial/Adverse/ Negligible)
				I	UK	E	R	C	D	L	
Construction Phase											
Dust Nuisance (Human)	Temporary	Major Adverse	Appropriate measures set out in Chapter 5 of the ES, this ES Chapter and Appendix 11.3, which will be inherent to the design. The measures will be included within the CEMP, which will be secured by planning condition at detailed design stage.							X	Negligible
PM ₁₀ Health Effects (Human)	Temporary	Minor Adverse								X	Negligible
Dust Deposition (Ecological)	Temporary	Negligible								X	Negligible
Operational Phase											
NO ₂ Health Effects (Human)	Permanent	Negligible	Mitigation measures required to align with Sussex-Air guidance. EV Charging Points, Cycle Storage and a Zero Emission Energy Strategy proposed. Specific details to be secured through appropriate planning conditions at detailed design stage.							X	Negligible
PM ₁₀ and PM _{2.5} Health Effects (Human)	Permanent	Negligible								X	Negligible
Air Quality at the Site	Permanent	Negligible	None required							X	Negligible
Cumulative Effects											
Construction	Temporary	Major Adverse	Appropriate measures set out in Chapter 5 of the ES, this ES Chapter and Appendix 11.3, which will be inherent to the design. The measures will be included within the CEMP, which will be secured by planning condition at detailed design stage.							X	Negligible

<i>Operation</i>	Permanent	Negligible	Mitigation measures required to align with Sussex-Air guidance. EV Charging Points, Cycle Storage and a Zero Emission Energy Strategy proposed. Specific details to be secured through appropriate planning conditions at detailed design stage.							X	Negligible
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*** Geographical Level of Importance**

I = International; UK = United Kingdom; E = England; R = Regional; C = County; D = District; L = Local

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