Wates Development Ltd

Proposed Development at Huntsland Road, Crawley Down – Northern Site

Air Quality Assessment

Report No: 446051-01 (00)

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RSK GENERAL NOTES

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK Group plc.

Abbreviations

AADT	Annual Average Daily Traffic
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Standard
ASR	Annual Status Report
CHP	Combined Heat and Power
CO_2	Carbon Dioxide
CO	Carbon Monoxide
DEFRA	Department for Environment, Food and Rural Affairs
DMP	Dust Management Plan
EC	European Commission
EPUK	Environmental Protection UK
EU	European Union
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LDV	Light Duty Vehicle
MSDC	Mid Sussex District Council
NAQS	National Air Quality Strategy
NPPF	National Planning Policy Framework
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
O_3	Ozone
$PM_{2.5}$	Particulate matter of size fraction approximating to <2.5µm diameter
PM_{10}	Particulate matter of size fraction approximating to <10µm diameter
RSK	RSK Environment Limited
VOC	Volatile Organic Compounds

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APPENDICES

1 INTRODUCTION

1.1 Background

RSK Environment Ltd (RSK) was commissioned to prepare an assessment of the potential air quality impacts associated with proposed development of 150 residential dwellings to be constructed at the land north to the Huntsland Road, Crawley Down. Figure 1.1 shows the site location.

The proposed development falls within the jurisdiction of Mid Sussex District Council (MSDC). The approximate grid reference for the centre of the site is 533533 , 137754. The site area is approximately 13.32 Ha. Figure 1.1 shows the location including the red line boundary of the site. The development site is bounded to the east by residential receptors at Wychwood Place, residential receptors in Huntsland Road to the south, Hurst Farm to the north and some residential receptors to the west.

It is understood that 350 residential dwellings are proposed to be constructed at the lands north and south of Huntsland. It is understood that this will be progressed via two applications:

1) The southern part (south of Huntslands) for 200 dwellings
2) The north part (north of Huntslands) for 150 dwellings with access via Wychwood

This report relates to the northern part (north of Huntslands) for 150 dwellings.

The district has only one air quality management area (AQMA) at Stonepound Crossroads (Mid Sussex District Council AQMA (No.1)). This was declared due to exceedances of the annual mean NO_2 objective in 2012. The proposed development is not located within or near an AQMA. The Crawley AQMA is however, 3.9 km away from the proposed development. Crawley Borough Council declared this AQMA due to exceedances of the annual mean NO_2 objective.

This report presents the findings of an assessment of existing/baseline air quality conditions, potential air quality impacts during the construction phase of the proposed development and anticipated impacts on local air quality resulting from increased road traffic emissions associated with the development once operational.

Figure 1.1: Proposed Development Site Location

2 LEGISLATION, PLANNING POLICY & GUIDANCE

2.1 Key Legislation

2.1.1 Air Quality Strategy

UK air quality policy is published under the umbrella of the Environment Act 1995, Part IV and specifically Section 80, the National Air Quality Strategy. The latest *Air Quality Strategy for England, Scotland, Wales and Northern Ireland – Working Together for Clean Air*, published in July 2007 sets air quality standards and objectives for ten key air pollutants to be achieved between 2003 and 2020.

The Clean Air Strategy 2019 supersedes the policies outlined in the 2007 strategy. This latest strategy aims to have a more joined-up approach, outlining actions the Government plans to take to reduce emissions from transport, homes, agriculture and industry. However, the air quality objectives remain as previously detailed within the 2007 strategy.

2.1.2 Air Quality Standards

The air quality standards (AQSs) in the United Kingdom are derived from European Commission (EC) directives and are adopted into English law via the Air Quality (England) Regulations 2000 and Air Quality (England) Amendment Regulations 2002. The Air Quality Limit Values Regulations 2003 and subsequent amendments implement the Air Quality Framework Directive into English Law. Directive 2008/50/EC was translated into UK law in 2010 via the Air Quality Standards Regulations 2010.

The relevant[1] AQS to England and Wales to protect human health are summarised in Table 2.1.

Table 2.1: Air Quality Standards (AQS) Relevant to the Proposed Development

Substance	Averaging period	Exceedances allowed per year	Ground level concentration limit ($\mu g/m^3$)
Nitrogen dioxide (NO_2)	1 calendar year	-	40
	1 hour	18	200
Fine particles (PM_{10})	1 calendar year	-	40
	24 hours	35	50
Fine particles ($PM_{2.5}$)	1 year	-	20

[1] Relevance, in this case, is defined by the scope of the assessment.

2.1.3 The Environment Act, 1995

These objectives are to be used in the review and assessment of air quality by local authorities under Section 82 of the Environment Act (1995). If exceedances are measured or predicted through the review and assessment process, the local authority must declare an Air Quality Management Area (AQMA) under Section 83 of the act, and produce an Air Quality Action Plan (AQAP) to outline how air quality is to be improved.

2.1.4 The Environment Act, 2021

On the 10th of November 2021, the new Environment Act (2021) passed royal assent, which amends the Environment Act (1995) to reinforce the local air quality management (LAQM) framework in order to encourage cooperation at the local level and broaden the range of organisations that play a role in improving local air quality. The Environment Act (2021) introduces a commitment to create a legally binding duty on government to reduce the concentrations of fine particulate matter ($PM_{2.5}$) in ambient air.

<u>The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023</u>

The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 was published on 31st January 2023, and came into force the following day. The 2023 Regulations introduce a reduced long-term annual average Air Quality Objective for $PM_{2.5}$ of 10 µg/m^3 by 2040, a reduction from the current Air Quality objective of 20 µg/m^3 set out within the Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020. Additionally, the 2023 Regulations introduce an interim target of 12 µg/m^3 by January 2028 and 35% reduction in average population exposure by 2040, with an interim target of a 22% reduction by January 2028, both compared to a 2018 baseline.

2.2 Planning Policy

The land use planning process is a key means of improving air quality, particularly in the long term, through the strategic location and design of new developments. Any air quality concern that relates to land use and its development can, depending on the details of the proposed development, be a material consideration in the determination of planning applications.

2.2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was revised in December 2024, superseding the previous NPPF with immediate effect. The NPPF includes a presumption in favour of sustainable development.

Section 15 of the NPPF deals with Conserving and Enhancing the Natural Environment, and states that the intention is that the planning system should prevent '*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. 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.*'

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

2.2.2 Local Planning Policy

The Mid Sussex District Plan 2014 – 2031

The Mid Sussex District Plan 2014 – 2031 was adopted by MSDC in March 2018 and sets out the long-term spatial vision for the District and MSDCs approach to development up to 2031.

Policy DP29 addresses Noise, Air and Light Pollution. It states in terms of Air quality 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:

Air Pollution:

• 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.'

Mid Sussex District Council, Site Allocations Development Plan Document, June 2022

The Site Allocations Development Plan Document looks to meet the housing and employment commitments set out in the District Plan. It complements the District Plan in shaping the future of the district to 2031 by providing a framework for the location of new homes and jobs.

The air quality related policy is as follows:

SA38: Air Quality provides additional policy requirements for when an air quality assessment may be required, for example, in relation to an AQMAs. It also addresses potential air quality impacts for the Ashdown Forest SPA and SAC.

The Submission Draft Mid Sussex District Plan 2021 - 2039

The Mid Sussex District Council is currently in the process of reviewing and updating the District Plan. The Mid Sussex District Plan 2014-2031 was submitted for independent examination on the 8th July 2024, and the first stage of the examination took place between 22nd and 31st October 2024.

Policy DPN9: Air Quality states:

People's health and quality of life and the natural environment 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 an unacceptable impact on air quality. The development must 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 that measures and/or mitigation 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.

2.3 Best Practice Guidance

2.3.1 Guidance on the Assessment of Dust from Demolition and Construction

The Institute of Air Quality Management (IAQM) published a guidance document (Holman *et al*., 2014), revised in 2024 on the assessment of construction phase impacts (herein the 'IAQM construction dust guidance'). The guidance was produced to provide advice to developers, consultants and environmental health officers on how to assess the impacts arising from construction activities. The emphasis of the methodology is on classifying sites according to the risk of impacts (in terms of dust nuisance, PM_{10} impacts on public exposure and impact upon sensitive ecological receptors) and to identify mitigation measure appropriate to the level of risk identified.

2.3.2 Local Air Quality Management Review and Assessment Technical Guidance

The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their air quality review and assessment work. This guidance, referred to in this document as the Local Air Quality Management Technical Guidance (Defra, 2022 ('LAQM TG.22').

2.3.3 Land-Use Planning & Development Control: Planning for Air Quality

Environmental Protection UK's (EPUK) and the IAQM jointly published a revised version of the guidance note 'Land-Use Planning & Development Control: Planning for Air Quality' in 2017 (herein the 'EPUK-IAQM guidance') to facilitate consideration of air quality within local development control processes. It provides a framework for air quality considerations, promoting a consistent approach to the treatment of air quality issues within development control decisions.

The guidance includes methods for undertaken an air quality assessment and an approach for assessing the significance of effects. The guidance note is widely accepted as an appropriate reference method for this purpose.

2.3.4 A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites

The Institute of Air Quality Management (IAQM) published a guidance document (Holman et al., 2020) on the assessment of air quality impacts on designated nature conservation sites (herein the 'IAQM designated nature conservation sites guidance'). The guidance was produced to provide advice to developers, consultants and environmental health officers on how to assess the air quality impacts of development on designated nature conservation sites. The document focuses on air quality assessments in support of Habitats Regulations Assessments, but it provides useful guidance when assessing the air quality impact on national or local designated nature conservation sites.

This guidance includes a number of environmental standards for ecological receptors. The relevant environmental standards for ecological receptors used in this assessment are presented in Table 2.2.

Table 2.2: Environmental Standards for Protected Conservation Areas

Substance	Emission period	Critical Level (mean) ($\mu g/m^3$)
Nitrogen oxides (NO_x)	24 hours	75$\mu g/m^3$
	Annual	30$\mu g/m^3$

2.3.5 Air Quality and Emissions Mitigation Guidance for Sussex (2021)

MSDC is a participating member of Sussex-air partnership, which has developed a guidance document for developers on how to assess and mitigate the air quality impacts from development and transport-related emissions.

3 ASSESSMENT SCOPE

3.1 Overall Approach

The approach taken for assessing the potential air quality impacts of the proposed development may be summarised as follows:

- Baseline characterisation of local air quality;
- Qualitative impact assessment of the construction phase of the development using the 2024 IAQM guidance;
- Quantitative assessment of air quality during the operational phase of the proposed development using the EPUK-IAQM 2017 guidance;
- Emission Mitigation Assessment
- Recommendation of mitigation measures, where appropriate, to ensure any adverse effects on air quality are minimised.

3.2 Baseline Characterisation

Existing or baseline air quality refers to the concentrations of relevant substances that are already present in ambient air. These substances are emitted by various sources, including road traffic, industrial, domestic, agricultural and natural sources.

A desk-based study has been undertaken including a review of monitoring data available from MSDC and estimated background data from the LAQM Support website maintained by Defra. Consideration has also been given to potential sources of air pollution and the presence of AQMA.

3.3 Construction Phase Assessment

3.3.1 Construction Dust and Particulate Matter

Construction works for the proposed development have the potential to lead to the release of fugitive dust and particulate matter. An assessment of the likely significant effects of construction phase dust and particulate matter at sensitive receptors has therefore been undertaken following the IAQM's construction dust guidance.

Three separate dust impacts were considered:

- Disamenity to dust soiling;
- The risk of health effects due to an increase in exposure to PM_{10}; and
- Harm to ecological receptors.

In order to assess the potential impacts of construction, activities are divided into four types:

- Demolition;
- Earthworks;

- Construction; and
- Trackout[2].

The risk of dust and PM_{10} arising to cause disamenity and/or health or ecological impacts was based on an assessment of likely emissions magnitude and the sensitivity of the surrounding environment. The risk category may be different for each of the four 'construction' activities.

Appendix B sets out the construction dust assessment methodology in detail as per the IAQM construction dust guidance. Once the level of risk has been determined, then site specific mitigation proportionate to the level of risk can be identified (as detailed in Section 6).

The Magic Map application available online by Defra was used to identify statutory ecological receptors near the proposed development site area.

3.3.2 Emissions to Air from Construction Traffic and Plant

Exhaust emissions from construction phase vehicles and plant may have an impact on local air quality adjacent to the routes used by these vehicles to access the proposed development site and in the vicinity of the proposed development site itself. Detailed information on the number of vehicles and plant associated with the construction phase is not available at this stage. Therefore, a qualitative impact assessment has been undertaken based on professional judgement.

3.4 Operational Phase Impact Assessment

3.4.1 Traffic Emissions

NO_2, PM_{10} and $PM_{2.5}$ are generally regarded as the most significant air pollutants released by vehicular combustion processes (as they tend to be more likely to be close to exceeding statutory limits in an urban environment), or subsequently generated by vehicle emissions in the atmosphere through chemical reactions.

The EPUK-IAQM 2017 guidance provides an approach for determining the significance of air quality impacts associated with a development in relation to emissions from traffic. To assess the impacts of a development on the surrounding area, the guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion.

The following subsectors provide further information regarding proposed methodology and dispersion model input for the air quality impact assessment.

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[2] Trackout is defined as the transport of dust and dirt from the construction / demolition sites onto public road network, where it may be deposited and then re-suspended by vehicles using the network.

3.4.2 Modelling Software

ADMS-Roads is an advanced dispersion model developed by the UK consultancy CERC (Cambridge Environmental Research Consultants). ADMS-Roads is widely used and validated within the UK and Europe. The model allows for the skewed nature of turbulence within the atmospheric boundary layer. ADMS-Roads is capable of processing hourly sequential meteorological data, whilst taking the turbulence caused by vehicles into account in calculating the dispersion profiles of emitted pollutants. ADMS-Roads enables the user to predict concentrations of pollutants of concern at multiple receptor locations.

ADMS-Roads (Version 5.0.1.3) has been used for assessing potential road traffic emission air quality impacts resulting from the operational phase of the proposed development, and the potential exposure of future residents at the proposed development site to poor air quality.

3.4.3 Modelling Scenarios

Once occupied, the proposed development will generate additional traffic on the surrounding road network and the emissions to air associated with this traffic have the potential to impact on nearby sensitive receptors.

The EPUK-IAQM 2017 guidance provides an approach for determining the significance of air quality impacts associated with a development in relation to emissions from traffic. To assess the impacts of a development on the surrounding area, the guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion. The approach is further described in Appendix C including the descriptors for the impact significance.

There are two aspects of air quality impact to be considered for the proposed development.

- The impacts of the proposed development on local air quality; and
- The impact of existing sources in the local area on the proposed development.

Considering the above we have assessed both the existing and the proposed sensitive receptors.

The main potential air quality impact once the proposed development is complete and occupied is likely to be emissions from road traffic associated with the proposed development (i.e. changes in flow volume and distribution). Thus, detailed dispersion modelling has been carried out to predict pollutant concentrations across the application site and the surrounding area. The following scenarios were modelled:

- Scenario 1 (S1): '2023 Baseline' for model verification purpose;

- Scenario 2 (S2): 'Future Year (2031) + Committed Development + Southern Site; and,
- Scenario 3 (S3): 'Future Year (2031) + Committed Development + Southern Site + Northern Development (Wychwood Place).

2023 is used as the baseline year in this assessment, for the purpose of model verification (i.e. S1) as the most recent year for which a full year of bias-adjusted and ratified local monitoring data is available.

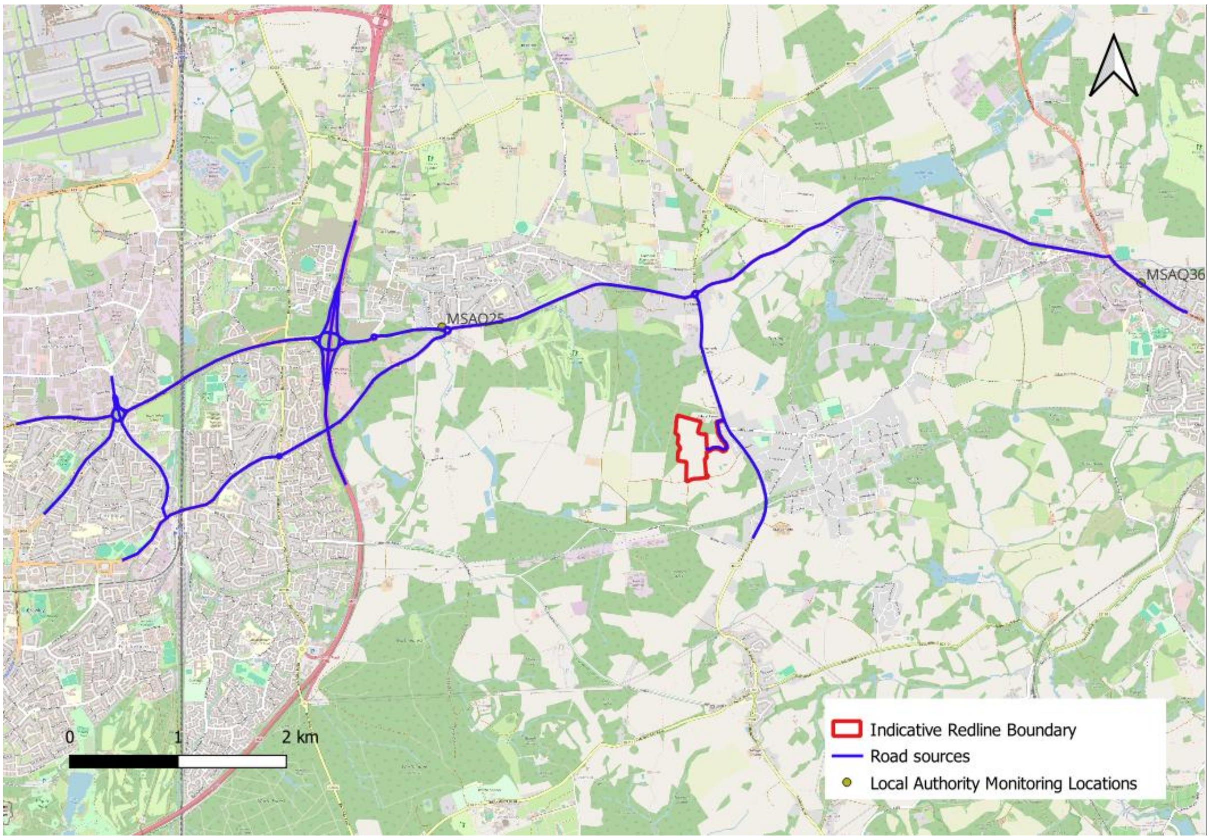
The development is anticipated to be complete and occupied in 2031. Therefore, 2031 has been used as the opening year in this assessment.

3.4.4 Traffic Data

Traffic data used in the air quality assessment were provided by the appointed project transport consultant, i- Transports. The traffic data used in the air quality dispersion modelling are presented in Appendix D.

The road network and monitoring locations included in the dispersion model is presented in Figure 3.1. Guidance in LAQM TG.22 and professional judgement was used to estimate speeds for use within the assessment, including reduced speeds at junctions.

Figure 3.1: The Roads and Monitoring Locations Included in the Dispersion Modelling Assessment for Verification



3.4.5 Traffic Emission Factors

Version 12.1 of the emissions factor toolkit (EFT), published by Defra, was used to derive vehicle emissions factors (i.e. the amount of pollution emitted from the vehicle fleet, in g/km/s) for nitrogen oxide (NO_x), PM_{10} and $PM_{2.5}$. Within the EFT, emission factors are available for 2018 through to 2050 for England (not London), and 2018 to 2030 for Wales, Scotland, Northern Ireland and London.

EFT version 12.1 takes into account the most recent evidence relating to factors such as advances in vehicle and exhaust technology and changes in composition of the vehicle fleet. The emission factors consequently reduce over time. Emission factors for 2023 were used to estimate vehicle emissions for S1 modelling scenario and 2031 emission factors were used for S2 and S3 modelling scenarios.

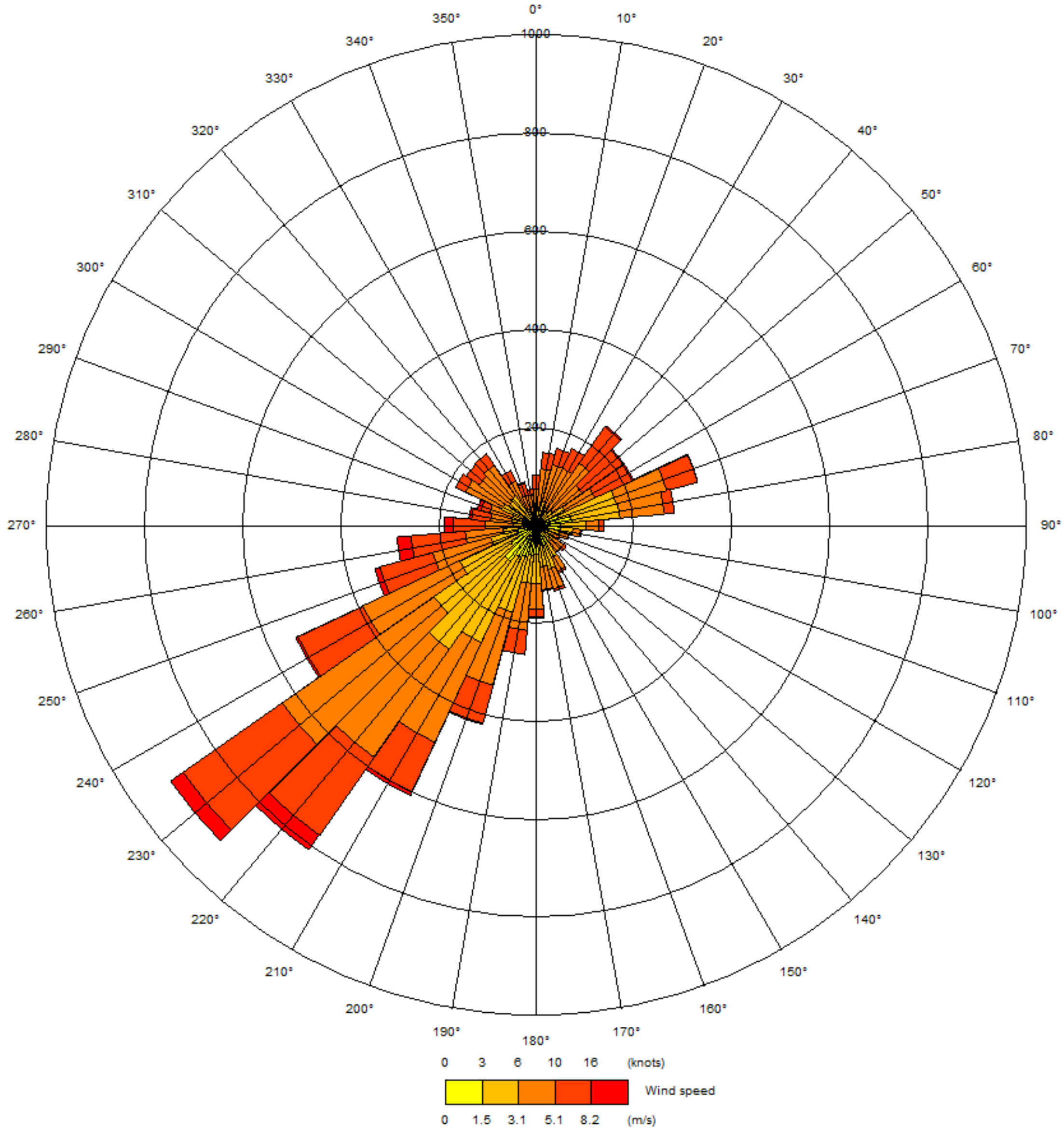
3.4.6 Time-Varying Profile

Vehicle movements vary with time. Diurnal profiles for the roads included within the model were not available and instead the UK National Profile 2023 published by the Department for Transport (DfT) was applied to all of the assessed roads. The diurnal profile is presented in Appendix D. A value of 1 on the y-axis is equivalent to the hourly average flow over 24 hours.

3.4.7 Meteorological Data

2023 hourly sequential meteorological data from the Gatwick Airport meteorological station was employed in the dispersion model. This meteorological station is located approximately 7.5km to the north-west of the study area and is considered to be representative of the development site condition. The windrose derived from the 2023 dataset is presented in Figure 3.3. The predominant wind direction was from the south-west.

Figure 3.2: Windrose from the Gatwick Airport Meteorological Station in 2023



3.4.8 Monitoring Locations

The diffusion tubes and automatic monitoring locations in the study area which are used in the dispersion modelling assessment for verification are shown in the Table 3.1

Table 3.1 Diffusion Tubes Included in the Dispersion Modelling Assessment

Receptor ID	Receptor Location	Grid Reference	
		X	Y
MSAQ25	Erica Way Copthorne	531176	138829
MSAQ36	Lamp Post adjacent Bridgeway London Road East Grinstead	537612	139405

3.4.9 Sensitive Receptor Locations

Pollutant concentrations were predicted at a number of human receptors at the proposed site and along the roads included in the study area. A height of 1.5m was used for human receptors and 0m for ecological receptors to represent the approximate average breathing height of an adult. Details of all specific human receptors included in the modelling study (and hence the air quality impacts assessed) are summarised in Table 3.2. The locations of all assessed receptors are shown in Appendix B.

Table 3.2 Receptors Included in the Dispersion Modelling Assessment

Receptor ID	Receptor Location	Grid Reference		Height (m)
		X	Y	
Existing receptors				
R1	Residential receptor 18,19 London Road, North End, East Grinstead	537443	139473	1.5
R2	Residential receptor 1, Long Wall, North End, Felbridge	537247	139627	1.5
R3	Felbridge Primary School, 2, Crawley Down Road	536794	139695	1.5
R4	26, Birch Grove, Felbridge, Tandridge	536909	139722	1.5
R5	47A, Copthorne Road, Felbridge, Tandridge	536444	139762	1.5
R6	146, Copthorne Road, Felbridge, Tandridge	535908	139983	1.5
R7	Copthorne Road, Felbridge, Tandridge, Surrey	534846	140037	1.5

Receptor ID	Receptor Location	Grid Reference		Height (m)
R8	Snow Hill, Firs Farm, Worth, Crawley Down	534376	139669	1.5
R9	4, Snow Hill, Firs Farm, Worth, Crawley Down	533884	139385	1.5
R10	Dukes Head Roundabout, Firs Farm, Worth, Crawley Down	533526	139241	1.5
R11	Vicarage Road, Grange Farm, Worth, Crawley Down	534216	137371	1.5
R12	Turners Hill Road, Hurst Farm, Worth, Crawley Down	533874	137927	1.5
R13	Wychwood Place, Hurst Farm, Worth, Crawley Down	533790	138046	1.5
R14	Turners Hill Road, Shepherds Farm, Worth, Crawley Down	533687	138417	1.5
R15	Tudor Rose, Turners Hill Road, Shepherds Farm	533534	139052	1.5
R16	Copthorne Common Road, Firs Farm	533126	139197	1.5
R17	Copthorne Common Road, Worth, Copthorne	532857	139262	1.5
R18	Copthorne Common Road, Worth, Copthorne	532484	139200	1.5
R19	16, Heather Close, Worth, Copthorne, Mid Sussex	531722	138916	1.5
R20	Kitsbridge House, Brookhill Road, Worth, Copthorne	531261	138833	1.5
R21	Copthorne Way, Worth, Copthorne, Mid Sussex	531185	138832	1.5
R22	Ivy Close, Worth, Copthorne, Mid Sussex, West Sussex	530937	138834	1.5
R23	41, Ferndown, Forge Wood, Crawley, West Sussex	530015	138611	1.5
R24	3, St Hilda's Close, Forge Wood, Crawley, West Sussex	529289	138524	1.5
R25	6, Tinsley Close, Three Bridges, Crawley, West Sussex	528391	138061	1.5
R26	Woodfield Road, Three Bridges, Crawley, West Sussex	528125	137888	1.5
R27	Hazelwick Cottage, Hazelwick Mill Lane, Three Bridges	528341	137767	1.5
R28	Crawley Avenue, Northgate, Crawley, West Sussex	527724	137893	1.5
R29	Northgate Avenue, Northgate, Crawley, West Sussex	528000	137585	1.5
R30	Hazelwick Avenue, Three Bridges, Crawley	528544	137501	1.5
R31	Copthorne Road, Worth, Copthorne, Mid Sussex	530880	138496	1.5

Receptor ID	Receptor Location	Grid Reference		Height (m)
R32	83, Bashford Way, Worth, Pound Hill, Crawley	529956	137730	1.5
R33	2, Woodlands, Worth, Pound Hill, Crawley, West Sussex	529663	137615	1.5
R34	St. Ives, Belloc Close, Worth, Pound Hill, Crawley	529022	137160	1.5
R35	39, Mill Road, Three Bridges, Crawley, West Sussex	528645	137190	1.5
R36	Medium sensitive Gatwick Road, Manor Royal, Crawley, West Sussex	528197	138152	1.5
R37	Residential Receptor at Wychwood Place	533750	137996	1.5
Proposed receptors				
P1	Proposed receptor on eastern boundary near site access	533625	137684	1.5
P2	Proposed receptor on northern façade on near Turners Hill Road	533562	138004	1.5
P3	Proposed receptor on eastern boundary near site access	533637	137773	1.5
Ecological receptors				
ER1	ER1	ER1	ER1	ER1
ER2	ER2	ER2	ER2	ER2
ER3	ER3	ER3	ER3	ER3
ER4	ER4	ER4	ER4	ER4

3.4.10 Background Air Quality Data Used in the Modelling

Given that there are currently no nearby representative background monitoring locations for NO_2, PM_{10} and $PM_{2.5}$, background concentrations for NO_2, PM_{10} and $PM_{2.5}$ were obtained from the 2018-based background maps on the Defra LAQM Support website, which provides estimated annual average background concentrations of PM_{10} and $PM_{2.5}$ on a 1 km^2 grid basis. The Defra LAQM background concentration maps assume that background concentrations will improve (i.e. reduce) over time, in line with predicted reduction in vehicle emissions as well as reduction in emissions from other sources. For a conservative approach, Defra background data for 2023 has been used for all modelled scenarios. The background concentrations included in the dispersion modelling assessment are presented in Table 3.2 and Table 3.3.

Table 3.2 Estimated 2023 Background Concentrations Included in the Assessment

Receptor	2023 Annual Average (µg/m^3)			Source
	NO_2	PM_{10}	$PM_{2.5}$	
Existing receptors				
R1	11.34	13.15	8.78	NO_2, PM_{10} & $PM_{2.5}$ – 2023 estimated data from Defra 2021based Background maps
R2	11.34	13.15	8.78	
R3	9.27	10.32	6.49	
R4	9.27	10.32	6.49	
R5	9.27	10.32	6.49	
R6	9.13	9.73	6.22	
R7	9.30	10.20	6.37	
R8	9.54	10.08	6.28	
R9	10.11	10.25	6.36	
R10	10.11	10.25	6.36	
R11	9.33	10.31	6.53	
R12	9.10	9.90	6.23	
R13	9.38	9.98	6.24	
R14	9.38	9.98	6.24	
R15	10.11	10.25	6.36	
R16	10.11	10.25	6.36	
R17	10.49	10.60	6.54	
R18	10.49	10.60	6.54	
R19	11.15	11.07	6.66	
R20	11.15	11.07	6.66	
R21	11.15	11.07	6.66	
R22	13.64	12.48	6.99	
R23	13.64	12.48	6.99	
R24	13.56	11.52	7.09	
R25	15.72	11.50	7.07	
R26	17.86	12.17	7.71	
R27	17.86	12.17	7.71	
R28	13.68	11.31	7.17	
R29	17.86	12.17	7.71	
R30	17.86	12.17	7.71	
R31	13.64	12.48	6.99	
R32	13.26	11.48	7.33	
R33	13.26	11.48	7.33	
R34	13.26	11.48	7.33	
R35	17.86	12.17	7.71	

Receptor	2023 Annual Average (µg/m³)			Source
R36	15.72	11.50	7.07	
R37	9.10	9.90	6.23	
Proposed receptors				
P1	9.10	9.90	6.23	NO_2, PM_{10} & $PM_{2.5}$ – 2023 estimated data from Defra 2021 based Background maps
P2	9.38	9.98	6.24	
P3	9.10	9.90	6.23	

Table 3.3 Estimated 2023 Background Concentrations Included in the Assessment for Ecological receptors

Receptor	2019 Annual Average (µg/m³)				Source
	NO_x	NO_2	PM_{10}	$PM_{2.5}$	
ER1	12.41	9.30	10.20	6.37	NOx from APIS, NO_2, PM_{10} & $PM_{2.5}$ – 2023 estimated data from Defra 2021 based Background maps
ER2	12.13	9.01	10.95	6.37	
ER3	12.13	9.01	10.95	6.37	
ER4	21.88	15.72	11.50	7.07	

3.4.11 Other Model Input Parameters

In order to represent the nature of the study area and surrounding area, a surface roughness of 0.5 was used in the model. The Minimum Monin-Obukhov length (related to atmospheric stability) was assumed to be 30m (Cities and Large Town). Settings were adjusted at the meteorological data site; a surface roughness of 0.5 and a Minimum Monin-Obukhov length of 30m were used.

3.4.12 Model Verification and Results Processing

The ADMS-Roads dispersion model has been widely validated for this type of assessment and is considered to be fit for purpose. Model validation undertaken by the software developer will not have included validation in the vicinity of the study area considered in this assessment. To determine the performance of the model at a local level, a comparison of modelled results with the results of monitoring carried out within the study area was undertaken. This process of verification attempts to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results, and was carried out following the methodology specified in LAQM.TG.22.

The two diffusion tubes were within close vicinity of the proposed development site and have been used for the verification of the model.

The monitoring locations are near the busy roads and therefore can be considered as a worst case. Therefore, 2023 monitored annual mean NO_2 concentrations from these have been used to verify the predicted road NO_x concentrations.

Full details of the verification calculations are presented within Appendix E.

An adjustment factor of **3.46** was obtained as part of the verification process for NO_2. The adjustment factor was applied to the modelled road-NO_x component before estimation of annual mean NO_2 concentrations using the NO_x: NO_2 calculator (version 8.1) available from the Defra website.

The predicted road-PM_{10} and road-$PM_{2.5}$ contributions were also adjusted using the factor calculated for road-NOx, before adding the appropriate background concentrations. This approach is consistent with guidance given in LAQM.TG.22.

LAQM TG.22 advises that an exceedance of the 1 hour mean NO_2 objective is unlikely to occur where the annual mean concentration is below 60µg/m^3, where road transport is the main source of pollution. This concentration has been used to screen whether the hourly mean objective is likely to be achieved.

Once processed, the predicted concentrations (full results presented in Section 5) were compared against the current statutory limit values and objectives for NO_2, PM_{10} and $PM_{2.5}$ set out in Table 2.1.

The modelling input parameters for the dispersion modelling assessment are presented in Table 3.4.

Table 3.4 Summary of Inputs to the Dispersion Model

Parameter	Brief description	Input into Model
Emission year	Predicted emission rates depend on the year of emission being used	2023 for S1, 2031 for S2 & S3
Road source emissions	Road source emission rates calculated from traffic flow data using an emission factor toolkit from AQC or Defra EFT	EFT V12.1
Time varied emissions	Diurnal variations of emissions applied to road sources	2023 national diurnal profile
Road elevation	Elevation of road above ground level	Crawley Interchange Roundabout and a link of Copthorne road was elevated. No terrain file used (due to relatively flat nature of study area)
Road width	Width of road (m)	Road widths determined based on approximate measurement of roads (internet mapping)
Road type	Selection of different types of road to be assessed, inputted into the emission factor toolkit calculations	'Urban (not London)' settings
Road speeds	Speed of the road effects the vehicle emissions to air	Standard speed limits used and professional judgement with slowing at junctions or bends
Meteorology	Representative hourly sequential meteorological data	Gatwick Airport meteorological station 2023
Latitude	Allows the location of the model area to be determined	51.1^{o}
Surface roughness	This defines the surface roughness of the model area	0.5m at development and at meteorological site
Monin-Obukhov length	A boundary layer parameter required to precisely describe the atmospheric stability conditions and to predict dispersion of pollutants released from road traffic	30m at the development and meteorological site

3.4.13 Air Quality Impact on Ecological Sites

Air quality impacts associated with the proposed development have the potential to impact on receptors of ecological sensitivity within the vicinity of the site. The IAQM guidance on 'Air Quality Impacts on Designated Nature Conservation Sites' (2020) outlines the types of designated nature sites within 2 km of the proposed development which require air quality assessment.

These are inclusive of;

- Sites of Special Scientific Interest (SSSIs);
- Special Areas of Conservation (SACs);
- Special Protection Areas (SPAs);
- Ramsar Sites;
- Areas of Special Scientific Interest (ASSIs);
- National Nature Reserves (NNRs);
- Local Nature Reserves (LNRs);
- Local Wildlife Sites (LWSs); and,
- Areas of Ancient Woodland (AW).

The Conservation of Habitats and Species Regulations (2019) additionally requires competent authorities to review planning applications and consents that have the potential to impact on European designated sites (e.g. Special Protection Areas).

A study was undertaken to identify any statutory designated sites of ecological or nature conservation importance within the extents of the dispersion modelling assessment. This was completed using the Multi-Agency Geographic Information for the Countryside (MAGIC) web-based interactive mapping service, which draws together information on key environmental schemes and designations. Following a search within the study area, the following statutory designated ecological receptors were on accordance with IAQM Guidance found to fall within 200m of an affected road as shown in Table 3.4 below:

Table 3.4: Ecological Sensitive Receptor Locations

Site ID	Site	Designation	UK NGR (m)		Distance from Site (km)	Distance from Nearest Affected Road (m)
			X	Y		
ER1	Hedgecourt	SSSI	534921	140226	2.9	161
ER2	Hedgecourt	SSSI	535089	140116	2.9	5
ER3	Hedgecourt	SSSI	534415	140105	2.9	6
ER4	Grattons Park	LNR	528967	138357	5.0	21

3.5 Uncertainties and Assumptions

The following uncertainties and assumptions have been made in the air quality assessment:

- In the absence of measured NO_2, PM_{10} and $PM_{2.5}$ at the proposed development location, estimated background data from the Defra LAQM website were used in the assessment. In reality, baseline air quality levels vary with time and location but in the absence of on-site baseline monitoring data, the assumption that the baseline concentrations obtained from the above-mentioned data source is applicable to the site location, is considered appropriate;
- Emissions from the average vehicle fleet using the local road network cannot be known, and therefore it is assumed those generated by the EFT provide an accurate representation of emissions generated by vehicles which currently and will use the modelled roads.
- There will be uncertainties introduced because the modelling has simplified real-world processes into a series of algorithms. For example, it has been assumed that wind conditions measured at Gatwick airport meteorological station in 2023 were representative of wind conditions at the site. Furthermore, it has been assumed that the subsequent dispersion of emitted pollutants will conform to a Gaussian distribution over flat terrain in order to simplify the real-world dilution and dispersion conditions;
- An important step in the assessment is verifying the dispersion model against measured data. The model verification was based on the comparison of model results based on 2023 traffic data with 2023 measured roadside NO_2 diffusion tube data. As no PM_{10} or $PM_{2.5}$ monitoring data were available near the site area, the adjustment factors used for the predicted roadside NO_x concentrations have been applied to the predicted PM_{10} and $PM_{2.5}$ concentrations, as per guidance in LAQM.TG.22.
- The national diurnal profile published by the Department for Transport for 2023, has been assumed to be applicable for the roads assessed.
- There is an element of uncertainty in all measured and modelled data. All values presented in this report are best possible estimates.

4 BASELINE AIR QUALITY CHARACTERISATION

Existing or baseline air quality refers to the concentrations of relevant substances that are already present in ambient air. These substances are emitted by various sources, including road traffic, industrial, domestic, agricultural and natural sources. Baseline air quality data employed in this study have been obtained from monitoring stations maintained by MSDC and from the LAQM Support website operated by the Department for Environment, Food and Rural Affairs (Defra).

4.1 Emissions Sources and Key Air Pollutants

The development site is bounded to the east by residential receptors at Wychwood Place, residential receptors in Huntsland Road to the south, Hurst Farm to the north and some residential receptors to the west. Therefore, the application site is located in an area where the main source of air pollution is likely to be road traffic emissions. The principal pollutants relevant to this assessment are considered to be NO_2, PM_{10} and $PM_{2.5}$, generally regarded as the most significant air pollutants released by vehicular combustion processes, or subsequently generated by vehicle emissions in the atmosphere through chemical reactions.

4.2 Presence of AQMAs

Mid Sussex District Council (MSDC) declared an AQMA at Stonepound Crossroads in Hassocks in 2012. This was declared for exceedance of nitrogen dioxide (NO_2) annual objective. The nearest AQMA to the proposed development is Crawley AQMA declared by Crawley Borough Council for exceedance of nitrogen dioxide (NO_2) annual objective located approximately 3.7 km away. Hence, the proposed development site is not located within or near an AQMA.

4.3 Local Authority Air Quality Monitoring Data

According to MSDC's 2024 Air Quality Annual Status Report (ASR), there was one automatic monitoring station and a network of 36 NO_2 diffusion tubes in the district in 2023.

There were two diffusion tubes located within 3.0km of the proposed development site. Table 4.1 presents the annual average measured NO_2 concentrations at monitoring locations nearest to the proposed development site. None of the tubes has shown any exceedance in the last four years.

Table 4.1 Annual Average Measured NO_2 Concentrations at Monitoring Sites nearest to the Proposed Development Site

Site ID	Site Name	Site Type	Approx distance from proposed development (km)	Annual Average NO_2 (µg/m3)				
				2019	2020	2021	2022	2023
MSAQ25	Erica Way Copthorne	Kerbside	1.73	26.8	18.4	18.8	20.6	18.2
MSAQ36	Lamp Post adjacent Bridgeway London Road East Grinstead	Roadside	2.79	-	31.6	32.7	33.5	29.8

4.4 LAQM Background Data

In addition to the local monitoring data, estimated background air quality data available from the Local Air Quality Management (LAQM) website operated by Defra, may also be used to establish likely background air quality conditions at the proposed development site.

This website provides estimated annual average background concentrations of NO_2, PM_{10} and $PM_{2.5}$ on a 1km^2 grid basis. Table 4.3 identifies estimated annual average background concentrations for the grid square containing the proposed development site for the years 2024 and 2025.

No exceedances of the NO_2, PM_{10} or $PM_{2.5}$ AQSs are predicted. As background concentrations are predicted to fall with time, background concentrations in future years would not be expected to exceed their respective AQSs.

Table 4.3: Estimated Background Annual Average NO_2, PM_{10} and $PM_{2.5}$ Concentrations at Proposed Development Site (from 2021 base map)

Assessment Year	Estimated Annual Average Pollutant Concentrations Derived from the LAQM Website (µg/m^3)		
	Annual Average NO_2	Annual Average PM_{10}	Annual Average $PM_{2.5}$
2024	8.39	12.44	8.40
2025	8.12	12.26	8.25
Air Quality Objective	**40**	**40**	**20**

Note: Presented concentrations for 1 km^2 grid centred on 533500 , 137500; approximate centre of development site is 533737 , 137306.

5 ASSESSMENT OF IMPACTS

5.1 Construction Phase

Atmospheric emissions from construction activities will depend on a combination of the potential for emissions (the type of activity and prevailing conditions) and the effectiveness of control measures. In general terms, there are two sources of emissions that will need to be controlled to minimise the potential for adverse environmental effects:

- Exhaust emissions from site plant, equipment and vehicles; and
- Fugitive dust emissions from site activities.

5.1.1 Exhaust Emissions from Plant and Vehicles

The operation of vehicles and equipment powered by internal combustion engines results in the emission of exhaust gases containing the pollutants NO_x, PM_{10}, volatile organic compounds (VOCs) and carbon monoxide (CO). The quantities emitted depend on factors such as engine type, service history, pattern of usage and fuel composition.

Construction traffic will comprise haulage/construction vehicles and vehicles used for workers' trips to and from the application site. The greatest impact on air quality due to emission from construction phase vehicles will be in areas adjacent to the application site access and nearby road network.

The transport consultants have confirmed that it has been assumed that assuming both estates are simultaneously built and applying a rate of 100 homes per year, it is expected that 46 two-way HGV movements and 124 two-way light vehicle movements could be generated but these should be halved as only one estate will be built at a time.

This equates to a generation of additional 23 HDV and 62 LDV 24 hourly AADT which is below the screening criteria for undertaking a detailed assessment. Therefore, it is considered unlikely to cause a significant impact on local air quality, in accordance with the IAQM guidance.

The operation of site equipment and machinery will result in emissions to atmosphere of exhaust gases, but with suitable controls and site management such emissions are unlikely to be significant (as per LAQM.TG(22)).

5.1.2 Fugitive Dust Emissions

Fugitive dust emissions arising from construction activities are likely to be variable in nature and will depend upon the type and extent of the activity, soil type and moisture content, road surface conditions and weather conditions. Periods of dry weather combined with higher than average wind speeds have the potential to generate more dust.

The construction activities anticipated as part of the proposed development that are often the most significant potential sources of fugitive dust emissions are:

- Earthworks comprising of levelling, construction of foundations, haulage, tipping, stockpiling, landscaping and tree removal;
- Construction of proposed development and hard landscaped areas; and,
- Trackout, involving the movement of vehicles over surfaces where muddy materials have been transferred off-site (for example, on to public highways).

Fugitive dust arising from construction and demolition activities is mainly of a particle size greater than the PM_{10} fraction (that which can potentially impact upon human health). However, it is noted that construction activities may contribute to local PM_{10} concentrations. There will be no demolition on site in this case. Appropriate dust control measures can be highly effective for controlling emissions from potentially dust generating activities identified above, and adverse effects can be greatly reduced or eliminated.

See Appendix A for further explanation of the tendency of dust to remain airborne.

5.1.3 Potential Dust Emission Magnitude

With reference to the IAQM guidance criteria outlined in Appendix A, the dust emissions magnitude for earthworks, construction and trackout activities are summarised in Tables 5.1, 5.2, 5.3 and 5.4. There will be no demolition on site and therefore, demolition risk has not been assessed. Risk categories for the construction activities are summarised in Table 5.4.

Worst-case assumptions have been made, where information is not currently available, for a conservative assessment.

Table 5.1: Summary of Dust Emissions Magnitude of Earthworks Activities (Before mitigation)

Earthworks Criteria	Dust Emissions Class	Evaluation of the Effects
Total site area	Large	133200 m^2 (13.32 Ha) which is >110,000 m^2
Soil type	Large	Silty clay and sand
Earth moving vehicles at any one time	Medium	5-10
Height of bunds	Medium	3-6 m
Overall Rating		**Large**

Table 5.2: Summary of Dust Emissions Magnitude of Construction Activities (Before mitigation)

Construction Criteria	Dust Emissions Class	Evaluation of the Effects
Total building volume	Medium	12,000-75,000 m3
On-site concrete batching proposed	Small	No
On-site concrete sandblasting	Small	No
Dust potential of construction materials	Medium	Potentially dusty soil on-site
Overall Rating		**Medium**

Table 5.3: Summary of Dust Emissions Magnitude of Trackout Activities (Before mitigation)

Trackout Criteria	Dust Emissions Class	Evaluation of the Effects
Number of HDV>3.5t per day	Medium	20-50 HDVs
Length of unpaved road	Small	<50m
Overall Rating		**Medium**

Table 5.4: Summary of Dust Emission Magnitude of the Site (Before mitigation)

Construction Activities	Dust Emissions Class
Earthworks	Large
Construction	Medium
Trackout	Medium

5.1.4 Sensitivity of the Area

As per the IAQM Guidance, the sensitivity of the area takes into account a number of factors, including:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM_{10}, the local background concentration; and
- Site specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

Consideration is given to human and ecological receptors, distances are calculated from the construction site boundary and the trackout route proposed. Where necessary, for example, if the trackout route is not yet known, a conservative view on the likely route has been taken. Figures 5.1 and 5.2 show maps indicating the earthworks/construction and trackout buffers, respectively, for identifying the sensitivity of the area. Table 5.5 presents the determined sensitivity of the area. Construction activities are relevant up to 350m from the proposed development site boundary whereas trackout activities are only considered relevant up to 50m from the edge of the road, as per the IAQM guidance. Only 20m and 50m buffers have been included for trackout for this reason.

The Magic Map application available online by Defra was used to identify statutory ecological receptors near the proposed development site area.

However, the MAGIC Maps website indicates that there are no Special Area of Conservation, Special Protection Area, Ramsar site, National Nature Reserve or Local Nature Reserve within 50m of the site boundary or potential routes along which trackout could arise. Impacts of ecological receptors are therefore not considered applicable and have not been considered further for construction phase.

Table 5.5: Sensitivity of the area

Potential Impact		Sensitivity of the surrounding area		
		Earthworks	Construction	Trackout
Dust soiling	Receptor sensitivity	High	High	High
	Number of receptors	1-10	1-10	1-10
	Distance from the source	<20m	<20m	<20m
	Sensitivity of the area	**Medium**	**Medium**	**Medium**
Human health	Receptor sensitivity	High	High	High
	Annual mean PM_{10} concentration	<24µg/m³	<24µg/m³	<24µg/m³
	Number of receptors	1-10	1-10	1-10
	Distance from the source	<20m	<20m	<20m
	Sensitivity of the area	**Low**	**Low**	**Low**
Ecological	Receptor sensitivity	N/A		

5.1.5 Risk of Impacts

The dust emission magnitude is combined with the sensitivity of the area to determine the risk of impacts of construction activities before mitigation; these are evaluated based on risk categories of each activity in Appendix A. The risk of dust impacts from construction activities is identified in Table 5.6.

Figure 5.1 shows a map indicating the demolition/earthworks/construction activities buffers, and Figure 5.2 show maps indicating the trackout activities buffers for identifying the sensitivity of the area.

Site specific mitigation measures to reduce construction phase impacts are defined based on this assessment in Section 6.

Figure 5.1: Demolition/Earthworks/Construction Activities Buffer Map

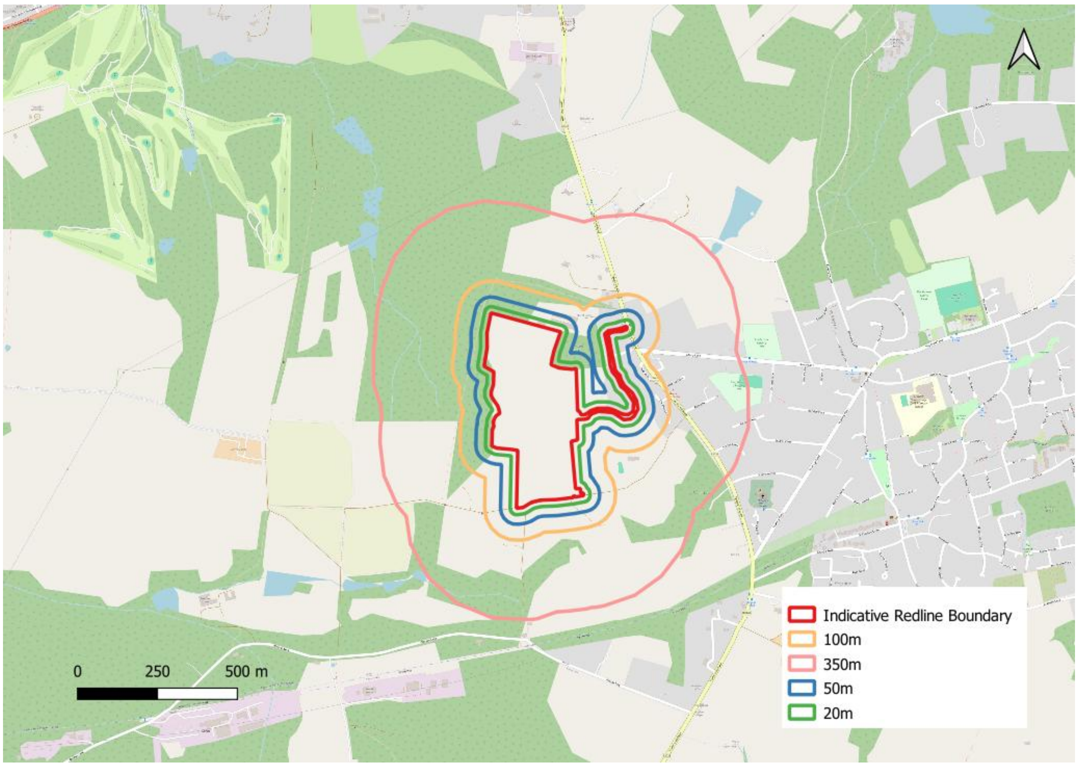


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Figure 5.2: Trackout Activities Buffer Map

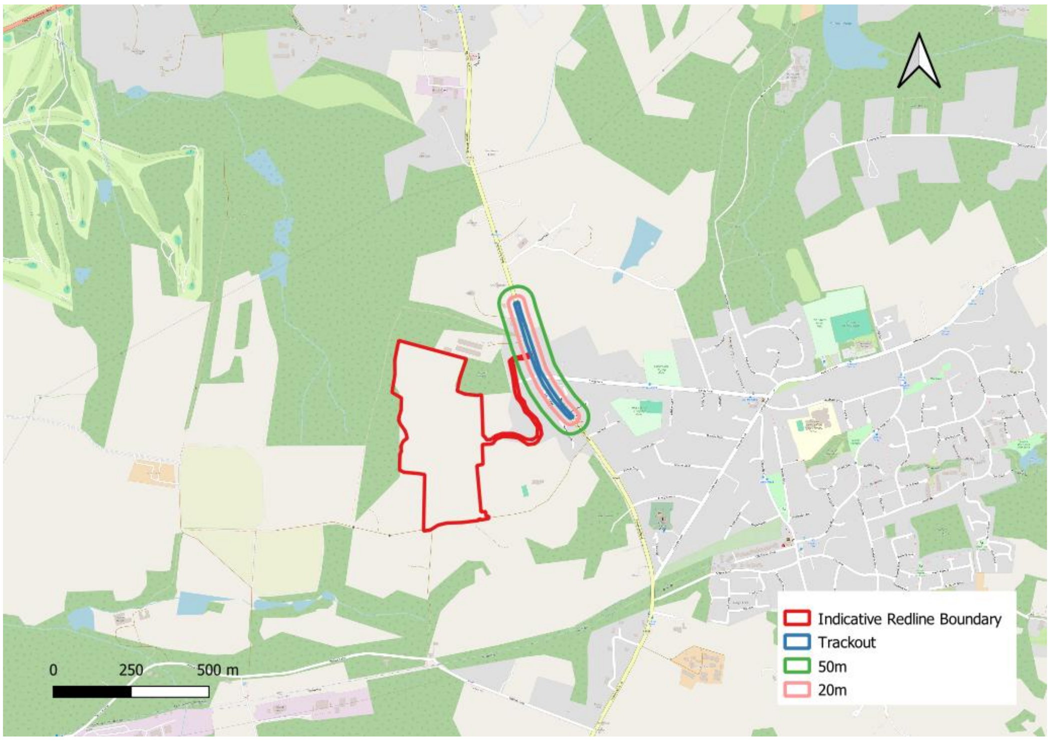

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Table 5.6: Summary of the Dust Risk from Construction Activities

Potential Impact	Dust Risk Impact		
	Earthworks	Construction	Trackout
Dust soiling	Medium Risk	Medium Risk	Medium Risk
Human health	Low Risk	Low Risk	Low Risk

5.2 Operational Phase

5.2.1 Emissions to Air from Operational Phase

No significant combustion sources such as combined heat and power (CHP) plant or biomass boilers are proposed as part of the scheme. Air source heat pumps are proposed for heating and hot water which mean that buildings will have no impact on air quality.

The principal operational phase air quality impact i.e. when the development is completed and fully occupied, is likely to be associated with road traffic emissions as a result of any changes in traffic flows or flow composition the development may bring.

The project transport consultant, i transports have confirmed that there would be a generation of 880 AADT due to the operation of the proposed development.

The operational phase assessment therefore consists of the quantified predictions of the change in NO_2, PM_{10} and $PM_{2.5}$ for the operational phase of the development due to changes in traffic movement. Predictions of air quality at the site have been undertaken for the operational phase of the development using ADMS Roads.

Emission factors for the 2023 baseline and 2031 projected 'Do-minimum and Do-something' scenarios have been calculated using the Emission Factor Toolkit (EFT) Version 12.1.

It is assumed the average vehicle speeds on the local road network in an opening year of 2031 will be broadly the same as the ones in 2023. A 50 m, 20 km/hr slow down phase is included on each link at every junction and roundabout within the assessment. All of the roads within the dispersion model are illustrated in Figure B1, Appendix B. Detailed traffic figures are provided in Appendix D.

5.2.2 Dispersion Modelling Results

Detailed dispersion modelling has been undertaken with the use of the ADMS-Roads dispersion model software, following guidance in LAQM.TG.22. The modelled concentrations have been verified and results processed as detailed in Appendix E.

Full results are presented in Appendix F and a summary is provided below.

5.2.2.1 Nitrogen Dioxide (NO_2)

The AQS objective for annual mean NO_2 concentrations is 40µg/m^3. The results of the assessment show that concentrations are predicted to meet the annual mean NO_2 objective at all assessment receptors.

Table 5.7 shows the comparison of annual mean NO_2 concentrations between the 'S2 2031 without the proposed northern development site but with consented developments and including southern site' and 'S3 2031 with the proposed northern site and committed developments including development at southern site' scenarios at the assessed receptor locations. The percentage changes in annual mean NO_2 concentrations relative to the air quality objective and the classification of impact magnitudes with reference to the EPUK-IAQM guidance are also presented.

The proposed development is not predicted to cause any new exceedances of the annual mean NO_2 objective.

The changes in annual mean NO_2 concentrations as a result of the proposed development and traffic redistribution are 0% of the air quality assessment level (AQAL) (i.e. <0.5% and therefore no perceptible change). The impacts of the proposed development on nearby sensitive receptors are predicted to be 'negligible' at all receptor locations.

LAQM TG.22 notes that 'exceedances of the 1-hour mean objective for NO_2 are only likely to occur where annual mean concentrations are 60µg/m^3 or above'. In the opening year of 2031 when the development is completed and fully occupied, annual mean NO_2 concentrations (see Table 5.7) are not predicted to exceed 60µg/m^3 at any receptors. Therefore, it is not anticipated that the hourly mean NO_2 objective would be exceeded at the site prior to or when the proposed development becomes operational.

Table 5.7: Predicted Annual Mean NO_2 Impact

Receptor ID	Annual Mean NO_2 Concentration				Impacts**
	AQ-S2 – 2031 Without Northern Site Development	AQ-S3 – 2031 With Northern Site Development		Change Between AQ-S2 and AQ-S3 as % of AQAL*	Impact of the proposed development
	NO_2 Concentration (µg/m^3)	NO_2 Concentration (µg/m^3)	DS Concentration (As % of AQAL)		
R1	12.27	12.28	30.70	0%	Negligible
R2	14.81	14.82	37.05	0%	Negligible
R3	11.35	11.36	28.40	0%	Negligible
R4	11.21	11.21	28.03	0%	Negligible
R5	10.35	10.35	25.88	0%	Negligible
R6	11.28	11.29	28.23	0%	Negligible
R7	10.89	10.89	27.23	0%	Negligible
R8	11.76	11.77	29.43	0%	Negligible
R9	16.32	16.34	40.85	0%	Negligible
R10	16.07	16.15	40.38	0%	Negligible
R11	10.90	10.91	27.28	0%	Negligible
R12	11.16	11.21	28.03	0%	Negligible
R13	10.94	11.15	27.88	0%	Negligible
R14	11.31	11.39	28.48	0%	Negligible
R15	11.50	11.55	28.88	0%	Negligible
R16	13.44	13.50	33.75	0%	Negligible
R17	14.09	14.15	35.38	0%	Negligible
R18	13.08	13.13	32.83	0%	Negligible
R19	14.82	14.88	37.20	0%	Negligible
R20	18.90	19.00	47.50	0%	Negligible
R21	16.14	16.19	40.48	0%	Negligible
R22	16.34	16.37	40.93	0%	Negligible
R23	17.28	17.29	43.23	0%	Negligible
R24	17.10	17.11	42.78	0%	Negligible

R25	21.38	21.40	53.50	0%	Negligible
R26	20.38	20.38	50.95	0%	Negligible
R27	19.41	19.42	48.55	0%	Negligible
R28	15.88	15.88	39.70	0%	Negligible
R29	19.89	19.89	49.73	0%	Negligible
R30	18.59	18.59	46.48	0%	Negligible
R31	15.08	15.09	37.73	0%	Negligible
R32	15.29	15.30	38.25	0%	Negligible
R33	16.07	16.09	40.23	0%	Negligible
R34	15.81	15.83	39.58	0%	Negligible
R35	18.78	18.79	46.98	0%	Negligible
R36	17.94	17.95	44.88	0%	Negligible
R37	9.46	9.67	24.18	0%	Negligible
P1	9.20	9.21	23.03	0%	Negligible
P2	9.51	9.52	23.80	0%	Negligible
P3	9.22	9.25	23.13	0%	Negligible
*As recommended in the EPUK-IAQM guidance, percentages have been rounded to whole numbers. Changes less than 0.5% i.e. 0%, have been described as negligible. **Impacts are determined in accordance with EPUK-IAQM guidance.					

5.2.2.2 Particular Matter (PM_{10})

The AQS objective for annual mean PM_{10} concentrations is 40µg/m^3. The results of the assessment indicate that in the anticipated opening year of 2031 (when the development is completed and fully occupied), annual mean PM_{10} concentrations for all receptor locations will be well below the objective.

Table 5.8 shows the comparison of annual mean PM_{10} concentrations between the 'S2 2031 without proposed development at Northern site' and 'S3 2031 with proposed development at Northern site' scenarios at the assessed receptor locations. The percentage changes in annual mean PM_{10} concentrations relative to the air quality objective and the classification of impact magnitudes with reference to the EPUK-IAQM guidance are also presented.

The proposed development is not predicted to cause any new exceedances of the annual mean PM_{10} objective.

The changes in annual mean PM_{10} concentrations as a result of the proposed development are 0% of the AQAL (i.e. <0.5% and therefore no perceptible change). The impacts of the proposed development on nearby sensitive receptors in relation to PM_{10} concentrations are predicted to be 'negligible' at all receptor locations.

LAQM TG.22 indicates that the number of annual exceedances of the 24-hour mean PM_{10} AQS can be estimated using the following formula: $-18.5 + 0.00145 \times \text{annual mean}^3 + (206/\text{annual mean})$. Table 5.9 presents results for the 24-hour mean PM_{10} concentrations as number of day greater than 50µg/m^3 for S2 and S3. The objective for 24-hour mean PM_{10} concentrations is 50µg/m^3 to be exceeded no more than 35 times a year. The number of days exceeding 50µg/m^3 predicted is a maximum of 4 days/annum, which is well below the objective.

The results indicate that in the opening year of 2031 (when the development is completed and fully occupied), no exceedances of annual mean PM_{10} concentrations are predicted with the proposed development at any of the proposed receptors.

Table 5.8: Predicted Annual Mean PM_{10} Impact

Receptor ID	Annual Mean PM_{10} Concentration				Impacts**
	AQ-S2 - 2031 Without Northern Site Development	AQ-S3 - 2031 With Northern Site Development		Change Between AQ-S2 and AQ-S3 as % of AQAL*	Impact of the proposed development
	PM_{10} Concentration (µg/m³)	PM_{10} Concentration (µg/m³)	As % of AQAL		
R1	13.84	13.85	34.63	0%	Negligible
R2	15.40	15.40	38.50	0%	Negligible
R3	11.98	11.98	29.95	0%	Negligible
R4	11.86	11.86	29.65	0%	Negligible
R5	11.17	11.17	27.93	0%	Negligible
R6	11.43	11.44	28.60	0%	Negligible
R7	11.44	11.45	28.63	0%	Negligible
R8	11.84	11.85	29.63	0%	Negligible
R9	15.32	15.34	38.35	0%	Negligible
R10	13.96	14.02	35.05	0%	Negligible
R11	11.57	11.58	28.95	0%	Negligible
R12	11.54	11.58	28.95	0%	Negligible
R13	11.21	11.38	28.45	0%	Negligible
R14	11.34	11.40	28.50	0%	Negligible
R15	11.19	11.22	28.05	0%	Negligible
R16	12.15	12.18	30.45	0%	Negligible
R17	12.66	12.69	31.73	0%	Negligible
R18	12.07	12.09	30.23	0%	Negligible
R19	13.15	13.18	32.95	0%	Negligible
R20	15.77	15.84	39.60	0%	Negligible
R21	14.32	14.36	35.90	0%	Negligible

Receptor ID	Annual Mean PM_{10} Concentration				Impacts**
	AQ-S2 - 2031 Without Northern Site Development	AQ-S3 - 2031 With Northern Site Development		Change Between AQ-S2 and AQ-S3 as % of AQAL*	Impact of the proposed development
	PM_{10} Concentration (μg/m^3)	PM_{10} Concentration (μg/m^3)	As % of AQAL		
R22	13.94	13.96	34.90	0%	Negligible
R23	14.06	14.07	35.18	0%	Negligible
R24	12.73	12.74	31.85	0%	Negligible
R25	13.95	13.96	34.90	0%	Negligible
R26	13.63	13.63	34.08	0%	Negligible
R27	13.30	13.31	33.28	0%	Negligible
R28	12.04	12.04	30.10	0%	Negligible
R29	13.58	13.58	33.95	0%	Negligible
R30	12.69	12.70	31.75	0%	Negligible
R31	13.20	13.21	33.03	0%	Negligible
R32	12.48	12.49	31.23	0%	Negligible
R33	13.38	13.40	33.50	0%	Negligible
R34	13.03	13.04	32.60	0%	Negligible
R35	12.83	12.83	32.08	0%	Negligible
R36	13.01	13.02	32.55	0%	Negligible
R37	10.17	10.34	25.85	0%	Negligible
P1	9.96	9.97	24.93	0%	Negligible
P2	10.06	10.07	25.18	0%	Negligible
P3	9.98	10.00	25.00	0%	Negligible

*As recommended in the EPUK-IAQM guidance, percentages have been rounded to whole numbers. Changes less than 0.5% i.e. 0%, will be described as negligible.

**Impacts are determined in accordance with EPUK-IAQM guidance.

Table 5.9: Predicted 24-Hour Mean PM_{10} Impact

Receptor ID	24-Hour Mean PM_{10}* (number of days >50µg/m^3)		
	AQ-S2 - 2031 Without Northern Site Development	AQ-S3 – 2031 With Northern Site Development	Change between AQ-S2 and AQ-S3
R1	0	0	0
R2	0	0	0
R3	1	1	0
R4	1	1	0
R5	2	2	0
R6	2	2	0
R7	2	2	0
R8	1	1	0
R9	0	0	0
R10	0	0	0
R11	2	2	0
R12	2	2	0
R13	2	2	0
R14	2	2	0
R15	2	2	0
R16	1	1	0
R17	1	1	0
R18	1	1	0
R19	0	0	0
R20	0	0	0
R21	0	0	0

Receptor ID	24-Hour Mean PM_{10}* (number of days >50µg/m^3)		
	AQ-S2 - 2031 Without Northern Site Development	AQ-S3 – 2031 With Northern Site Development	Change between AQ-S2 and AQ-S3
R22	0	0	0
R23	0	0	0
R24	1	1	0
R25	0	0	0
R26	0	0	0
R27	0	0	0
R28	1	1	0
R29	0	0	0
R30	1	1	0
R31	0	0	0
R32	1	1	0
R33	0	0	0
R34	1	1	0
R35	1	1	0
R36	1	1	0
R37	3	3	0
P1	4	4	0
P2	3	3	0
P3	4	4	0
*Rounded to whole days			

5.2.2.3 Particular Matter ($PM_{2.5}$)

The AQS objective for annual mean $PM_{2.5}$ concentrations is 20µg/m^3. The results of the assessment show that concentrations are predicted to meet the annual mean $PM_{2.5}$ objective at all assessment receptors.

Table 5.10 shows the comparison of annual mean $PM_{2.5}$ concentrations between the 'S2 2031 without proposed development at Northern site' and 'S3 2031 with proposed development at Northern site' scenarios at the assessed receptor locations. The results as percentages of the AQAL (i.e. the UK AQS objectives) are also presented which are used in the determination of significance of impacts (based on the EPUK-IAQM guidance).

The proposed development is not predicted to cause any new exceedances of the annual mean $PM_{2.5}$ objective.

The changes in annual mean $PM_{2.5}$ concentrations as a result of the proposed development are 0% of the AQAL (i.e. <0.5% and therefore no perceptible change). The impacts of the proposed development on nearby sensitive receptors in relation to $PM_{2.5}$ concentrations, are predicted to be 'negligible' at all receptor locations.

The results indicate that in the opening year of 2031 when the development is completed and fully occupied, no exceedances of annual mean $PM_{2.5}$ concentrations are predicted with the proposed development at any of the proposed receptors.

Table 5.10: Predicted Annual Mean $PM_{2.5}$ Impact

Receptor ID	Annual Mean $PM_{2.5}$ Concentration				Impacts**
	AQ-S2 – 2031 Without Northern Site Development	AQ-S3 - 2031 With Northern Site Development		Change Between AQ-S2 and AQ-S3 as % of AQAL*	Impact of the proposed development
	$PM_{2.5}$ Concentration (µg/m3)	$PM_{2.5}$ Concentration (µg/m3)	As % of AQAL		
R1	9.14	9.14	45.70	0%	Negligible
R2	9.14	9.14	49.75	0%	Negligible
R3	9.95	9.95	36.80	0%	Negligible
R4	7.36	7.36	36.50	0%	Negligible
R5	7.30	7.30	34.70	0%	Negligible
R6	6.94	6.94	35.55	0%	Negligible
R7	7.11	7.11	35.15	0%	Negligible
R8	7.02	7.03	36.05	0%	Negligible
R9	7.20	7.21	45.10	0%	Negligible
R10	9.01	9.02	41.60	0%	Negligible
R11	8.29	8.32	36.00	0%	Negligible
R12	7.19	7.20	35.55	0%	Negligible
R13	7.09	7.11	34.85	0%	Negligible
R14	6.88	6.97	35.00	0%	Negligible
R15	6.97	7.00	34.40	0%	Negligible
R16	6.86	6.88	37.20	0%	Negligible
R17	7.42	7.44	38.50	0%	Negligible
R18	7.69	7.70	36.85	0%	Negligible
R19	7.36	7.37	39.15	0%	Negligible
R20	7.82	7.83	45.95	0%	Negligible
R21	9.15	9.19	41.95	0%	Negligible
R22	8.37	8.39	39.10	0%	Negligible
R23	7.81	7.82	39.35	0%	Negligible
R24	7.87	7.87	39.05	0%	Negligible

Receptor ID	Annual Mean $PM_{2.5}$ Concentration				Impacts**
	AQ-S2 – 2031 Without Northern Site Development	AQ-S3 - 2031 With Northern Site Development		Change Between AQ-S2 and AQ-S3 as % of AQAL*	Impact of the proposed development
	$PM_{2.5}$ Concentration (µg/m3)	$PM_{2.5}$ Concentration (µg/m3)	As % of AQAL		
R25	7.81	7.81	42.25	0%	Negligible
R26	8.44	8.45	42.45	0%	Negligible
R27	8.48	8.49	41.55	0%	Negligible
R28	8.31	8.31	37.95	0%	Negligible
R29	7.59	7.59	42.35	0%	Negligible
R30	8.47	8.47	39.95	0%	Negligible
R31	7.99	7.99	37.00	0%	Negligible
R32	7.40	7.40	39.45	0%	Negligible
R33	7.89	7.89	41.65	0%	Negligible
R34	8.33	8.33	40.70	0%	Negligible
R35	8.13	8.14	40.30	0%	Negligible
R36	8.06	8.06	39.35	0%	Negligible
R37	7.87	7.87	32.30	0%	Negligible
P1	6.37	6.46	31.30	0%	Negligible
P2	6.26	6.26	31.40	0%	Negligible
P3	6.28	6.28	31.40	0%	Negligible

*As recommended in the EPUK-IAQM guidance, percentages have been rounded to whole numbers. Changes less than 0.5% i.e. 0%, will be described as negligible.

**Impacts are determined in accordance with EPUK-IAQM guidance.

5.2.3 Ecological Receptors – Dispersion Modelling Results

Nitrogen Oxide

Table 5.11 presents a summary of the exposure to NO_X concentrations at relevant ecological receptor locations during do-minimum and do-something scenarios.

Background concentrations at each of the ecologically sensitive sites were determined through a review of the NO_X pollutants published on the APIS website.

Table 5.11: Predicted Annual Average Concentrations of NO_X at Ecological Receptor Locations

Ecological Receptor		Predicted Maximum Annual Mean Concentration (µg/m³)				
		S2 2031 Without Nothern Site Development	S3 2031 With Northern Site Development	Process Contribution (PC)	% Change of Critical Level	Background
ER1	Hedgecourt SSSI	13.20	13.21	0.00	0.01	12.41
ER2	Hedgecourt SSSI	23.64	23.69	0.04	0.13	12.13
ER3	Hedgecourt SSSI	18.62	18.65	0.02	0.08	12.13
ER4	Grattons Park LNR	27.57	27.59	0.02	0.07	21.88
Annual Mean AQO/Critical Level (CL)		**30 µg/m³**				

As indicated in Table 5.11, the maximum predicted exposure to NO_X at any ecological receptor during the operation of the proposed development, is 27.59 µg/m³ at Grattons Park (LNR) (ER4) which is below the objective/ critical load. The maximum NOx process contribution at any ecological receptor due to the proposed development is only 0.13% of NOx Critical Level. Similarly, the process contributed nitrogen deposition rate is less than 1% of the respective lower critical loads at each ecological receptor. As a result, no further assessment is required and the impact at the ecological receptors is considered to be negligible.

5.2.4 Summary

The AQS for NO_2, PM_{10} and $PM_{2.5}$ are predicted to be met at all receptor locations considered in the assessment. In accordance with EPUK-IAQM guidance, the impacts of the proposed development on NO_2, PM_{10} and $PM_{2.5}$ concentrations at sensitive human receptors, prior to mitigation, are predicted to be 'negligible'. Therefore, the effect of the proposed development on NO_2, PM_{10} and $PM_{2.5}$ concentrations, prior to mitigation, is considered to be not significant.

Predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations at proposed receptors across the proposed development site itself show that future occupants are not predicted to be exposed to air quality exceeding the UK AQS.

6 Emission Mitigation Assessment

An emissions assessment has been carried out as per Air quality and emissions mitigation guidance for Sussex (2021) to determine the appropriate level of mitigation required to help avoid, minimise and/or off-set the impact on air quality; enable an evidence-based and proportionate approach.

In accordance with the Defra Air Quality Damage Cost Guidance (January 2023), a damage cost calculation has been undertaken using the 'air quality damage cost appraisal toolkit' (available on https://www.gov.uk/government/publications/assess-the-impact-of-air-quality).

Due to the nature of the development, road traffic is expected to be the main source of air pollutants once the development is operational. The principal pollutants relevant to this assessment are therefore considered to be nitrogen oxides (NOx) and particulate matter (PM), which are generally regarded as the most significant air pollutants released by vehicular combustion processes. Therefore, the damage cost calculation has been undertaken for both NOx and PM.

Based on the traffic data provided by the Transport Consultant, the total trip generation by the proposed development in an average 24-hour period is 880 AADT. The emission calculation has assumed a 10km average trip length and 50km/h vehicle speed as per the 'Land use planning & development control: planning for air quality' guidance (Environmental Protection UK and Institute of Air Quality Management, 2017).

In accordance with the Defra guidance, PM_{10} emissions must be 'adjusted' to $PM_{2.5}$ emissions, in order to monetise these emissions. The damage cost calculation considers an 'appraisal period' of 5 years (including the development opening year and four subsequent years). A start year of 2031 has been assumed, because this is the anticipated opening year of the proposed development.

The following tools were used for the damage cost calculation:

- Defra '*Emission Factors Toolkit v12.1*' (available online at: https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/); and
- Defra 'Air quality appraisal: damage cost toolkit' (available online at: https://www.gov.uk/government/publications/assess-the-impact-of-air-quality).

Step 1: Quantify change in emissions for NO_x and $PM_{2.5}$

- **Pollutants: NOx and $PM_{2.5}$** – road traffic is expected to be the main source of air pollutants once the development is operational. The principal pollutants relevant to this assessment are therefore considered to be nitrogen oxides (NO_x) and particulate matter (PM), which are generally regarded as the most significant air pollutant released by vehicular combustion processes. $PM_{2.5}$ has been used for PM in line with the Defra Air Quality Appraisal guidance.

- **Road Type: Urban (not London)**
- **Traffic Flow: 880 Annual Average Daily Trips (AADT) for Light Duty Vehicles (LDVs)** – data provided by project Transport Consultants
- **Cars only** (that is, 0% HGV)
- **Average speed: 50 kph** (in accordance with Sussex-air 2021 guidance)
- **Trip length used: 10km**
- **Years: 2031-2035** - 2031 is the anticipated opening year of the development. 5 years of emissions, in line with the Sussex-air guidance, have then been used up to 2035.

Table 6.1 presents the EFT output with the emissions converted from kg/yr to tonnes/yr.

Table 6.1: Converted EFT output

Emissions (tonnes/yr)					
	2031	**2032**	**2033**	**2034**	**2035**
NO_x	0.241	0.208	0.181	0.160	0.146
$PM_{2.5}$	0.0544	0.0542	0.0541	0.0539	0.0538

Step 2: Calculate damage costs for NO_x and $PM_{2.5}$

The Defra Damage Cost Appraisal Toolkit (updated February 2023) was used with the following input:

- Start year: 2031
- End year: 2035
- Price Based Year: 2024
- Number of Pollutants: 2 (NO_x and $PM_{2.5}$)
- Source: Road transport

Table 6.2 presents the damage cost calculation outputs.

Table 6.2 Damage Cost Appraisal Toolkit Output

Output from Damage Cost Appraisal Toolkit						
	2031	2032	2033	2034	2035	Total
Central Value NO_x	£2,301	£1,949	£1,672	£1,462	£1,308	**£8,692**
Central Value $PM_{2.5}$	£3,653	£3,587	£3,523	£3,462	£3,402	**£16,627**
Total Central Value Costs						**£26,320**

The damage cost calculation is considered to provide a basis for quantifying the financial commitment required for offsetting potential development-generated emissions. The calculated central damage cost value over a five-year period is £26,320, which can be used to fund onsite mitigation measures or to contribute to off-site mitigation measures.

It is recommended that the allocation of funds should be discussed and agreed with MSDC, and the extent of the total money for Air Quality mitigation should be equal to/greater than the value determined by the damage cost calculation (i.e. £26,320).

It is understood that mitigation measures like EV charging infrastructure, cycle storage and public transport vouchers are proposed and it is equal to or greater than the value determined by the damage cost calculation (i.e. **£26,320**).

7 MITIGATION MEASURES

7.1 Construction Phase Mitigation

The dust emitting activities outlined in Section 5.1 can be effectively controlled by appropriate dust control measures and any adverse effects can be greatly reduced or eliminated.

It is recommended that a dust management plan (DMP, which may be as part of a Construction Environmental Management Plan (CEMP)) for the construction phase should be prepared and agreed with the Local Authority to ensure that the potential for adverse environmental effects on local receptors is minimised. The DMP should include *inter alia*, measures for controlling dust and general pollution from site construction operations and include details of any monitoring scheme, if appropriate. Controls should be applied throughout the construction period to ensure that emissions are mitigated.

The dust risk categories identified have been used to define appropriate, site-specific mitigation methods. More detailed, site-specific mitigation measures are contained in Appendix A.

The road traffic effects of the proposed development during the construction phase will be limited to a relatively short period and will be along traffic routes employed by haulage/construction vehicles and workers. Any effects on air quality will be temporary i.e. during the construction and demolition period only, and can be suitably controlled by the employment of mitigation measures appropriate to the development project.

With implementation of the proposed construction phase mitigation measures, the residual impacts are considered to be negligible.

7.2 Operational Phase Mitigation

All modelled existing and proposed residential receptors are predicted to be below the annual average AQO for NO_2, PM_{10} and $PM_{2.5}$. Therefore, no further mitigation to that proposed in the road transport report/ assessment is required for the proposed development.

However best practice measures could be used to further reduce the effects of the development on local air quality where feasible. Such measures could include:

- The preparation of a travel plan to encourage employees to use sustainable transport (public, cycling and walking); and
- Provision of electric vehicle charge points;

8 CONTROL MEASURES AND MITIGATION

8.1 Mitigation measures

Site-specific mitigation measures are divided into general measures, applicable to all sites and measures specific to demolition, earthworks, construction and trackout. Depending on the level of risk assigned to each site, different mitigation is assigned. The method of assigning mitigation measures as detailed in the IAQM guidance has been used.

For those mitigation measures that are general, the highest risk has been applied. In this case, the '**Medium risk**' site mitigation measures have been applied, as determined by the dust risk assessment in Section 5. There are two categories of mitigation measure – 'highly recommended' and 'desirable', which are indicated according to the dust risk level identified in Table 5.7. Desirable measures are presented in *italics*.

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.

Dust Management

- 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. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real-time PM_{10} 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 exceptional 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

- *Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, with cleaning to be provided if necessary.*

- 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 site 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 PM_{10} continuous monitoring locations with the local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences.

Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- 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 Vehicles/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.
- *Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).*
- *Implement a Travel plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).*

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 such 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 or burning of waste material.

Specific to Earthworks

No specific measures for earthworks

Specific to Construction

- *Avoid scabbling (roughening of concrete surfaces) if possible.*
- 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.
- *Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.*
- *For similar supplies of fine powder material ensure bags are sealed after use and stored appropriately to prevent dust.*

Specific to 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 any dry sweeping of large areas.*
- *Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.*
- *Record all inspections of haul routes and any subsequent action in a site log book.*
- *Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).*

9 CONCLUSIONS

An air quality assessment associated with proposed development of 150 residential dwellings to be constructed at the land north to the Huntsland Road, Crawley Down has been prepared with reference to existing air quality in the area and relevant air quality legislation, policy and guidance.

Construction phase impacts were assessed following the IAQM construction dust guidance. Mitigation measures are recommended to reduce the risk of dust and particulate matter being generated and re-suspended, and also to reduce emissions from vehicles and plant associated with construction related activities. With implementation of the appropriate measures, no significant impacts are anticipated during the construction phase.

The principal air quality impact once the proposed development is complete and operational is likely to be emissions from the increased traffic on local roads surrounding the site. An assessment of operational phase impacts has been undertaken using the ADMS-Roads atmospheric dispersion model.

Concentrations of the key pollutants (NO_2, PM_{10} and $PM_{2.5}$) were predicted at relevant receptor locations for the base year and for the proposed opening year 2031 without and with the proposed development in place. The air quality impacts were assessed as 'negligible' with respect to annual mean NO_2, PM_{10} and $PM_{2.5}$ at all assessed sensitive receptors. Therefore, the overall air quality impact of the development may be considered 'not significant'.

RSK understand that no significant stationary combustion sources such as combined heat and power (CHP) plants or biomass boilers are proposed within the development. Electric vehicle charging points will be provided as part of the proposal, with the exact number to be determined in line with the latest guidance.

An emission mitigation assessment was undertaken and the damage cost was calculated. The calculated central damage cost value over a five-year period is £26,320, which can be used to fund onsite mitigation measures or to contribute to off-site mitigation measures. It is recommended that the allocation of funds should be discussed and agreed with MSDC, and the extent of the total money for Air Quality mitigation should be equal to/greater than the value determined by the damage cost calculation (i.e. £26,320).

Based on the results of the assessment, it is judged that with appropriate construction phase mitigation, the proposed development complies with relevant national and local planning policies and that there are no air quality constraints.

10 REFERENCES

Air Quality (England) Regulations 2000, 928. London, Her Majesty's Stationery Office.

Air Quality (England) (Amendment) Regulations 2002, 3043. London, Her Majesty's Stationery Office.

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APPENDIX A CONSTRUCTION DUST ASSESSMENT METHODOLOGY

This appendix contains the construction dust assessment methodology used in the assessment.

To assess the potential impacts, construction activities are divided into demolition, earthworks, construction and trackout. The descriptors included in this section are based upon the IAQM construction dust guidance. The assessment follows the steps recommended in the guidance.

<u>Step 1</u>: Screen the requirement for assessment

The first step is to screen out the requirement for a construction dust assessment, this is usually a somewhat conservative level of screening. An assessment is usually required where there is:

- a 'human receptor' within:
  - 250m of the boundary of the site; or
  - 50m of the route used by construction vehicles on the public highway, up to 250m from the site entrance(s).
- an 'ecological receptor':
  - 50m of the boundary of the site; or
  - 50m of the route(s) used by construction vehicles on the public highway, up to 250m from the site entrance(s).

<u>Step 2A</u>: Defining the Potential Dust Emission Magnitude

Demolition

The dust emission magnitude category for demolition is varied for each site in terms of timing, building type, duration and scale. Examples of the potential dust emission classes are provided in the guidance as follows:

- **Large**: Total building volume >75,000m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >12m above ground level;
- **Medium**: Total building volume 12,000m^3 – 75,000m^3, potentially dusty construction material, demolition activities 6m – 12m above ground level; and
- **Small**: Total building volume <12,000m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <6m above ground, demolition during wetter months.

Earthworks

The dust emission magnitude category for earthworks is varied for each site in terms of timing, geology, topography and duration. Examples of the potential dust emission classes are provided in the guidance as follows:

- **Large**: Total site area >110,000m^2, potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds >6m in height;

- **Medium**: Total site area 18,000 – 110,000m^2, moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 4 – 6m in height; and
- **Small**: Total site area < 18,000m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4m in height.

Construction

The dust emission magnitude category for construction is varied for each site in terms of timing, building type, duration, and scale. Examples of the potential dust emissions classes are provided in the guidance as follows:

- **Large**: Total building volume >75,000m^3, on site concrete batching, sandblasting;
- **Medium**: Total building volume 12,000 – 75,000m^3, potentially dusty construction material (e.g. concrete), on site concrete batching; and
- **Small**: Total building volume <12,000m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

Trackout

Factors which determine the dust emission magnitude class of trackout activities are vehicle size, vehicle speed, vehicle number, geology and duration. Examples of the potential dust emissions classes are provided in the guidance as follows:

- **Large**: >50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;
- **Medium**: 20 – 50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 – 100m; and
- **Small**: <20 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50m.

<u>Step 2B</u>: Defining the Sensitivity of the Area

The sensitivity of the area is defined for dust soiling, human health and ecosystems. The sensitivity of the area takes into account the following factors:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM_{10}, the local background concentration; and
- Site-specific factors, such as whether here are natural shelters such as trees, to reduce the risk of wind-blown dust.

Table A1 has been used to define the sensitivity of different types of receptors to dust soiling, health effects and ecological effects.

Table A1: Sensitivity of the Area Surrounding the Site

Sensitivity of Area	Dust Soiling	Human Receptors	Ecological Receptors
High	• Users can reasonably expect enjoyment of a high level of amenity. • The appearance, aesthetics or value of their property would be diminished by soiling. • The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. • Examples include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms.	• Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day) • Examples include residential properties, hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	• Locations with an international or national designation *and* the designated features may be affected by dust soiling. • Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain. • Examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.
Medium	• Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home. • The appearance, aesthetics or value of their property could be diminished by soiling. • The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. • Examples include parks and places of work.	• Locations where the people exposed are workers and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • Examples include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.	• Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown. • Locations with a national designation where the features may be affected by dust deposition. • Example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.
Low	• The enjoyment of amenity would not reasonably be expected. • Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling. • There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. • Examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.	• Locations where human exposure is transient. • Indicative examples include public footpaths, playing fields, parks and shopping streets.	• Locations with a local designation where the features may be affected by dust deposition. • Example is a local Nature Reserve with dust sensitive features.

Based on the sensitivities assigned of the different types of receptors surrounding the site and numbers of receptors within certain distances of the site, a sensitivity classification for the area can be defined for each. **Tables A2** to **A4** indicate the method used to determine the sensitivity of the area for dust soiling, human health and ecological impacts, respectively.

For trackout, as per the IAQM construction dust guidance, it is only considered necessary to consider trackout impacts up to 50m from the edge of the road.

Table A2: Sensitivity of the area to dust soiling effects on people and property

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

Table A3: Sensitivity of the area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Conc.	Number of Receptors	Distances from the Source (m)				
			<20	<50	<100	<200	<350
High	>32$\mu g/m^3$	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32$\mu g/m^3$	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28$\mu g/m^3$	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 $\mu g/m^3$	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32$\mu g/m^3$	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32$\mu g/m^3$	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28$\mu g/m^3$	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 $\mu g/m^3$	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table A4: Sensitivity of the area to Ecological Impacts

Receptor Sensitivity	Distances from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

<u>Step 2C</u>: Defining the Risk of Impacts

The final step is to use both the dust emission magnitude classification with the sensitivity of the area, to determine a potential risk of impacts for each construction activity, before the application of mitigation. **Tables A5** to **A7** indicate the method used to assign the level of risk for each construction activity.

Table A5: Risk of Dust Impacts from Demolition

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

Table A6: Risk of Dust Impacts from Earthworks/Construction

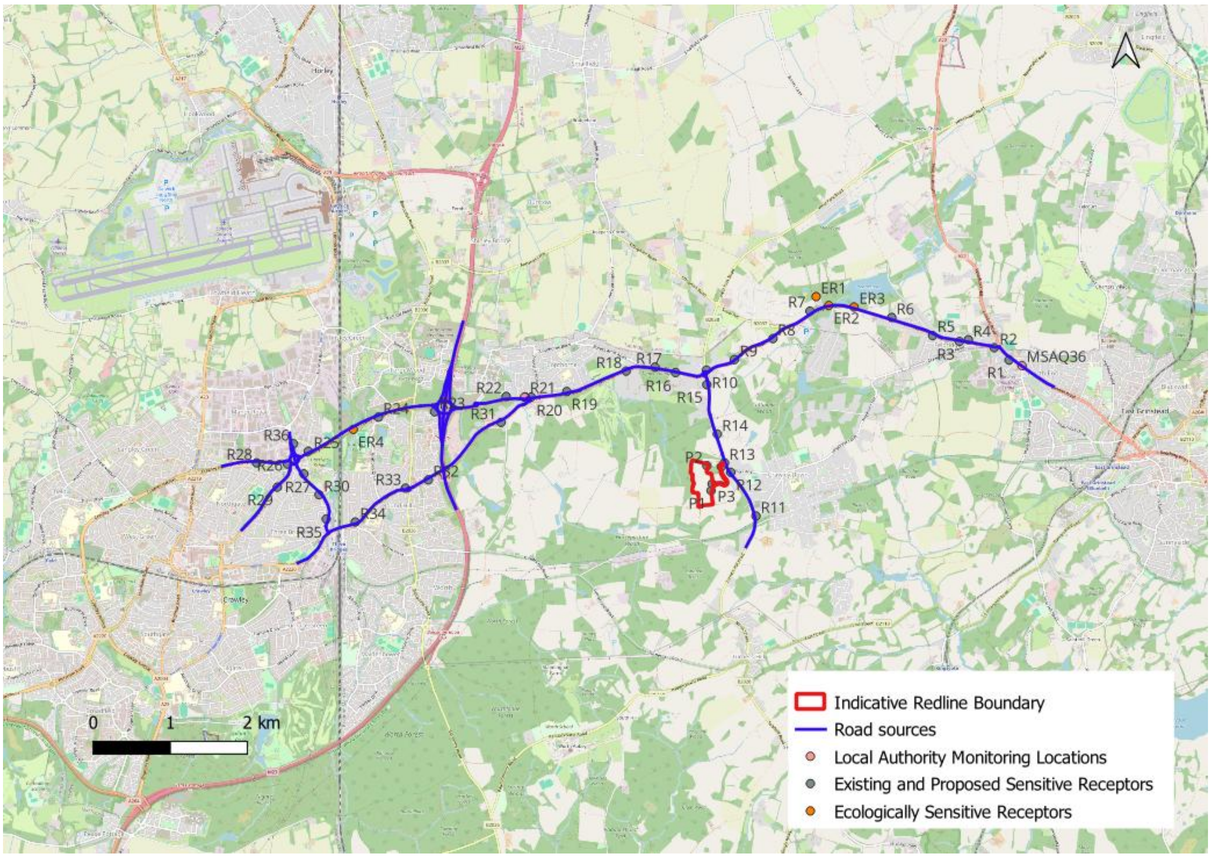
Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A7: Risk of Dust Impacts from Trackout

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

APPENDIX B ASSESSMENT AREA

Figure B-1: Assessment Area



APPENDIX C
OPERATIONAL PHASE IMPACT SIGNIFICANCE CRITERIA

This appendix contains the significance criteria used in the assessment for the operational impact assessment from the 2017 EPUK-IAQM guidance.

To assess the impacts of a development on the surrounding area, the EPUK-IAQM 2017 guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion. Table C1 presents the suggested framework, provided within the EPUK/IAQM guidance, for describing the impacts.

Table C1: Impact Descriptors for Individual Receptors

Long term average concentration at receptors in assessment year	% Change in Concentration Relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% 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

Notes

AQAL = Air Quality Assessment Level, which for this assessment related to the UK Air Quality Strategy Objectives.

Where the % change in concentrations is <0.5%, the change is described as ‘negligible’ regardless of the concentration.

Where concentrations increase the impact is described as adverse, and where it decrease as beneficial.

The EPUK/IAQM guidance notes that the criteria in Table C1 should be used to describe impacts at individual receptors and should only be considered as a starting point to make a judgement on significance of effects, as other influences may need to be accounted for. The EPUK/IAQM guidance states that the assessment of overall significance should be based on professional judgement, taking into account several factors, including:

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

The EPUK/IAQM guidance states that for most road transport related emissions, long-term average concentrations are the most useful for evaluating the severity of impacts.

APPENDIX D
ROAD TRAFFIC DATA

This appendix contains the traffic data used in the dispersion modelling assessment. The data was provided by the project transport consultants including traffic flow data in AADT and the percentage Heavy Duty Vehicles (HDV), the speed included for each road link and the diurnal profile used. Reduced speeds were used at junctions, roundabout, roads with traffic light and pedestrian lane.

Table D1 24-hour Traffic Flow (AADT) and Speed Data used in the Dispersion Modelling Assessment

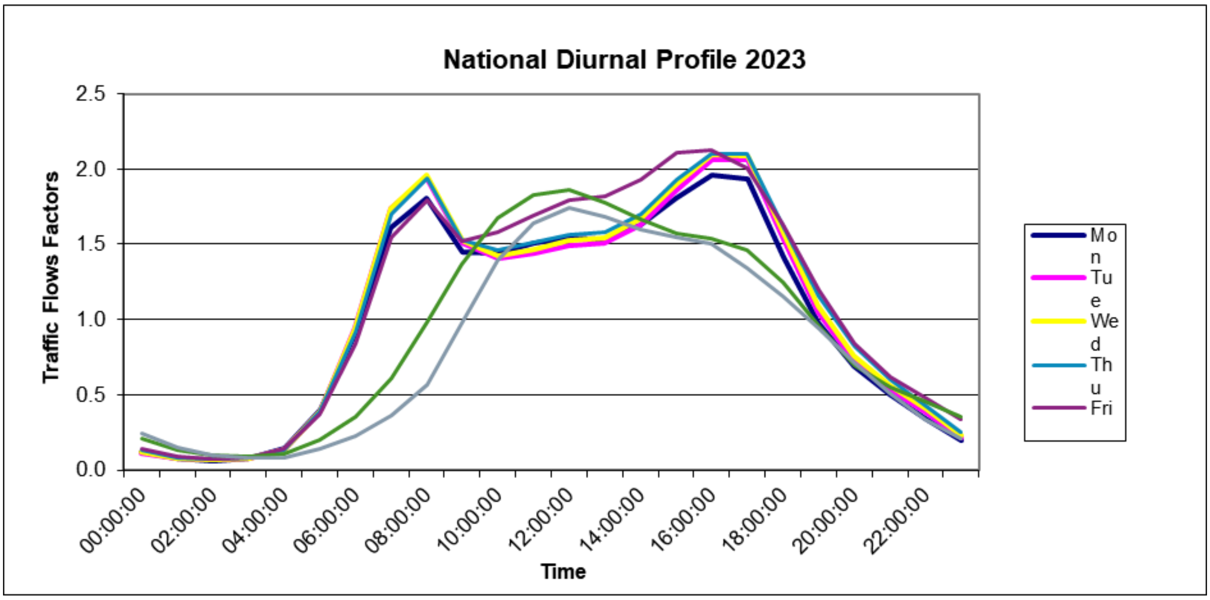
Figure D1 Diurnal Profile Included in the Dispersion Modelling Assessment

Table D1: 24-hour Traffic Flow (AADT) and Speed Data used in the Dispersion Modelling Assessment

Ref	Road Link	Average Speed (kph)	(S1) 2023 Base year		(S2) 2031 Without Northern Site Development		(S3) 2031 With Northern Site Development	
			Total AADT	HDV%	Total AADT	HDV%	Total AADT	HDV %
1	Turners Hill Road (between Huntsland and Sandy Lane)	48	9902	3.7%	10,886	3.6%	11,851	3.3%
2	Turners Hill Road (south of Dukes Head Roundabout)	64	12877	4.3%	14,693	4.1%	15,618	3.8%
3	Copthorne Common Road (between Dukes Head Roundabout and Copthorne Hotel Roundabout)	80	24095	4.0%	27,970	3.8%	28,634	3.7%
4	Copthorne Way (between Copthorne Hotel Roundabout and Copthorne Way Roundabout)	80	24039	4.1%	27,783	3.8%	28,283	3.8%
5	Copthorne Way (between Copthorne Way roundabout and Crawley Interchange)	80	25254	4.2%	29,143	4.0%	29,643	3.9%
6	A2220 (between Copthorne Hotel Roundabout and Hazelwick Avenue)	80	11224	4.8%	12,318	4.8%	12,466	4.7%

Ref	Road Link	Average Speed (kph)	(S1) 2023 Base year		(S2) 2031 Without Northern Site Development		(S3) 2031 With Northern Site Development	
7	Haslett Avenue East (between Hazelwick Avenue and Crawley College)	48	13413	3.7%	14,696	3.7%	14,844	3.7%
8	Crawley Avenue (between Crawley Interchange and Hazelwick Roundabout)	112	30608	5.1%	34,133	5.0%	34,281	4.9%
9	Gatwick Road (between Hazelwick Avenue and Manor Royal)	48	9163	2.5%	10827	2.4%	10974	2.4%
10	London Road, East Grinstead (between Copthorne Road and Lingfield Road)	48	19285	2.1%	22,327	2.0%	22,441	2.0%
11	M23 Southbound Off-slip	112	11605	5.8%	13,078	5.6%	13,180	5.6%
12	M23 Southbound On-slip	112	11310	5.1%	12,768	4.9%	12,842	4.9%
13	M23 Northbound Off-slip	112	9498.512608	4.2%	10,692	4.1%	10,754	4.1%
14	M23 Northbound On-slip	112	11,014	6.8%	12,419	6.6%	12,533	6.5%
15	A2011 Crawley Avenue (west of Hazelwick Roundabout)	112	21,445	2.6%	23,306	2.6%	23,306	2.6%
16	Hazelwick Avenue (south of Hazelwick Roundabout)	64	9163	2.5%	10827	2.4%	10974	2.4%
17	A2004 Northgate Avenue (between Hazelwick Roundabout and Hermits Road)	64	11,299	1.1%	12,280	1.1%	12,280	1.1%
18	M23 (south of J10)	112	86,274	4.9%	93,859	4.9%	93,995	4.9%
19	M23 (north of J10)	112	94,985	5.2%	103,394	5.1%	103,610	5.1%
20	Wychwood Place Access	48	290	3.9%	315	3.9%	1,195	1.0%

Figure D1 Diurnal Profile Included in the Dispersion Modelling Assessment



APPENDIX E
MODELLING OF OPERATIONAL PHASE – VERIFICATION METHODOLOGY

The dispersion model results were verified following the relevant guidance in LAQM TG.22. Predicted results from a dispersion model may differ from measured concentrations for a variety of reasons, these are identified in LAQM TG.22 to include:

- Estimates of background concentrations;
- Meteorological data uncertainties;
- Uncertainties in source data for example, traffic flow data, stack emissions and emission factors;
- Model input parameters such as roughness length, minimum Monin-Obukhov and overall model limitations; and,
- Uncertainties associated with monitoring data, including locations.

The two diffusion tubes were used for the dispersion model verification against traffic data.

The Mid Sussex District Council and Crawley Borough Council were consulted via emails regarding the methodology and the diffusion tubes to be used for verification of the model. The Mid Sussex District Council and Crawley Borough Council were consulted via emails regarding the methodology and the diffusion tubes to be used for verification of the model. The methodology was accepted by both the councils. It was clarified during consultation that the traffic data for east Grinstead was not available and moreover the transport consultants have confirmed that significant traffic due to the proposed development is not expected there. Considering this, the diffusion tubes in East Grinstead were not used for verification, instead only MSAQ25 and MSAQ36 were used. Furthermore, it is clarified that MSAQ25 is located at Kerbside location and MSAQ36 is located near a junction however, these were the nearest tubes to the proposed development and considering the availability of the traffic data, these tubes had to be used for verification of the model.

Tables E1 present details of the monitoring location used and the dispersion model verification process.

Table E1: Verification Results

Monitoring Site ID	X	Y	Monitoring Result	Background NO_x	Background NO_2	Modelled Roadside NO_x	Roadside monitored NO_x Road NO_x, mg m^{-3}	Primary Adjusted Modelled Roadside NOx	Total NO_2	Modelled Road Contribution NO_2	Monitored Road Contribution NO_2	Secondary Adjusted Modelled Road Contribution NO_2	Secondary Adjusted Total NO_2	Difference
MSAQ25	531176	138829	**18.20**	14.72	11.15	5.73	13.14	19.84	21.64	10.49	7.05	10.39	**21.54**	**18.36%**
MSAQ36	537612	139405	**29.80**	15.03	11.34	9.25	36.2	32.05	27.83	16.49	18.46	16.33	**27.67**	**-7.13%**

An adjustment factor of **3.46** was obtained during the verification process and applied to the modelled road-NO_x component predicted at each receptor.

The final verification model correlation coefficient (representing the model uncertainty) is 0.99. This was achieved by applying a model correction factor of 3.46 to roadside predicted NO_X concentrations before converting to NO_2. This demonstrates that the model predictions were in line with the road traffic emissions at the monitoring locations.

The verified annual mean modelled road contribution NO_x concentrations have then been converted into annual mean road NO_2 by using the Defra NO_x to NO_2 spreadsheet; a comparison of monitored and model adjusted NO_2 is presented in Table E1. This shows that, following adjustment, the modelled NO_2 result is within +/- 25% of monitored NO_2 concentrations at all the locations. In accordance with the LAQM TG.22 guidance, it is not considered that further verification is required.

It is further noted that the nearest diffusion tube MSAQ25 is overpredicting in the model, however, it is modelled within 25% of monitoring results, as required in TG(22) guidance.

There were no automatic monitoring station monitoring PM_{10} close to the site. As such, the NO_2 adjustment factor has also been applied to the PM_{10} and $PM_{2.5}$ modelled results, in accordance with LAQM.TG(22) for robust assessment.

APPENDIX F
MODEL RESULTS

Table F1: Predicted Pollutant Concentrations at Existing and Proposed Receptor Locations (2023 meteorological data, background concentrations included): S1, S2 and S3

Receptor	Annual Mean NO_2 Concentrations (µg/m^3)			Annual Mean PM_{10} Concentrations (µg/m^3)			Number of days when 24 Hour PM_{10} Concentrations >50µg/m^3 (days)			Annual Mean $PM_{2.5}$ Concentrations (µg/m^3)		
	S1 2023	S2 2031	S3 2031	S1 2023	S2 2031	S3 2031	S1 2023	S2 2031	S3 2031	S1 2023	S2 2031	S3 2031
R1	13.60	12.27	12.28	13.77	13.84	13.85	0	0	0	9.11	9.14	9.14
R2	19.90	14.81	14.82	15.15	15.40	15.40	0	0	0	9.84	9.95	9.95
R3	14.59	11.35	11.36	11.78	11.98	11.98	1	1	1	7.27	7.36	7.36
R4	14.23	11.21	11.21	11.68	11.86	11.86	1	1	1	7.21	7.30	7.30
R5	12.04	10.35	10.35	11.07	11.17	11.17	2	2	2	6.89	6.94	6.94
R6	14.62	11.28	11.29	11.23	11.43	11.44	2	2	2	7.02	7.11	7.11
R7	13.36	10.89	10.89	11.29	11.44	11.45	2	2	2	6.95	7.02	7.03
R8	14.95	11.76	11.77	11.64	11.84	11.85	1	1	1	7.11	7.20	7.21
R9	24.66	16.32	16.34	14.68	15.32	15.34	0	0	0	8.71	9.01	9.02
R10	22.85	16.07	16.15	13.41	13.96	14.02	0	0	0	8.04	8.29	8.32
R11	12.95	10.90	10.91	11.36	11.57	11.58	2	2	2	7.09	7.19	7.20
R12	13.83	11.16	11.21	11.27	11.54	11.58	2	2	2	6.96	7.09	7.11
R13	13.00	10.94	11.15	11.02	11.21	11.38	2	2	2	6.79	6.88	6.97
R14	13.85	11.31	11.39	11.12	11.34	11.40	2	2	2	6.86	6.97	7.00
R15	13.34	11.50	11.55	11.04	11.19	11.22	2	2	2	6.79	6.86	6.88
R16	17.94	13.44	13.50	11.83	12.15	12.18	1	1	1	7.27	7.42	7.44
R17	18.94	14.09	14.15	12.31	12.66	12.69	1	1	1	7.52	7.69	7.70
R18	16.68	13.08	13.13	11.83	12.07	12.09	1	1	1	7.24	7.36	7.37
R19	19.79	14.82	14.88	12.80	13.15	13.18	1	0	0	7.64	7.82	7.83
R20	27.96	18.90	19.00	15.04	15.77	15.84	0	0	0	8.81	9.15	9.19
R21	22.32	16.14	16.19	13.84	14.32	14.36	0	0	0	8.14	8.37	8.39
R22	20.21	16.34	16.37	13.71	13.94	13.96	0	0	0	7.70	7.81	7.82
R23	22.70	17.28	17.29	13.85	14.06	14.07	0	0	0	7.78	7.87	7.87
R24	22.63	17.10	17.11	12.57	12.73	12.74	1	1	1	7.75	7.81	7.81
R25	29.22	21.38	21.40	13.61	13.95	13.96	0	0	0	8.30	8.44	8.45
R26	23.75	20.38	20.38	13.48	13.63	13.63	0	0	0	8.42	8.48	8.49
R27	21.57	19.41	19.42	13.15	13.30	13.31	0	0	0	8.24	8.31	8.31
R28	19.45	15.88	15.88	11.99	12.04	12.04	1	1	1	7.59	7.59	7.59
R29	23.07	19.89	19.89	13.51	13.58	13.58	0	0	0	8.44	8.47	8.47
R30	19.63	18.59	18.59	12.62	12.69	12.70	1	1	1	7.95	7.99	7.99
R31	17.32	15.08	15.09	13.10	13.20	13.21	0	0	0	7.35	7.40	7.40
R32	18.54	15.29	15.30	12.35	12.48	12.49	1	1	1	7.83	7.89	7.89
R33	20.00	16.07	16.09	13.18	13.38	13.40	0	0	0	8.24	8.33	8.33
R34	19.11	15.81	15.83	12.88	13.03	13.04	1	1	1	8.07	8.13	8.14
R35	20.04	18.78	18.79	12.74	12.83	12.83	1	1	1	8.02	8.06	8.06
R36	20.95	17.94	17.95	12.81	13.01	13.02	1	1	1	7.77	7.87	7.87
R37	9.98	9.46	9.67	10.13	10.17	10.34	3	3	3	6.35	6.37	6.46

Receptor	Annual Mean NO_2 Concentrations ($\mu g/m^3$)			Annual Mean PM_{10} Concentrations ($\mu g/m^3$)			Number of days when 24 Hour PM_{10} Concentrations >50$\mu g/m^3$ (days)			Annual Mean $PM_{2.5}$ Concentrations ($\mu g/m^3$)		
	S1 2023	S2 2031	S3 2031	S1 2023	S2 2031	S3 2031	S1 2023	S2 2031	S3 2031	S1 2023	S2 2031	S3 2031
P1	9.35	9.20	9.21	9.95	9.96	9.97	4	4	4	6.26	6.26	6.26
P2	9.71	9.51	9.52	10.05	10.06	10.07	3	3	3	6.28	6.28	6.28
P3	9.40	9.22	9.25	9.96	9.98	10.00	4	4	4	6.26	6.27	6.28
Air Quality Objective	**40**			**40**			**35 days**			**20**		