Gibraltar Farm, Ham Lane, Hempstead, Gillingham, Kent

Air Quality Assessment

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Air Quality Assessment

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1 INTRODUCTION

1.1 Entran Limited has been commissioned to undertake an assessment of air quality impacts associated with a proposed residential development located at Gibraltar Farm, Ham Lane, Hempstead, Gillingham, Kent. An indicative layout of the Site is presented in Figure 1.1.

1.2 The proposals comprise the following:

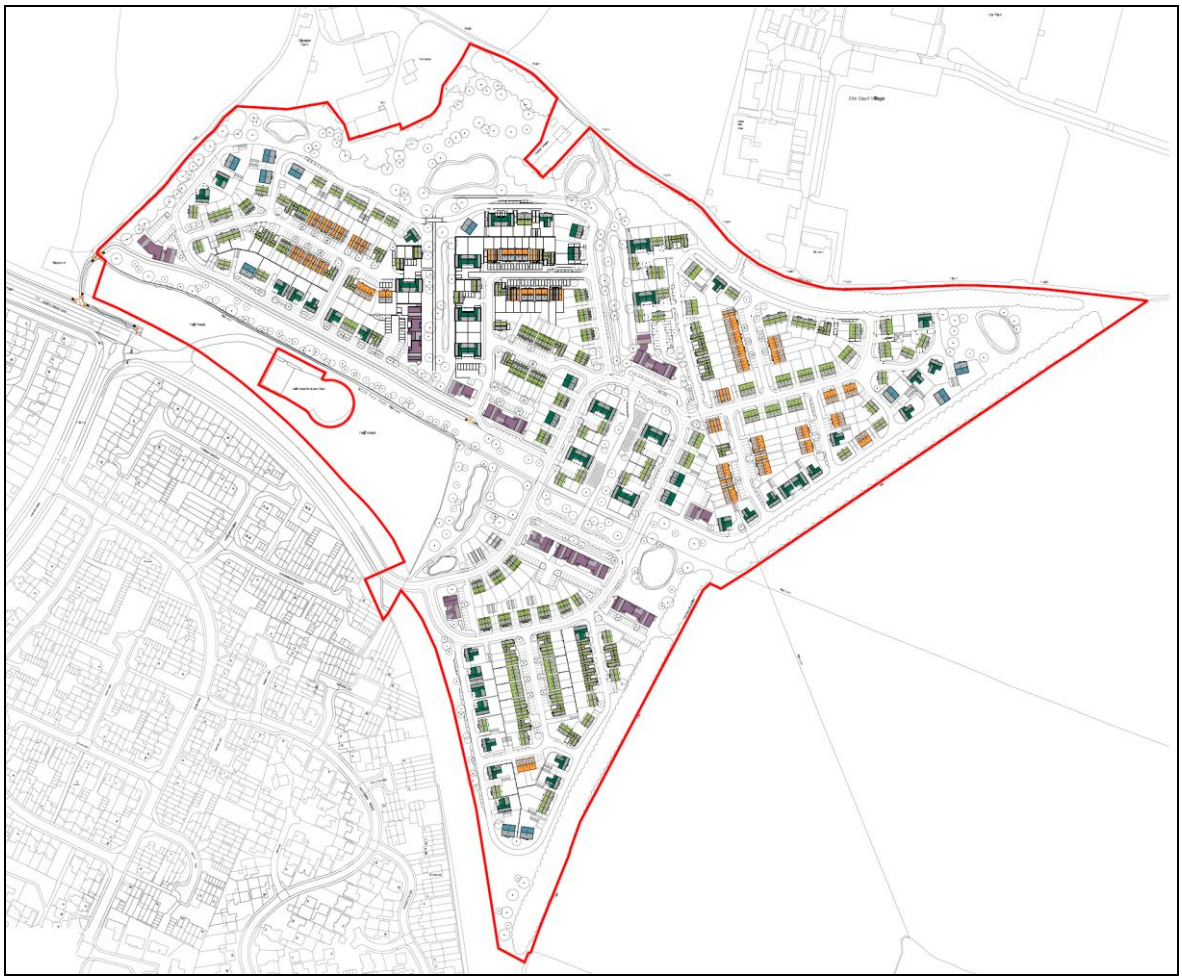
- Provision of 440 dwellings;
- With associated access and internal estate roads;
- Public open space;
- Retention of existing woodland and provision of new woodland planting and landscaping;
- And a combined footway and cycle way connecting the application site to the Lordswood Leisure Centre and the western edge of North Dane Way.

1.3 Medway Council (MC) has declared four Air Quality Management Areas (AQMAs) due to exceedances of the annual mean NO_2 objective. The Site is not located within or near an AQMA. The closest AQMA to the Proposed Development is Central Medway AQMA which is declared for a number of roads in the Central Medway area and is located approximately 3.2km to the northwest of the Site.

1.4 This report presents the findings of a detailed air quality assessment of the potential impacts associated with the Proposed Development on local air quality during both the construction and operational phases and the suitability of the Site for residential purposes with regards to the exposure of future occupants to elevated pollution concentrations. For both phases the type, source and significance of potential impacts are identified and the measures that should be employed to minimise these impacts are described.

1.5 A glossary of common air quality terminology is provided in **Appendix A.**

Figure 1.1: Proposed Site Layout



2 LEGISLATION AND POLICY

Air Quality Strategy for England, Scotland, Wales & Northern Ireland

2.1 The Government's policy on air quality within the UK is set out in the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland (AQS) published in July 2007[1], pursuant to the requirements of Part IV of the Environment Act 1995. The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in the UK. The AQS is designed to be an evolving process that is monitored and regularly reviewed.

2.2 The AQS sets standards and objectives for ten main air pollutants to protect health, vegetation and ecosystems. These are benzene (C_6H_6), 1,3-butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter (PM_{10}, $PM_{2.5}$), sulphur dioxide (SO_2), ozone (O_3) and polycyclic aromatic hydrocarbons (PAHs).

2.3 The air quality standards are long-term benchmarks for ambient pollutant concentrations which represent negligible or zero risk to health, based on medical and scientific evidence reviewed by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO). These are general concentration limits, above which sensitive members of the public (e.g. children, the elderly and the unwell) might experience adverse health effects.

2.4 The air quality objectives are medium-term policy-based targets set by the Government which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e. a limited number of permitted exceedances of the standard over a given period.

2.5 For some pollutants, there is both a long-term (annual mean) standard and a short-term standard. In the case of nitrogen dioxide (NO_2), the short-term standard is for a 1-hour averaging period, whereas for fine particulates (PM_{10}) it is for a 24-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants (e.g. temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road).

[1] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland – July 2007.

2.6 The AQS also contains a framework for considering the effects of a finer group of particles known as '$PM_{2.5}$'. Local Authorities are required to work towards reducing emissions / concentrations of $PM_{2.5}$, but there is currently no statutory objective incorporated into UK law at this time.

2.7 The AQS objective levels relevant to this assessment are set presented in **Appendix B**.

Local Air Quality Management (LAQM)

2.8 Part IV of the Environment Act 1995 also requires local authorities to periodically Review and Assess the quality of air within their administrative area. The Reviews have to consider the present and future air quality and whether any air quality objectives prescribed in Regulations are being achieved or are likely to be achieved in the future.

2.9 Where any of the prescribed air quality objectives are not likely to be achieved the authority concerned must designate that part an Air Quality Management Area (AQMA).

2.10 For each AQMA, the local authority has a duty to draw up an Air Quality Action Plan (AQAP) setting out the measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the air quality objectives. Local authorities are not statutorily obliged to meet the objectives, but they must show that they are working towards them.

2.11 The Department of Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their Review and Assessment work[2]. This guidance, referred to in this chapter as LAQM.TG(16), has been used where appropriate in the assessment.

National Planning Policy Framework

2.12 The National Planning Policy Framework (NPPF)[3] sets out the Government's planning policies for England and how these are expected to be applied. At the heart of the NPPF is a presumption in favour of sustainable development. It requires Local Plans to be consistent with the principles and policies set out in the NPPF with the objective of contributing to the achievement of sustainable development.

[2] Department for Environment, Food and Rural Affairs (DEFRA), (2016): Part IV The Environment Act 1995 Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(16).

[3] Ministry of Housing, Communities and Local Government: *National Planning Policy Framework* (February 2019).

2.13 The NPPF states that the planning system has three overarching objectives in achieving sustainable development including a requirement to *'contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.'*

2.14 Under Section 15: Conserving and Enhancing the Natural Environment, the NPPF (paragraph 170) requires that *'planning policies and decisions should contribute to and enhance the natural local environment by …preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible help to improve local environmental conditions such as air and water quality.'*

2.15 In dealing specifically with air quality the NPPF (paragraph 181) states that *'planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.'*

2.16 Paragraph 183 states that *'the focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively.'*

Medway Local Plan

2.17 The Medway Local Plan[4] was adopted in May 2003. The following policy relevant to air pollution and the Proposed Development are contained within this document:

2.18 Policy BNE2 – Air Quality, which states

'Development likely to result in airborne emissions should provide a full and detailed assessment of the likely impact of these emissions. Development will not be permitted when it is considered that unacceptable effects will be imposed on the health, amenity or natural environment of the surrounding area, taking into account the cumulative effects of other proposed or existing sources of air pollution in the vicinity..'

Control of dust and particulates associated with construction

2.19 Section 79 of the *Environmental Protection Act (1990*) states that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Statutory nuisance is defined as:

- 'Any dust or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance', and
- 'any accumulation or deposit which is prejudicial to health or a nuisance'.

2.20 Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

2.21 In the context of the Proposed Development, the main potential for nuisance of this nature will arise during the demolition and construction phases – potential sources being the clearance, earthworks, construction and landscaping processes.

2.22 There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist – 'nuisance' is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred. However, research has been undertaken by a number of parties to determine community responses to such impacts and correlate these to dust deposition rates.

[4] Medway Council. (2003). Medway Local Plan.

EPUK & IAQM Land Use Planning and Development Control

2.23 Environmental Protection UK (EPUK) & Institute of Air Quality Management (IAQM) published the Land Use Planning and Development Control Air Quality guidance in January 2017[5] to provide guidance on the assessment of air quality in relation to planning proposals and ensure that air quality is adequately considered within the planning control process.

2.24 The main focus of the guidance is to ensure all developments apply good practice principles to ensure emissions and exposure are kept to a minimum. It also sets out criteria for identifying when a more detailed assessment of operational impacts is required, guidance on undertaking detailed assessments and criteria for assigning the significance of any identified impacts.

2.25 This guidance has been used within this assessment.

Assessment of Dust from Demolition and Construction

2.26 The IAQM published guidance in 2014 on the assessment of emissions from demolition and construction activities[6]. The guidance sets out an approach to identifying the risk of impacts occurring at nearby sensitive receptors from dust generated during the construction process and sets out recommended mitigation measures based on the identified risk.

2.27 This guidance has been used within this assessment.

Kent & Medway Air Quality Partnership Planning Guidance

2.28 The Kent & Medway Partnership Planning Guidance[7] provides a methodology for assessing the air quality impacts of proposed developments in the Kent and Medway area. This guidance has been used within this assessment.

[5] EPUK & IAQM. Land-use Planning and Development Control: Planning for Air Quality, January 2017.

[6] Guidance on the assessment of dust from demolition and construction (version 1.1), IAQM, February 2014.

[7] Kent and Medway Air Quality Partnership Air Quality Planning Guidance (Mitigation Option B).

3 METHODOLOGY

Scope of Assessment

3.1 The scope of the assessment has been determined in the following way:

- Review of air quality data for the area surrounding the Site and background pollutant maps; and
- Review of the traffic flow data, which has been used as an input to the air quality modelling assessment.

3.2 There is the potential for impacts on local air quality during both the construction and operational phases of the Proposed Development. During the construction phase, there is the potential for impacts to occur as a result of dust and PM_{10} emissions. Guidance provided by the IAQM includes the following criteria for assessing the effects of construction dust:

- A sensitive 'human receptor' within 350m of the Proposed Development site boundary or within 50m of the route used by construction vehicles on public highways up to 500m from the Site entrance; and /or
- A sensitive 'ecological receptor' within 50m of the Proposed Development site boundary or within 50m of the route used by construction vehicles on the public highway, up to 500m from the Site entrance.

3.3 There are several residential properties surrounding the Proposed Development. An assessment of construction phase impacts of dust and particulate matter has therefore been included in this assessment. There are no sensitive ecological receptors within 50m of the Site boundary or within 50m of the route used by construction vehicles up to 500m from the Site entrance, an assessment of the impact of the construction phase on sensitive ecological habitats has therefore not been considered further.

3.4 During the operation of the Proposed Development there is the potential for impacts on local air quality to occur as a result of emissions from road vehicle trips generated by the operation of the Proposed Development. Based on the Department for Transport (DfT) thresholds for transport assessments as set out in Appendix 2 of the Kent and Medway Air Quality Planning Guidance, the Proposed Development is classed as a 'major' development (i.e. >50 residential units). Following a review of the Proposed Development against checklist 1 and checklist 2 set out within the Guidance it is concluded that an air quality assessment is required.

3.1 Guidance provided by the IAQM & EPUK provides threshold criteria for establishing when significant impacts on local air quality may occur and when a detailed assessment of potential impacts is required. At locations outside an AQMA, a change in light duty vehicles (LDV) of more than 500 per day and / or a change in heavy duty vehicles (HDV) of more than 100 per day is considered to result in potentially significant impacts on air quality. At locations within or adjacent to an AQMA, a change in LDVs of more than 100 per day and / or a change in HDVs of more than 25 per day is considered potentially significant.

3.2 The Site does not fall within or near to an AQMA. Data provided by the transport consultants indicates that the proposed development will result in an increase in LDVs in excess of the threshold values for locations outside an AQMA on a number of road links in the vicinity. An assessment of impacts arising from vehicle emissions using the local roads has therefore been included in the assessment. Consideration has also been given to the suitability of the Site for its proposed use.

3.3 Traffic generated by the Development may result in an increase in local air pollution impacting air quality at nearby sensitive ecological receptors located adjacent to the local road network. The North Downs Woodlands SAC is located within 3km of the Site and within 200m of roads likely to have an increase in traffic as a result of the Proposed Development. However, since these roads are a considerable distance from the Site, it is concluded that the North Downs Woodlands SAC will not be affected by air quality issues associated with traffic movements from the Proposed Development. An assessment of the operational impacts of the Proposed Development on ecologically sensitive receptors has therefore been excluded from this assessment.

3.4 Details of the assessment methodology and the specific issues considered are provided below.

Construction Phase Methodology

Introduction

3.5 To assess the potential impacts associated with dust and PM_{10} releases during the construction phase and to determine any necessary mitigation measures, an assessment based on the latest guidance from the IAQM has been undertaken.

3.6 This approach divides construction activities into the following dust emission sources:

- demolition;
- earthworks;
- construction; and
- trackout.

3.7 The risk of dust effects (low, medium or high) is determined by the scale (magnitude) and nature of the works and the proximity of sensitive human and ecological receptors.

3.8 The significance of dust effects is based on professional judgement, taking into account the sensitivity of receptors and existing air quality.

Dust Emission Magnitude

3.9 The magnitude of the dust impacts for each source is classified as Small, Medium or Large depending on the scale of the proposed works. Table 3.1 summarises the IAQM criteria that may be used to determine the magnitude of the dust emission. These criteria are used in combination with site specific information and professional judgement.

Table 3.1: Dust Emission Magnitude Criteria

Source	Large	Medium	Small
Demolition	• Total building volume >50,000m^3 • Potentially dusty material (e.g. concrete) • Onsite crushing and screening • Demolition activities >20m above ground level.	• Total building volume 20,000 - 50,000m^3 • Potentially dusty material • Demolition activities 10 - 20m above ground level.	• Total building volume <20,000m^3 • Construction material with low potential for dust release • Demolition activities <10m above ground level • Demolition during wetter months
Earthworks	• Total site area >10,000m^2 • Potentially dusty soil type (e.g. clay) • >10 heavy earth moving vehicles active at any one time • Formation of bunds >8m in height • Total material moved >100,000 tonnes	• Total site area 2,500 -10,000m^2 • Moderately dusty soil type (e.g. silt) • 5 - 10 heavy earth moving vehicles active at any one time • Formation of bunds 4 - 8m in height • Total material moved 20,000 - 100,000 tonnes	• Total site area <2,500m^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 • Total material moved <20,000 tonnes • Earthworks during wetter months
Construction	• Total building volume >100,000m^3 • On site concrete batching • Sandblasting	• Total building volume 25,000 - 100,000m^3 • Potentially dusty construction material (e.g. concrete) • On site concrete batching	• Total building volume <25,000m^3 • Material with low potential for dust release (e.g. metal cladding or timber)
Trackout	• >50 HGV movements in any one day (a) • Potentially dusty surface material (e.g. high clay content) • Unpaved road length >100m	• 10 - 50 HGV movements in any one day (a) • Moderately dusty surface material (e.g. silt) • Unpaved road length 50 - 100m	• <10 HGV movements in any one day (a) • Surface material with low potential for dust release • Unpaved road length <50m
(a) HGV movements refer to outward trips (leaving the site) by vehicles of over 3.5 tonnes.			

Receptor Sensitivity

3.10 Factors defining the sensitivity of a receptor are presented in Table 3.2.

Table 3.2: Factors Defining the Sensitivity of a Receptor

Sensitivity	Human (health)	Human (dust soiling)	Ecological
High	• Locations where members of the public are exposed over a time period relevant to the air quality objectives for PM_{10} (a) • Examples include residential dwellings, hospitals, schools and residential care homes.	• Regular exposure • High level of amenity expected. • Appearance, aesthetics or value of the property would be affected by dust soiling. • Examples include residential dwellings, museums, medium and long-term car parks and car showrooms.	• Nationally or Internationally designated site with dust sensitive features (b) • Locations with vascular species (c)
Medium	• Locations where workers are exposed over a time period relevant to the air quality objectives for PM_{10} (a) • Examples include office and shop workers (d)	• Short-term exposure • Moderate level of amenity expected • Possible diminished appearance or aesthetics of property due to dust soiling • Examples include parks and places of work	• Nationally designated site with dust sensitive features (b) • Nationally designated site with a particularly important plant species where dust sensitivity is unknown
Low	• Transient human exposure • Examples include public footpaths, playing fields, parks and shopping streets	• Transient exposure • Enjoyment of amenity not expected. • Appearance and aesthetics of property unaffected • Examples include playing fields, farmland (e), footpaths, short-term car parks and roads	• Locally designated site with dust sensitive features (b)

(a) 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.

(b) Ecosystems that are particularly sensitive to dust deposition include lichens and acid heathland (for alkaline dust, such as concrete).

(c) Cheffing C. M. & Farrell L. (Editors) (2005), The Vascular Plant. Red Data List for Great Britain, Joint Nature Conservation Committee.

(d) Does not include workers exposure to PM_{10} as protection is covered by Health and Safety at Work legislation.

(e) Except commercially sensitive horticulture.

3.11 The sensitivity of a receptor will also depend on a number of additional factors including any history of dust generating activities in the area, likely cumulative dust impacts from nearby construction sites, any pre-existing screening such as trees or buildings and the likely duration of the impacts. In addition, the influence of the prevailing wind direction and local topography may be of relevance when determining the sensitivity of a receptor.

Area Sensitivity

3.12 The sensitivity of the area to dust soiling and health impacts is dependent on the number of receptors within each sensitivity class and their distance from the source. In addition, human health impacts are dependent on the existing PM_{10} concentrations in the area. Tables 3.3, 3.4 and 3.5 summarise the criteria for determining the overall sensitivity of the area to dust soiling, health impacts and ecological impacts respectively.

Table 3.3: Sensitivity of the Area to Dust Soiling Effects on People and Property

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

(a) For trackout, the distance is measured from the side of roads used by construction traffic. Beyond 50m, the impact is negligible.

Table 3.4: Sensitivity of the Area to Human Health Impacts

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

(a) For trackout, the distance is measured from the side of roads used by construction traffic. Beyond 50m, the impact is negligible.

Table 3.5: Sensitivity of Area to Ecological Impacts

Sensitivity of Area	Distance from the Source	
	<20m	<50m
High	High Risk	Medium Risk
Medium	Medium Risk	Low Risk
Low	Low Risk	Low Risk

3.13 For each dust emission source (demolition, construction, earthworks and trackout), the worst-case area sensitivity is used in combination with the dust emission magnitude to determine the risk of dust impacts.

Risk of Dust Impacts

3.14 The risk of dust impacts prior to mitigation for each emission source is presented in Tables 3.6, 3.7 and 3.8.

Table 3.6: Risk of Dust Impacts – 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 3.7: Risk of Dust Impacts – Earthworks and Construction

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

Table 3.8: Risk of Dust Impacts - Trackout

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

Mitigation and Significance

3.15 The IAQM guidance provides a range of mitigation measures which are dependent on the level of dust risk attributed to the Proposed Development. Site specific mitigation measures are also included where appropriate.

3.16 The IAQM assessment methodology recommends that significance criteria are only assigned to the identified risk of dust impacts occurring from a construction activity following the application of appropriate mitigation measures. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effects will normally be negligible.

Construction Traffic

3.17 Construction traffic will contribute to existing traffic levels on the surrounding road network. The greatest potential for impacts on air quality from traffic associated with this phase of the Proposed Development will be in the areas immediately adjacent to the principal means of access for construction traffic.

3.18 The number of vehicles associated with construction of the Proposed Development is not predicted to be significant.

Operational Phase Methodology

3.19 Air quality at the Proposed Development has been predicted using the ADMS Roads dispersion model (Version 4.1.1, January 2018). This is a commercially available dispersion model and has been widely validated for this type of assessment and used extensively in the Air Quality Review and Assessment process.

3.20 The ADMS Roads model uses detailed information regarding traffic flows on the local road network and local meteorological conditions to predict pollution concentrations at specific

locations selected by the user. Meteorological data from Gravesend for the year 2018 has been used for the assessment.

3.21 The model has been used to predict road specific concentrations of oxides of nitrogen (NO_x) and Particulate Matter (PM_{10} and $PM_{2.5}$) at selected receptors. The predicted concentrations of NO_x have been converted to NO_2 using the NO_x to NO_2 calculator available on the Defra air quality website[8].

3.22 Traffic data for road links adjacent to the Proposed Development have been provided by the Transport Consultants for the project (Charles & Associates).

3.23 A summary of the traffic data used in the assessment can be found in **Appendix 8.2**. The data includes details of annual average daily traffic flows (AADT), vehicle speeds and percentage Heavy Duty Vehicles (HDV) for the assessment years considered. Low traffic speeds have been assigned to appropriate road links to account for congestion and queuing vehicles.

3.24 The following scenarios have been included in the assessment:

- 2018 – baseline traffic (for verification purposes);
- 2035 – baseline traffic, with committed developments (hereafter referred to as 'without development' scenario); and
- 2035 – baseline and development traffic (hereafter referred to as 'with development' scenario).

3.25 The emission factors released by Defra in June 2019, provided in the emissions factor toolkit EFT2019_9.0 have been used to predict traffic related emissions in 2018 (for verification purposes) and 2028 (the proposed opening year of the Proposed Development).

3.26 To predict local air quality, traffic emissions predicted by the model must be added to local background concentrations. Background concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been taken from the 2017 Defra background maps. The maps provide an estimate of background concentrations between 2017 and 2030. The data used for the modelling assessment are set out in Table 4.4.

[8] http://uk-air.defra.gov.uk

3.27 Background concentrations for 2018 have been used to predict concentrations in 2028 assuming no change in future years. This is considered to represent a conservative prediction of future concentrations.

3.28 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 aims to minimise modelling uncertainty and systematic error by correcting the modelled results by an adjustment factor to gain greater confidence in the final results. This process was undertaken using the methodology outlined in Chapter 7, Section 4 of LAQM.TG(16).

3.29 Traffic data for the model verification study was sourced from the Department for Transport traffic counts[9]. A verification factor of 0.69 was determined which indicates that the model is over-predicting in this area. An adjustment factor was therefore not applied to the model results to ensure a conservative assessment. Further details of the determination of the verification factor are provided in **Appendix D**.

3.30 A quantitative assessment of air quality in the vicinity of the Proposed Development has been completed against the Air Quality Strategy objectives set out in **Appendix B** for NO_2, PM_{10} and $PM_{2.5}$.

Sensitive Receptors

3.31 LAQM.TG(16) describes in detail typical locations where consideration should be given to pollutants defined in the Regulations. Generally, the guidance suggests that all locations '*where members of the public are regularly present'* should be considered. At such locations, members of the public will be exposed to pollution over the time that they are present, and the most suitable averaging period of the pollutant needs to be used for assessment purposes.

3.32 For instance, on a footpath, where exposure will be transient (for the duration of passage along that path) comparison with short-term standards (i.e. 15 minute mean or 1 hour mean) may be relevant. In a school, or adjacent to a private dwelling, however; where exposure may be for longer periods, comparison with long-term standards (such as 24 hour mean or annual mean) may be most appropriate. In general terms, concentrations associated with long-term standards are lower than short-term standards owing to the chronic health effects associated with exposure to low level pollution for longer periods of time.

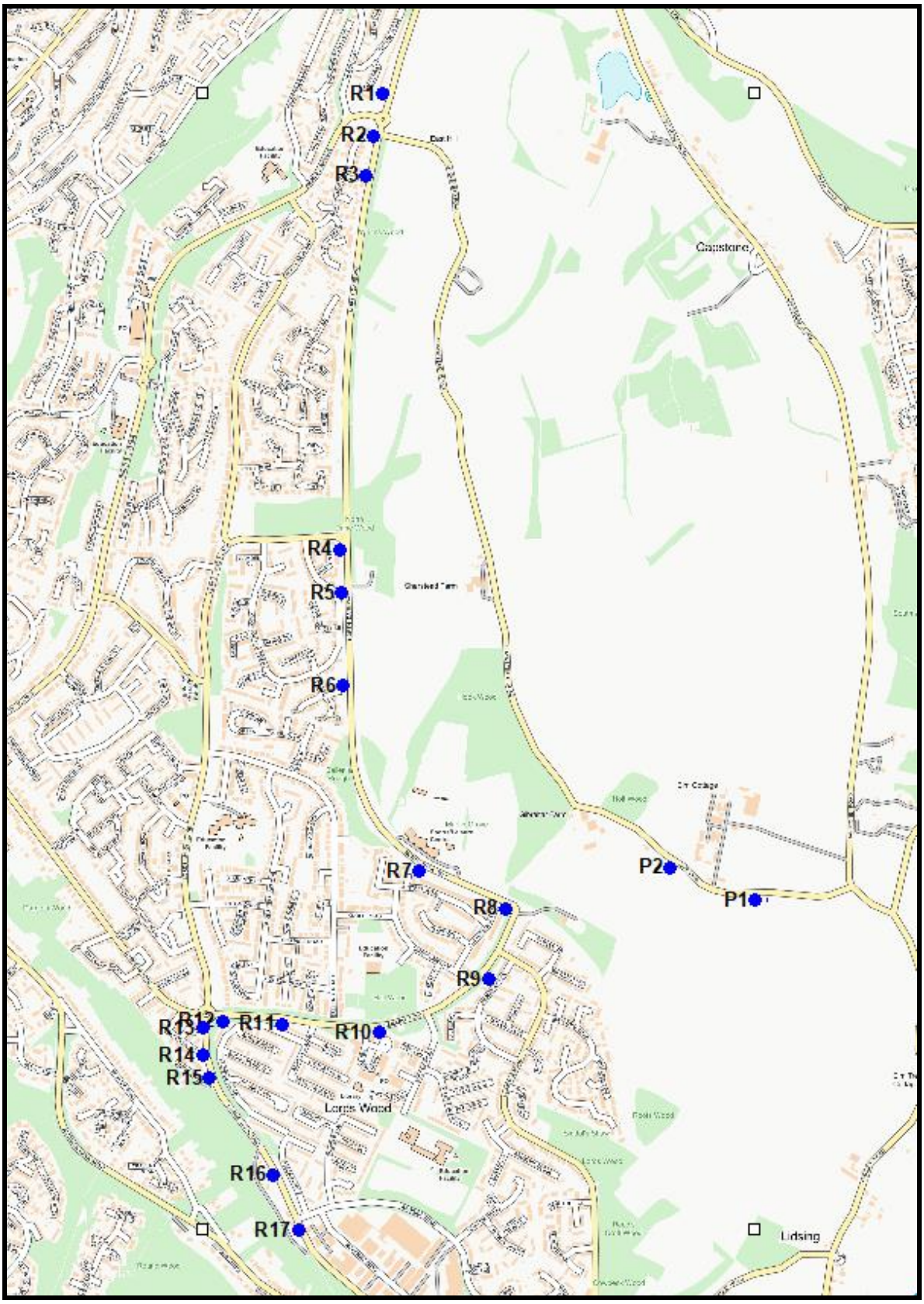
[9] https://roadtraffic.dft.gov.uk/manualcountpoints/36010

3.33 To assess the impact of traffic generated by the Proposed Development pollutant concentrations have been predicted at 17 existing sensitive residential receptors close to the roads affected by traffic generated by the Proposed Development. There are no sensitive ecological habitats within the vicinity of the Proposed Development or the roads likely to be affected by the Proposed Development. The modelling assessment also predicted concentrations at two at the facades of the Proposed Development. Details of these sensitive receptors are presented in Table 3.9 and the locations are illustrated in Figure 3.1.

Table 3.9: Location of Sensitive Receptors

ID	Receptor	Type	Easting	Northing
R1	Hampshire Close (North Dane Way)	Residential	577313.1	165355.5
R2	Barleymow Close (North Dane Way)	Residential	577285.9	165236.2
R3	Barleymow Close (North Dane Way)	Residential	577266.6	165123.1
R4	Merton Close (North Dane Way)	Residential	577189.7	164050.0
R5	Kingston Crescent (North Dane Way)	Residential	577197.3	163925.8
R6	Croydon Close (North Dane Way)	Residential	577200.4	163660.7
R7	Aintree Road (North Dane Way)	Residential	577418.3	163130.1
R8	Catterick Road (North Dane Way)	Residential	577664.6	163022.9
R9	Abinger Drive (Albemarle Road)	Residential	577616.1	162819.3
R10	Kestrel Road (Albemarle Road)	Residential	577302.6	162667.6
R11	Phoenix Road (Albemarle Road)	Residential	577025.4	162691.9
R12	Phoenix Road (Albemarle Road)	Residential	576853.9	162700.1
R13	Slade Close (Lords Wood Lane)	Residential	576797.1	162679.0
R14	Slade Close (Lords Wood Lane)	Residential	576796.9	162601.1
R15	Lords Wood Close (Lords Wood Lane)	Residential	576817.0	162537.1
R16	Lords Wood Lane	Residential	576999.8	162258.8
R17	Lords Wood Lane	Residential	577071.3	162101.6
P1	Facade of Proposed Development	Proposed	578380.0	163046.9
P2	Façade of Proposed Development	Proposed	578137.8	163139.4

Figure 3.1: Receptor Locations used in Modelling Assessment



Significance Criteria

3.34 The significance of the predicted impacts has been determined using the guidance set out within the Kent and Medway Air Quality Planning Guidance. In the first instance the change in pollutant concentrations as a result of the development is calculated as a percentage of the relevant objective limit. The impact is then classified according to the criteria set out in Table 3.10 below.

3.35 Following classification of the impacts the guidance recommends the actions set out in Table 3.11 based on the identified impact.

Table 3.10: Classification of impacts due to changes in pollutant concentrations

Classification of Impact	Concentration change due to development	Or if development contribution causes
Very High	Increase >10%	Breach of air quality objective
High	Increase 5-10%	Exposure to be within 5% of Objective
Medium	Increase 1-5%	Exposure to be within 10% of Objective
Low/Imperceptible	Increase <1%	-

Table 3.11: Recommended Planning Requirements

Magnitude of change in air quality	Likely requirements	Likely Outcomes
Very High	Require mitigation to remove very high air quality impacts. If impact of development on air quality is still very high – strong presumption for recommendation of refusal on air quality grounds	Recommend Refusal
High	Recommend refusal unless appropriate on-site mitigation measures implemented to the satisfaction of the planning authority. Mitigations to include reducing exposure through various measures, emissions reduction technologies and/or development redesign	Refusal, unless recommended mitigation is implemented.
Medium	Seek mitigation to reduce air quality impacts. Mitigations to include reducing exposure through various measures, emissions reduction technologies	Ensure on-site mitigation options are implemented.

	and/or development redesign	
Low/ Imperceptible	Recommend the minimum mitigation for development scheme type	Recommend minimum mitigation

3.36 The EPUK & IAQM planning guidance also provides criteria for determining the significance of a development. These criteria are provided below for comparison.

3.37 The EPUK & IAQM guidance recommends that the impact at individual receptors is described by expressing the magnitude of incremental change in pollution concentration 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 as summarised in Table 3.12.

Table 3.12: Impact Descriptors for Individual Receptors.

Long Term Average Concentration at Receptor in Assessment Year	% Change in concentration relative to AQAL (a)			
	1	2-5	5-10	>10
75% or less of AQAL	Negligible	Negligible	Slight adverse	Moderate adverse
76-94% of AQAL	Negligible	Slight adverse	Moderate adverse	Moderate adverse
95-102% of AQAL	Slight adverse	Moderate adverse	Moderate adverse	Substantial adverse
103-109% of AQAL	Moderate adverse	Moderate adverse	Substantial adverse	Substantial adverse
110% or more of AQAL	Moderate adverse	Substantial adverse	Substantial adverse	Substantial adverse
(a) A change in concentration of less than 0.5% of the AQAL is considered insignificant, however changes between 0.5% and 1% are rounded up to 1%.				

3.38 The EPUK/IAQM guidance notes that the criteria in Table 3.12 should be used to describe impacts at individual receptors and should 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 Proposed 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.

4 BASELINE CONDITIONS

Medway Council Review and Assessment of Air Quality

4.1 MC has carried out detailed assessments of air quality in the area and as a result has declared four AQMAs within the Medway area. All four are due to potential exceedences of the AQS objectives for annual mean NO_2 concentrations. The Site is not located within or near an AQMA. The closest AQMA to the Proposed Development is Central Medway AQMA which is declared for a number of roads in the Central Medway area and is located approximately 3.2km to the northwest of the Site.

Automatic Local Monitoring Data

4.2 MC operates two automatic monitoring sites, the closest is a roadside site located approximately 3.8km to the northwest of the Proposed Development. The other automatic monitor is a rural background site located 14km to the northeast of the Proposed Development. Bias adjusted data obtained from both monitoring stations is presented in Tables 4.1 and 4.2.

Table 4.1: NO_2 Concentrations recorded at the nearest Continuous Automatic Monitors (µg/m^3)

Monitoring Site	Statistic	2014	2015	2016	2017	2018
Chatham	Annual Mean (µg/m^3)	24.8	23.5	25.7	25.4	23.4
	Number of 1-hour means > 200 µg/m^3	0	0	0	0	0
Rochester Stoke	Annual Mean (µg/m^3)	14.1	13.0	13.3	14.7	13.0
	Number of 1-hour means > 200 µg/m^3	0	0	0	0	0
Data obtained from MC Air Quality Annual Status Report 2019						

4.3 Exceedences of the AQS objective for annual mean NO_2 concentrations have not been experienced at the Chatham monitor throughout the five-year period presented, despite being located at a roadside location within an AQMA. No exceedences were recorded at the background site.

4.4 Exceedences of the hourly objective have not been recorded during the five years of the monitoring presented, therefore the objective was met in all five monitoring years.

4.5 Based on the data recorded at these sites, NO_2 concentrations are expected to meet the annual mean and hourly mean objectives at the Proposed Development.

Table 4.2: PM_{10} Concentrations recorded at the nearest Continuous Automatic Monitors (µg/m³)

Monitoring Site	Statistic	2014	2015	2016	2017	2018
Chatham	Annual Mean (µg/m³)	21.4	18.5	19.1	21.6	23.7
	Number of 24-hour means > 50 µg/m³	15	4	3	7	11
Rochester Stoke	Annual Mean (µg/m³)	17.6	14.6	15.8	16.6	17.4
	Number of 24-hour means > 50 µg/m³	8	2	4	4	0
Data obtained from MC Air Quality Annual Status Report 2019						

4.6 Annual mean PM_{10} concentrations recorded have been consistently below the 40 µg/m³ objective since 2014.

4.7 Exceedences of the 24-hour objective have been recorded at both monitoring stations during the five years of the monitoring presented, however the objective allows for 35 exceedences of the 50 µg/m³ limit in any given year therefore the objective was met in all five monitoring years.

4.8 Based on the data recorded at these sites, PM_{10} concentrations are expected to meet the annual mean and 24-hour objectives at the Proposed Development.

Non-Automatic Monitoring

4.9 NO_2 diffusion tube monitoring is also carried out at 34 locations in the Medway area. However, none of these tubes are located in the vicinity of the Proposed Development. However, Maidstone Borough Council (MBC) undertakes diffusion tube monitoring relatively close the Proposed Development. Data from these monitoring sites are presented in Table 4.3 below.

Table 4.3: NO_2 Concentrations recorded at the nearest Diffusion Tube Monitors (µg/m³)

Monitoring Site	Type	Distance to Kerb	2016	2017	2018
Maid99 – Forge Lane	Roadside	1	52.8	-	-
Maid100 – Harp Farm Road	Roadside	1	56.9	-	-
Maid105 – Near Harp Farm Rd, Westfield Sole, Maidstone	Roadside	19	32.9	30.9	21.5
Maid114 – Speed sign on West side of road bridge over M2 (at Blind Lane end)	Roadside	15	-	31.1	-

4.10 Limited data is available from these monitoring sites. At Maid105 and Maid114 diffusion tube sites, the AQS objective for annual mean NO_2 concentrations has been met. At Maid99 and Maid100, which are located in close proximity to the M2, concentrations are exceeding of the objective level in 2016.

4.11 Diffusion tubes cannot monitor short-term NO_2 concentrations, however, as previously discussed, research has concluded that exceedances of the 1-hour mean objective are generally unlikely to occur where annual mean concentrations do not exceed 60 µg/m³. Annual mean NO_2 concentrations were below 60 µg/m³ at all monitoring sites therefore it is expected that the 1-hour objective is being met at these locations.

DEFRA Background Maps

4.12 Additional information on background concentrations in the vicinity of the Proposed Development have been obtained from the Defra background pollutant maps. The average pollutant concentrations from the grid squares representing the assessment area have been extracted from the maps which include the modelled receptors and road links included in the modelling assessment.

4.13 The Proposed Development site lies within the following grid squares: 577500, 163500; 578500, 162500; 578500, 163500.

4.14 Separate background concentrations have been obtained for the grid squares representing the monitoring sites used in the verification of the modelling.

4.15 The 2017 Defra background maps, which provide estimated background concentrations between 2017 and 2030, have been used to obtain concentrations for 2018. The data is set out in Table 4.4.

Table 4.4: Estimated Annual Mean Background Concentrations from Defra Maps (µg/m^3)

Grid Square	Receptor	NO_2	PM_{10}	$PM_{2.5}$
577500, 165500	R1, R2, R3	14.9	16.3	11.3
577500, 164500	R4	14.1	16.1	11.0
577500, 163500	R5, R6, R7, R8	14.4	16.3	11.1
578500, 163500	P1, P2	13.9	16.3	10.8
577500, 162500	R9, R10, R11, R17	16.0	16.3	11.3
576500, 162500	R12, R13, R14, R15, R16	16.5	16.3	11.3
577500, 161500	Maid105	20.0	17.7	11.5

4.16 The background concentrations obtained from the Defra background maps for NO_2 and PM_{10} shows reasonable correlation with the concentrations measured at the background monitoring site.

5 ASSESSMENT OF IMPACT

Construction Phase

Area Sensitivity

5.1 The Site is currently occupied by open fields, therefore there are no buildings requiring demolition at the Site. An assessment of dust effects associated with demolition have not therefore been included within this assessment.

5.2 The assessment of dust impacts is dependent on the proximity of the most sensitive receptors to the Site boundary. A summary of the receptor and area sensitivity to health and dust soiling impacts is presented in Table 5.1.

Table 5.1: Sensitivity of Receptors and the Local Area to Dust and PM_{10} Impacts

Receptor	Distance from Site Boundary (m)	Approx. Number of Receptors	Sensitivity to Health Impacts (a)		Sensitivity to Dust Soiling Impacts	
			Receptor	Area	Receptor	Area
Residential Properties	<20 m	1-10	High	Low	High	Medium
	<50 m	10-100	High	Low	High	Medium
Overall Sensitivity of the Area			**Low**		**Medium**	
(a) Estimated background PM_{10} concentration is 16.3 µg/m^3.						

5.3 The route of the construction traffic is assumed to be Ham Lane. As the Proposed Development site is large in size, the sensitivity of the area to impacts arising from track-out is considered within a distance of 500m from the Proposed Development site entrance. There are relatively few sensitive receptors along the roads within this distance, therefore the sensitivity of the area to impacts from trackout is considered to be medium for dust impacts and low for human health impacts.

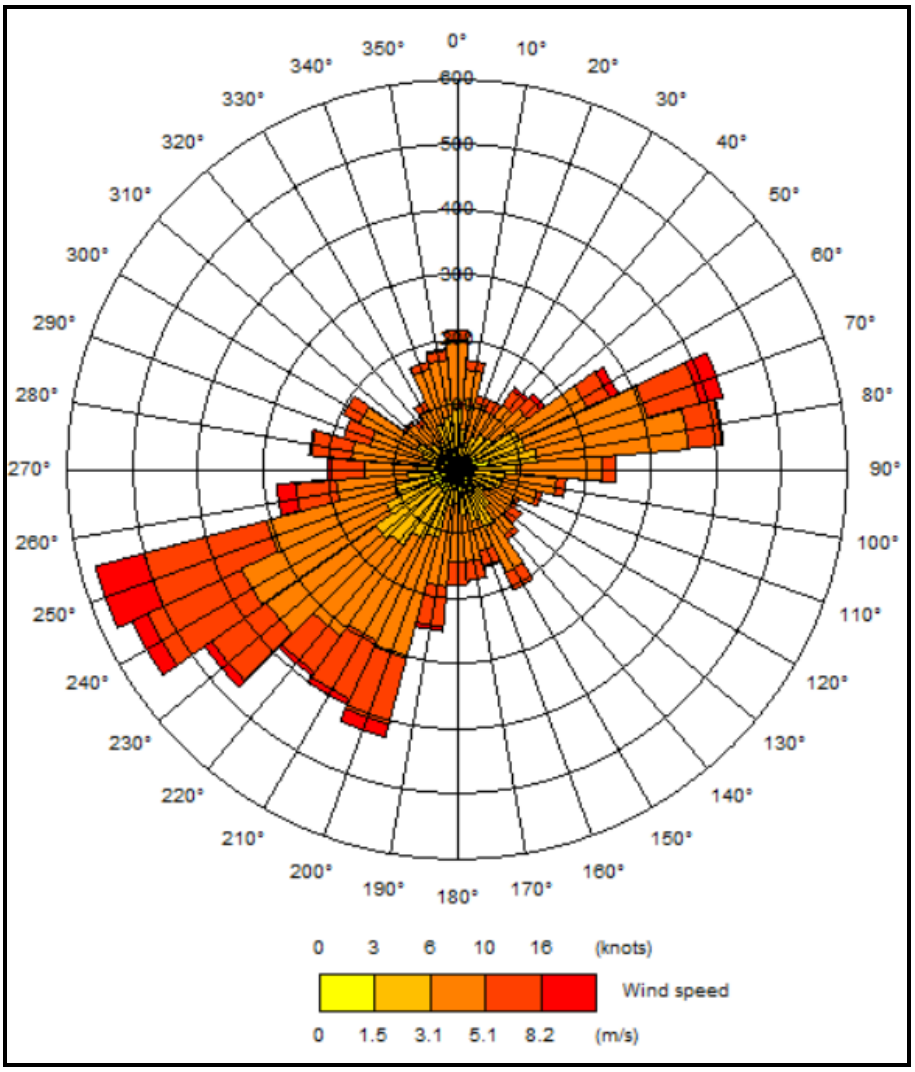
5.4 There are no dust-sensitive habitat sites within 500m of the Proposed Development nor within 50m of the route used by construction vehicles, therefore the impact of dust and particulate matter emissions on ecologically sensitive receptors has not been considered further in this assessment.

5.5 The precise behaviour of the dust, its residence time in the atmosphere, and the distance it may travel before being deposited will depend upon a number of factors. These

include wind direction and strength, local topography and the presence of intervening structures (buildings, etc.) that may intercept dust before it reaches sensitive locations. Furthermore, dust would be naturally suppressed by rainfall.

5.6 A wind rose from Gravesend is provided in Figure 5.1, which shows that the prevailing wind is from the southwest, therefore receptors to the northeast of the Proposed Development are the most likely to experience dust impacts from the Proposed Development. There are two sensitive residential receptors to the northeast of the Proposed Development.

Figure 5.1: Wind Rose for Gravesend Meteorological Station (2018)



Dust Emission Magnitude

5.7 Earthworks will primarily involve excavating material, haulage, tipping and stockpiling. This may also involve levelling of the Site and landscaping. Given the size of the Site, the magnitude of the dust emission for the earthworks phase is considered to be *large*.

5.8 Dust emissions during construction will depend on the scale of the works, method of construction, construction materials and duration of build. Based on the overall size of the Proposed Development and the construction materials, the dust emission magnitude is considered to be *large*.

5.9 Factors influencing the degree of trackout and associated magnitude of effect include vehicle size, vehicle speed, vehicle numbers, geology and duration. Construction traffic will likely access the Proposed Development site via Ham Lane. Based on the likely movements per day, dust emission magnitude due to trackout is considered to be *medium.*

Dust Risk Effects

5.10 A summary of the potential risk of dust impacts, based on the low overall sensitivity of the area to human health impacts and medium overall sensitivity to dust soiling impacts, is presented in Table 5.2.

Table 5.2: Risk of Dust Impacts Prior to Mitigation

Source	Impact Magnitude	Human Health Risk	Dust Soiling Risk
Earthworks	Large	Low	Medium
Construction	Large	Low	Medium
Trackout	Medium	Low	Low

Operational Phase

NO_2 Concentrations

5.11 Annual mean NO_2 concentrations predicted at the selected receptor locations are set out in Table 5.3. The concentrations include the 2018 background NO_2 concentrations estimated within the Defra background maps detailed in Table 4.4.

Table 5.3: Predicted Annual Mean NO_2 Concentrations at Modelled Receptors (µg/m^3)

Receptor Number	2028 Without Development	2028 With Development	Change as a result of Development (as % of the AQAL)	Significance of Impact
R1	16.4	16.4	0.2	Low / Imperceptible
R2	16.2	16.3	0.3	Low / Imperceptible
R3	16.2	16.3	0.3	Low / Imperceptible
R4	14.5	14.6	0.2	Low / Imperceptible

Receptor Number	2028 Without Development	2028 With Development	Change as a result of Development (as % of the AQAL)	Significance of Impact
R5	14.7	14.8	0.3	Low / Imperceptible
R6	14.7	14.8	0.2	Low / Imperceptible
R7	14.7	14.8	0.2	Low / Imperceptible
R8	14.9	15.0	0.4	Low / Imperceptible
R9	16.4	16.5	0.2	Low / Imperceptible
R10	16.2	16.3	0.2	Low / Imperceptible
R11	16.3	16.4	0.3	Low / Imperceptible
R12	17.0	17.1	0.3	Low / Imperceptible
R13	17.4	17.6	0.4	Low / Imperceptible
R14	17.1	17.2	0.3	Low / Imperceptible
R15	17.1	17.2	0.3	Low / Imperceptible
R16	17.1	17.2	0.3	Low / Imperceptible
R17	16.6	16.7	0.3	Low / Imperceptible
P1	-	14.2	-	-
P2	-	14.2	-	-

5.12 The results of the modelling indicate that predicted annual mean NO_2 concentrations are well below (less than 75%) the AQS objective level of 40 µg/m^3 at all the selected receptors both with and without the Proposed Development operational.

5.13 The greatest increase as a result of emissions from the traffic generated by the Proposed Development is 0.16 µg/m^3 which equates to 0.4% of the AQAL. According to the Kent and Medway Air Quality Partnership Air Quality Planning Guidance criteria set out in Table 3.10, the impact of the Proposed Development on local air quality with regard to annual mean NO_2 concentrations is considered to be *low / imperceptible* at all receptors.

5.14 The EPUK & IAQM guidance also provides guidance for determining the significance of an impact to air quality. These are set out in Table 3.12. In accordance with the EPUK & IAQM significance criteria, the impact of the operation of the Proposed Development on annual mean NO_2 concentrations is *negligible*.

5.15 The predicted annual mean NO_2 concentrations are all below 60µg/m^3, therefore it is considered likely that the AQS objective level for hourly mean NO_2 concentrations will also be met. Therefore, the impact of the Proposed Development with regard to hourly mean NO_2 concentrations is also considered to be *low / imperceptible*.

5.16 Within the Site itself (receptors P1 and P2) annual mean NO_2 concentrations are predicted to fall well below (less than 75%) the relevant AQAL. It is also expected that the hourly mean objective level within the Site will be met. The impact with regards to new exposure is therefore also considered to be *low / imperceptible*.

PM_{10} Concentrations

5.17 Annual mean PM_{10} concentrations predicted at the existing receptors and at the Site are set out in Table 5.4. The concentrations include the 2018 background PM_{10} concentrations estimated within the Defra background maps detailed in Table 4.4.

Table 5.4: Predicted Annual Mean PM_{10} Concentrations at Modelled Receptors (µg/m^3)

Receptor Number	2028 Without Development	2028 With Development	Change as a result of Development (as % of the AQAL)	Significance of Impact
R1	16.9	17.0	0.1	Low / Imperceptible
R2	16.8	16.9	0.1	Low / Imperceptible
R3	16.9	16.9	0.1	Low / Imperceptible
R4	16.3	16.3	0.1	Low / Imperceptible
R5	16.4	16.5	0.1	Low / Imperceptible
R6	16.4	16.4	0.1	Low / Imperceptible
R7	16.4	16.4	0.1	Low / Imperceptible
R8	16.5	16.5	0.1	Low / Imperceptible
R9	16.5	16.5	0.1	Low / Imperceptible
R10	16.4	16.4	0.1	Low / Imperceptible
R11	16.4	16.5	0.1	Low / Imperceptible
R12	16.5	16.5	0.1	Low / Imperceptible
R13	16.7	16.7	0.2	Low / Imperceptible
R14	16.5	16.6	0.1	Low / Imperceptible
R15	16.6	16.6	0.1	Low / Imperceptible
R16	16.6	16.6	0.1	Low / Imperceptible
R17	16.6	16.6	0.1	Low / Imperceptible
P1	-	16.4	-	-
P2	-	16.4	-	-

5.18 The results of the modelling indicate that predicted annual mean PM_{10} concentrations are well below (less than 75%) the AQS objective level of 40 µg/m^3 at all the selected receptors both with and without the Proposed Development operational.

5.19 Traffic associated with the Proposed Development is predicted to result in a maximum increase in the annual mean PM_{10} concentration of 0.1 µg/m^3 which equates to 0.2% of the AQAL. In accordance with the Kent and Medway Air Quality Partnership Air Quality Planning Guidance criteria as set out in Table 3.10, the impact on local air quality with regards to this pollutant is considered to be *low / imperceptible*.

5.20 In accordance with the EPUK & IAQM significance criteria set out in Table 3.12, the significance of the impact of the operation of the Proposed Development on annual mean PM_{10} concentrations is *negligible*.

5.21 LAQM.TG(16) provides a relationship between predicted annual mean concentrations and the likely number of exceedances of the short-term (24-hour mean) PM_{10} objective of 50 µg/m^3 (N), where:

$$N = -18.5 + 0.00145 \times \text{annual mean}^3 + (206/\text{annual mean}).$$

5.22 The objective allows 35 exceedances per year, which is equivalent to an annual mean of 32 µg/m^3.

5.23 Based on the above approach, the maximum number of days where PM_{10} concentrations are predicted to exceed 50µg/m^3 is 1 day with a change of less than one day as a result of the operation of the Proposed Development. The impact on 24 hour PM_{10} concentrations is therefore also considered to be *low / imperceptible*.

5.24 Within the Site itself, annual mean and 24-hour mean PM_{10} concentrations are predicted to fall well below the relevant AQALs. The effect with regards to new exposure is therefore also considered to be *low / imperceptible*.

$PM_{2.5}$ Concentrations

5.25 Annual mean $PM_{2.5}$ concentrations predicted at the existing receptors and at the Site are set out in Table 5.5. The concentrations include the 2018 background $PM_{2.5}$ concentrations estimated within the Defra background maps detailed in Table 4.4.

Table 5.5: Predicted Annual Mean $PM_{2.5}$ Concentrations at Modelled Receptors (µg/m³)

Receptor Number	2028 Without Development	2028 With Development	Change as a result of Development (as % of the AQAL)	Significance of Impact
R1	11.6	11.7	0.1	Low / Imperceptible
R2	11.6	11.6	0.1	Low / Imperceptible
R3	11.6	11.6	0.1	Low / Imperceptible
R4	11.1	11.1	0.1	Low / Imperceptible
R5	11.2	11.2	0.1	Low / Imperceptible
R6	11.2	11.2	0.1	Low / Imperceptible
R7	11.2	11.2	0.1	Low / Imperceptible
R8	11.2	11.2	0.1	Low / Imperceptible
R9	11.4	11.4	0.1	Low / Imperceptible
R10	11.4	11.4	0.1	Low / Imperceptible
R11	11.4	11.4	0.1	Low / Imperceptible
R12	11.4	11.4	0.1	Low / Imperceptible
R13	11.5	11.5	0.1	Low / Imperceptible
R14	11.4	11.5	0.1	Low / Imperceptible
R15	11.4	11.5	0.1	Low / Imperceptible
R16	11.5	11.5	0.1	Low / Imperceptible
R17	11.4	11.5	0.1	Low / Imperceptible
P1	-	10.9	-	-
P2	-	10.9	-	-

5.26 The results of the modelling assessment indicate that predicted annual mean $PM_{2.5}$ concentrations are well below (less than 75%) of the AQAL as the selected receptor locations both with and without the Proposed Development.

5.27 The Proposed Development is predicted to increase $PM_{2.5}$ concentrations by a maximum of 0.04µm³ which equates to 0.1% of the AQAL. In accordance with the Kent and Medway Air Quality Partnership Air Quality Planning Guidance criteria as set out in Table 3.10, the impact on local air quality with regards to this pollutant is considered to be *low / imperceptible*.

5.28 In accordance with the EPUK & IAQM significance criteria set out in Table 3.12, the significance of the impact of the operation of the Proposed Development on annual mean $PM_{2.5}$ concentrations is *negligible*.

5.29 Within the Site itself, annual mean $PM_{2.5}$ concentrations are predicted to fall well (less than 75%) below the relevant AQAL. The effect with regards to new exposure is therefore also considered to be *low / imperceptible.*

EMISSIONS MITIGATION CALCULATION

5.30 The Proposed Development is predicted to result in a low/imperceptible impact on local air quality. However, in accordance with the advice provided in the Kent & Medway Guidance which is reproduced in Table 3.11, mitigation measures will be implemented to reduce operational emissions.

5.31 In order to assist in determining the value of emissions mitigation required an Emissions Mitigation Assessment was completed including an emissions mitigation calculation in accordance with the advice provided in the Kent and Medway Air Quality Planning Guidance.

Table 5.6: Emissions Mitigation Calculation

	NOx	**$PM_{2.5}$**
Proposed Development Trips (as AADT)(1)	1,641 (0.9% HGV)	
Average Trip Length (km)(2)	13.8	
Emissions (kg/yr)(3)	1,273.49	146.48
Emissions (tonnes/yr)	1.27	0.15
Damage Cost (per tonne)(4)	£16,156.00	£307,169.00
Cost of 5 Year Exposure	£107,071.08	£234,148.40
Total	**£341,219.48**	

(1) Provided by Transport Consultants

(2) Obtained from National Travel Survey 2017 (Av miles travelled per car per person in a year /av no of trips made per car per person in a year) (5104/594 = 8.6 miles (13.8km))

(3) Value obtained from EFT spreadsheet (assuming average speed of 48kph)

(4) IGCB Air Quality Damage Costs per tonne (2017 prices) (Central Estimate for Transport Urban Large in 2028). 2% uplift added for each additional year.

5.32 The Emissions Mitigation Calculation presented above suggests a damage cost of £341,219.48. A range of costs is provided, the above damage cost is based on the Central Estimate. Overall the range of costs is from £58,575.53 to £1,132,667.63.

MITIGATION

Construction Phase

5.33 The control of dust emissions from construction site activities relies upon management provision and mitigation techniques to reduce emissions of dust and limit dispersion. Where dust emission controls have been used effectively, large-scale operations have been successfully undertaken without impacts to nearby properties.

5.34 Overall the Proposed Development is considered to be a medium risk of dust impacts, and low risk to human health from particulate matter concentrations at nearby receptors during the construction phase. Appropriate mitigation measures for the Proposed Development have been identified following the IAQM guidance and based on the risk effects presented in Table 5.2. It is recommended that the 'highly recommended' measures set out in the IAQM guidance and reproduced in **Appendix E** are incorporated into a Dust Management Plan (DMP) and approved by MC prior to commencement of any work on the Site.

5.35 In addition to the 'recommended' measures, the IAQM guidance also sets out a number of 'desirable' measures which should also be considered. These are also set out in **Appendix E**.

5.36 Following implementation of the 'highly recommended' measures outlined in the IAQM guidance and reproduced in **Appendix E**, the impact of emissions during construction of the Proposed Development would be negligible.

Operational Phase

5.37 The detailed dispersion modelling indicates that the impact of the operation of the Proposed Development on local pollutant concentrations is low/imperceptible and that the concentrations of relevant pollutants (NO_2, PM_{10} and $PM_{2.5}$) within the Proposed Development and at nearby sensitive receptors will meet the relevant air quality objectives in the opening year.

5.38 The following mitigation measures will be included within the Proposed Development:

- All gas fired boilers to meet a standard of <40mgNO_x/kWh;
- 1 Electric Vehicle charging point per dwelling with dedicated parking or 1 charging point per 10 spaces (unallocated parking); and
- Travel plan including mechanisms for discouraging high emission vehicle use and encouraging the uptake of low emission fuels and technologies.

5.39 The cost of implementing the above mitigation measures will exceed the Damage Cost figure calculated in Table 5.6 by a significant margin. The implementation of the above mitigation measures should further reduce the impact of emissions during operation of the Proposed Development.

6 CONCLUSIONS

6.1 An air quality impact assessment has been carried out to assess both construction and operational impacts of the Proposed Development.

6.2 An assessment of the potential impacts during the construction phase has been carried out in accordance with the latest Institute of Air Quality Management Guidance. This has shown that for the Proposed Development, limited releases of dust and particulate matter are likely to be generated from on-site activities. However, through good site practice and the implementation of suitable mitigation measures, the impact of dust and particulate matter releases may be effectively mitigated and the resultant impacts are considered to be negligible.

6.3 ADMS Roads dispersion modelling has been carried out to assess both the impact of the operation of the Proposed Development on local pollutant concentrations and the suitability of the Proposed Development site for its proposed end use with regards to local air quality. The results indicate that predicted concentrations of relevant pollutants (NO_2, PM_{10} and $PM_{2.5}$) concentrations are below the relevant objectives within the Proposed Development and at nearby sensitive receptors.

6.4 Emissions arising from traffic generated by the operation of the Proposed Development would result in a negligible impact on local pollutant concentrations, predicted concentrations remain below the objective levels at all the selected receptors. In accordance with the Kent and Medway Air Quality Partnership Air Quality Planning Guidance, the impact of the emissions arising from traffic associated with the operation of the Proposed Development is considered to be *low / imperceptible*.

6.5 In accordance with the EPUK & IAQM significance criteria, the impact of the operation of the Proposed Development on NO_2, PM_{10} and $PM_{2.5}$ concentrations is considered to be negligible.

6.6 Future occupants of the Proposed Development would not be exposed to pollutant concentrations above the relevant objective levels, therefore the impact of the Proposed Development with regards new exposure to air quality is considered to be negligible.

6.7 It is concluded that air quality does not pose a constraint to the Proposed Development, either during construction or once operational.

APPENDIX A - AIR QUALITY TERMINOLOGY

Term	Definition
Accuracy	A measure of how well a set of data fits the true value.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. This period avoids splitting winter season between 2 years, which is useful for pollutants that have higher concentrations during the winter months.
AQMA	Air Quality Management Area.
DEFRA	Department for Environment, Food and Rural Affairs.
Exceedance	A period of time where the concentrations of a pollutant is greater than, or equal to, the appropriate air quality standard.
Fugitive emissions	Emissions arising from the passage of vehicles that do not arise from the exhaust system.
LAQM	Local Air Quality Management.
NO	Nitrogen monoxide, a.k.a. nitric oxide.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
O_3	Ozone.
Percentile	The percentage of results below a given value.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
ppb parts per billion	The concentration of a pollutant in the air in terms of volume ratio. A concentration of 1 ppb means that for every billion (10^9) units of air, there is one unit of pollutant present.
ppm parts per million	The concentration of a pollutant in the air in terms of volume ratio. A concentration of 1 ppm means that for every billion (10^6) units of air, there is one unit of pollutant present.
Ratification (Monitoring)	Involves a critical review of all information relating to a data set, in order to amend or reject the data. When the data have been ratified they represent the final data to be used (see also validation).
µg/m^3 micrograms per cubic metre	A measure of concentration in terms of mass per unit volume. A concentration of 1ug/m3 means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
UKAS	United Kingdom Accreditation Service.
Uncertainty	A measure, associated with the result of a measurement, which characterizes the range of values within which the true value is expected to lie. Uncertainty is usually expressed as the range within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more clearly defined than the closely related parameter 'accuracy', and has replaced it on recent European legislation.
USA	Updating and Screening Assessment.
Validation (modelling)	Refers to the general comparison of modelled results against monitoring data carried out by model developers.
Validation (monitoring)	Screening monitoring data by visual examination to check for spurious and unusual measurements (see also ratification).
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.

APPENDIX B - AIR QUALITY STANDARDS AND OBJECTIVES

Table B1: Air Quality Strategy Objectives

Pollutant	Objective Level ($\mu g/m^3$)	Averaging Period	No. of Permitted Exceedances
NO_2	200 (a)	1-Hour	18 per annum (99.8th percentile)
	40 (a)	Annual	-
PM_{10}	200 (a)	24-Hour	35 per annum (90.4th percentile)
	50 (a)	Annual	-
$PM_{2.5}$	25 (b)	Annual	

(a) Air Quality Standards Regulations (2010)

(b) EU Directive Limit Value

APPENDIX C - SUMMARY OF TRAFFIC DATA

Table C1: Traffic data utilised for the air quality assessment (AADT)

Description	Average Speed (kph)		2035 Without Development		2035 With Development	
	Freeflow	Junction/ Congestion	AADT Traffic Flows	HDV (%)	AADT Traffic Flows	HDV (%)
N Dane Way (N)	64	54	23514	4.0%	25155	3.8%
N Dane Way (S)	64	54	16271	1.4%	17912	1.3%
Princess Ave	64	54	18089	3.3%	18089	3.3%
Shawstead Rd	48	38	5897	1.5%	5897	1.5%
Lords Wood Lane N	48	38	5017	2.3%	5017	2.3%
N Dane Way (S of Princes Way)	96	86	4219	0.7%	5860	0.7%
Lords Wood Lane (N of Dargets Rd)	48	38	4542	10.2%	4542	10.2%
Dargets Rd	48	38	5844	3.5%	5844	3.5%
Lords Wood Lane (S of Dargets Rd)	48/64	38	6845	5.8%	8362	4.9%
Albermarle Rd W	48	38	2803	12.0%	4320	8.1%
Boxley Rd	64	54	5441	1.7%	5441	1.7%
A2045	96	86	21831	2.5%	23348	2.4%
Harp Farm Rd	64	54	5744	3.9%	5744	3.9%
Westfoeld Sole Rd	48	38	13323	1.7%	13323	1.7%
Lords Wood Lane (N of A2045 junc)	96	86	22097	2.6%	23614	2.5%
Albermarle Rd E	48	38	7926	3.3%	9443	2.9%
Clandon Rd	48	38	4286	5.1%	4286	5.1%
N Dane Way (S of site access)	48	38	8827	1.0%	10344	0.9%

Table C2: Traffic Data used in Model Verification Study

Description	Average Speed (kph)	2018	
		AADT Traffic Flows	HDV (%)
M2	112	81290	10.3

APPENDIX D – VERIFICATION AND ADJUSTMENT OF MODELLED CONCENTRATIONS

Nitrogen Dioxide (NO_2)

Most nitrogen dioxide (NO_2) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions. Verification of concentrations predicted by the ADMS model has followed the methodology presented in LAQM.TG(16).

The model has been run to predict annual mean road-NO_x concentrations at one nearby monitoring site.

The model output of road-NOx (i.e. the component of total NO_x coming from road traffic) has been compared to the 'measured' road-NO_x (Table D1). The 'measured' road NO_x has been calculated from the measured NO_2 concentrations by using the Defra NO_x to NO_2 calculator available on the UK-AIR website.

Table D1: Comparison of Modelled and Monitored NOx concentrations

Monitoring Location	Total Monitored NO_2	Total Monitored NOx	Background NO2	Background NOx	Monitored Road NOx	Modelled Road NOx	Ratio
Maid105	21.5	35.3	20.0	29.4	5.9	8.6	0.69

The results in Table D1 indicate that the ADMS model over-predicted the road NO_x concentration at the selected monitoring site. An adjustment factor was therefore not used to ensure a conservative assessment.

APPENDIX E – CONSTRUCTION MITIGATION MEASURES

It is recommended that the 'highly recommended' measures set out below are incorporated into a DMP and approved by MC prior to commencement of any work on site:

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- display the name and contact details of the person accountable for air quality and dust issues on the site boundary (i.e. the environment manager/engineer or site manager);
- display the head or regional office contact information on the site boundary;
- record all dust and air quality complaints, identify cause, 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;
- carry out regular site inspections to monitor compliance with the DMP, record inspection results and make inspection log available to MC when asked;
- increase frequency of site inspection 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 periods of 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 is a large site, before work on a phase commences. Further guidance is provided by the IAQM on *monitoring during demolition, earthworks and construction*.
- 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 as necessary that are at least as high as any stockpiles;
- 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.
- Cover, seed or fence stockpiles to prevent wind whipping;
- 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;

- produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials;
- 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 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;
- avoid bonfires and burning of waste materials;
- 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;
- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;
- Avoid dry sweeping of large areas;
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;
- Record all inspections of haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits; and
- Access gates to be located at least 10m from receptors where possible.

The following 'desirable' measures should also be considered for inclusion within the DMP:

- undertake daily on-site and off-site inspection, where receptors area nearby, to monitor, 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 the site boundary;

- impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph 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);
- re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable;
- only remove the cover in small areas during work and not all at once;
- avoid scabbling (roughening of concrete surfaces);
- 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; and
- for smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.