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A1 Glossary

AADT	Annual Average Daily Traffic
ADMS-Roads	Atmospheric Dispersion Modelling System model for Roads
ADMS-5	Atmospheric Dispersion Modelling System model for point sources
AQAL	Air Quality Assessment Level
AQC	Air Quality Consultants
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
CAZ	Clean Air Zone
CEMP	Construction Environmental Management Plan
DBC	Dartford Borough Council
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMP	Dust Management Plan
EFT	Emission Factor Toolkit
EPUK	Environmental Protection UK
EU	European Union
EV	Electric Vehicle
Exceedance	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
GBC	Gravesham Borough Council
HDV	Heavy Duty Vehicles (> 3.5 tonnes)
HGV	Heavy Goods Vehicle
HMSO	Her Majesty's Stationery Office
IAQM	Institute of Air Quality Management
JAQU	Joint Air Quality Unit
kph	Kilometres Per hour
LAQM	Local Air Quality Management

LDV	Light Duty Vehicles (<3.5 tonnes)
LGV	Light Goods Vehicle
µg/m³	Microgrammes per cubic metre
NO	Nitric oxide
NO₂	Nitrogen dioxide
NO_x	Nitrogen oxides (taken to be NO ₂ + NO)
NPPF	National Planning Policy Framework
OEP	Office for Environmental Protection
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
OLEV	Office for Low Emission Vehicles
PM₁₀	Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter
PM_{2.5}	Small airborne particles less than 2.5 micrometres in aerodynamic diameter
PPG	Planning Practice Guidance
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal

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A2 Legislative and Planning Policy Context

A2.1 All European legislation referred to in this report is written into UK law and remains in place.

Air Quality Strategy

A2.2 The Air Quality Strategy¹ published by the Department for Environment, Food, and Rural Affairs (Defra) and Devolved Administrations, provides the policy framework for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment. It also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives. Local authorities are seen to play a particularly important role. The strategy describes the Local Air Quality Management (LAQM) regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

Clean Air Strategy 2019

A2.3 The Clean Air Strategy² sets out a wide range of actions by which the UK Government will seek to reduce pollutant emissions and improve air quality. Actions are targeted at four main sources of emissions: Transport, Domestic, Farming and Industry. At this stage, there is no straightforward way to take account of the expected future benefits to air quality within this assessment.

Reducing Emissions from Road Transport: Road to Zero Strategy

A2.4 The Office for Low Emission Vehicles (OLEV) and Department for Transport (DfT) published a Policy Paper³ in July 2018 outlining how the government will support the transition to zero tailpipe emission road transport and reduce tailpipe emissions from conventional vehicles during the transition. This paper affirms the Government's pledge to end the sale of new conventional petrol and diesel cars and vans by 2040. It states that the Government expects the majority of new cars and vans sold to be 100% zero tailpipe emission and all new cars and vans to have significant zero tailpipe emission capability by this year, and that by 2050 almost every car and van should have zero tailpipe emissions. It also states that the Government wants to see at least 50%, and as many as 70%, of new car sales, and up to 40% of new van sales, being ultra-low emission by 2030.

A2.5 The paper sets out a number of measures by which Government will support this transition, but is clear that Government expects this transition to be industry and consumer led. The Government has

¹ Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland

² Defra (2019) Clean Air Strategy 2019

³ DfT (2018) The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy

since announced that the phase-out date for the sale of new petrol and diesel cars and vans will be brought forward to 2030 and that all new cars and vans must be fully zero emission at the tailpipe from 2035. If these ambitions are realised then road traffic-related NO_x emissions can be expected to reduce significantly over the coming decades, likely beyond the scale of reductions forecast in the tools utilised in carrying out this air quality assessment.

Environment Act 2021

- A2.6 The UK's new legal framework for protection of the natural environment, the Environment Act 2021⁴ passed into UK law on 9 November 2021. The Act gives the Government the power to set long-term, legally binding environmental targets. It also establishes an Office for Environmental Protection (OEP), responsible for holding the government to account and ensuring compliance with these targets.
- A2.7 The Act requires the Government to set at least one long-term target (spanning a minimum of 15 years), supported by interim targets set in a five-year cycle, in each of four identified areas: Air Quality, Biodiversity, Water and Resource Efficiency and Waste Reduction. An additional target for annual mean levels of PM_{2.5} is also required. These targets must be set before November 2022; a scope for what these targets will involve has been outlined but they are not yet precisely defined. As the targets have not yet been either finalised or adopted by the Government, they cannot impact on current planning policy.

Planning Policy

National Policies

- A2.8 The National Planning Policy Framework (NPPF)⁵ sets out planning policy for England. It states that the purpose of the planning system is to contribute to the achievement of sustainable development, and that the planning system has three overarching objectives, one of which (Paragraph 8c) is an environmental objective:

“to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy”.

- A2.9 To prevent unacceptable risks from air pollution, Paragraph 174 of the NPPF states that:

“Planning policies and decisions should contribute to and enhance the natural and local environment by...preventing new and existing development from contributing to, being put at unacceptable risk

⁴ HMSO (2021) Environment Act 2021

⁵ Ministry of Housing, Communities & Local Government (2021) National Planning Policy Framework, available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf

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 quality”.

A2.10 Paragraph 185 states:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development”.

A2.11 More specifically on air quality, Paragraph 186 makes clear 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”.

A2.12 The NPPF is supported by Planning Practice Guidance (PPG)⁶, which includes guiding principles on how planning can take account of the impacts of new development on air quality. The PPG states that:

“Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with Limit Values. It is important that the potential impact of new development on air quality is taken into account where the national assessment indicates that relevant limits have been exceeded or are near the limit, or where the need for emissions reductions has been identified”.

A2.13 Regarding plan-making, the PPG states:

“It is important to take into account air quality management areas, Clean Air Zones and other areas including sensitive habitats or designated sites of importance for biodiversity where there could be specific requirements or limitations on new development because of air quality”.

A2.14 The role of the local authorities through the LAQM regime is covered, with the PPG stating that a local authority Air Quality Action Plan *“identifies measures that will be introduced in pursuit of the*

⁶ Ministry of Housing, Communities & Local Government (2019) Planning Practice Guidance

objectives and can have implications for planning". In addition, the PPG makes clear that "Odour and dust can also be a planning concern, for example, because of the effect on local amenity".

A2.15 Regarding the need for an air quality assessment, the PPG states that:

"Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity".

A2.16 The PPG sets out the information that may be required in an air quality assessment, making clear that:

"Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific".

A2.17 The PPG also provides guidance on options for mitigating air quality impacts, as well as examples of the types of measures to be considered. It makes clear that:

"Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact. It is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented".

Local Transport Plan

A2.18 The Local Transport Plan for Kent (LTP4)⁷ identifies that there is "significant out-commuting...causing congestion and poor air quality". One of the ambitions for Kent (Outcome 5: Better health and wellbeing) is to "provide and promote active travel choices for all members of the community to encourage good health and wellbeing, and implement measures to improve local air quality".

Local Policies

A2.19 The Gravesham Local Plan Core Strategy⁸ was adopted in 2014, and includes Policy CS19 on 'Development and Design Principles' which states:

⁷ Kent County Council (2017) Local Transport Plan 4: Delivering Growth without Gridlock 2016 - 2031

⁸ Gravesham Borough Council (2014) Gravesham Local Plan Core Strategy

“New development will be visually attractive, fit for purpose and locally distinctive. It will conserve and enhance the character of the local built, historic and natural environment, integrate well with the surrounding local area and meet anti-crime standards. The design and construction of new development will incorporate sustainable construction standards and techniques, be adaptable to reflect changing lifestyles, and be resilient to the effects of climate change. This will be achieved through the criteria set out below:

- *New development will be located, designed and constructed to:*
 - *... avoid adverse environmental impacts from pollution, including noise, air, odour and light pollution, and land contamination; ...”*

A2.20 GBC, in conjunction with the Kent and Medway Air Quality Partnership has produced an Air Quality Planning Guidance document⁹, in order to *“improve air quality across Kent and Medway and encourage emissions reductions to improve the environment and health of the population”* which applies across the whole borough.

Building Standards

A2.21 Part F(1) of the Building Regulations 2010¹⁰ places a duty on building owners, or those responsible for relevant building work¹¹, to ensure adequate ventilation is provided to building occupants. Compliance with the Building Regulations is not required for planning approval, but it is assumed that the Regulations will be complied with in the completed building.

A2.22 Approved Document F, which accompanies the Building Regulations, explains that care should be taken to minimise entry of external air pollutants. Specific steps should be taken to manage ventilation intakes where the building is near to a significant source of emissions, or if local ambient concentrations exceed values set in the Air Quality Standards Regulations 2010. These steps include maximising the distance between emission source and air intake, considering likely dispersion patterns, and considering the timing of pollution releases when designing the ventilation system.

⁹ Kent and Medway Air Quality Partnership (2015) Air Quality Planning Guidance

¹⁰ Ministry of Housing, Communities & Local Government (2020) The Building Regulations 2010 The Merged Approved Documents

¹¹ Building work is a legal term for work covered by the Building Regulations. With limited exemptions, the Regulations apply to all significant building work, including erecting or extending a building.

Air Quality Action Plans

National Air Quality Plan

A2.23 Defra has produced an Air Quality Plan¹² to tackle roadside nitrogen dioxide concentrations in the UK; a supplement to the 2017 Plan¹³ was published in October 2018 and sets out the steps Government is taking in relation to a further 33 local authorities where shorter-term exceedances of the limit value were identified. Alongside a package of national measures, the 2017 Plan and the 2018 Supplement require those identified English Local Authorities (or the GLA in the case of London Authorities) to produce local action plans and/or feasibility studies. These plans and feasibility studies must have regard to measures to achieve the statutory limit values within the shortest possible time, which may include the implementation of a CAZ. There is currently no straightforward way to take account of the effects of the 2017 Plan or 2018 Supplement in the modelling undertaken for this assessment; however, consideration has been given to whether there is currently, or is likely to be in the future, a limit value exceedance in the vicinity of the Development. This assessment has principally been carried out in relation to the air quality objectives, rather than the limit values that are the focus of the Air Quality Plan.

Local Air Quality Action Plan

A2.24 GBC has prepared two separate Air Quality Action Plans covering:

- the A2 Trunk Road and Northfleet Industrial Area; and
- the Urban Area AQMAs (including the A226 One-way system in Gravesend AQMA and the A227/B261 Wrotham Road / Old Road West junction AQMA).

A2.25 The proposed development is located within the Northfleet Industrial Area AQMA. After reviewing several measures, GBC concluded¹⁴ the largest reductions in PM₁₀ concentrations would result from *“improvements to the Lafarge Cement UK Northfleet Works, in combination with reductions in PM₁₀ from other industrial processes and additional street cleaning. [...] The longer term goal (2008) is the relocation of the Lafarge Cement UK Works.”* The Lafarge Cement UK Works closed in 2008, and nearby monitoring (site ZG3) has not recorded an exceedance of the PM₁₀ objective in the last five years¹⁵.

¹² Defra (2017) Air quality plan for nitrogen dioxide (NO₂) in the UK

¹³ Defra (2018) Supplement to the UK plan for tackling roadside nitrogen dioxide concentrations

¹⁴ Gravesham Borough Council (2004) Local Air Quality Management – Final Action Plan, available: <http://aqma.defra.gov.uk/action-plans/GBC%20AQAP%202004.pdf>

¹⁵ Gravesham Borough Council (2022) Annual Status Report 2021, available: <https://kentair.org.uk/report/gravesham-borough-council-annual-status-report-2021>

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A3 EPUK & IAQM Planning for Air Quality Guidance

- A3.1 The guidance issued by EPUK and IAQM¹⁶ is comprehensive in its explanation of the place of air quality in the planning regime. Key sections of the guidance not already mentioned above are set out below.

Air Quality as a Material Consideration

“Any air quality issue that relates to land use and its development is capable of being a material planning consideration. The weight, however, given to air quality in making a planning application decision, in addition to the policies in the local plan, will depend on such factors as:

- *the severity of the impacts on air quality;*
- *the air quality in the area surrounding the proposed development;*
- *the likely use of the development, i.e. the length of time people are likely to be exposed at that location; and*
- *the positive benefits provided through other material considerations”.*

Recommended Best Practice

- A3.2 The guidance goes into detail on how all development proposals can and should adopt good design principles that reduce emissions and contribute to better air quality management. It states:

“The basic concept is that good practice to reduce emissions and exposure is incorporated into all developments at the outset, at a scale commensurate with the emissions”.

- A3.3 The guidance sets out a number of good practice principles that should be applied to all developments that:

- include 10 or more dwellings;
- where the number of dwellings is not known, residential development is carried out on a site of more than 0.5 ha;
- provide more than 1,000 m² of commercial floorspace;
- are carried out on land of 1 ha or more.

- A3.4 The good practice principles are that:

- New developments should not contravene the Council's Air Quality Action Plan, or render any of the measures unworkable;

¹⁶ Moorcroft and Barrowcliffe et al. (2017) Land-Use Planning & Development Control: Planning For Air Quality v1.2

- Wherever possible, new developments should not create a new “street canyon”, as this inhibits pollution dispersion;
- Delivering sustainable development should be the key theme of any application;
- New development should be designed to minimise public exposure to pollution sources, e.g. by locating habitable rooms away from busy roads;
- The provision of at least 1 Electric Vehicle (EV) “rapid charge” point per 10 residential dwellings and/or 1000 m² of commercial floorspace. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made available;
- Where development generates significant additional traffic, provision of a detailed travel plan (with provision to measure its implementation and effect) which sets out measures to encourage sustainable means of transport (public, cycling and walking) via subsidised or free-ticketing, improved links to bus stops, improved infrastructure and layouts to improve accessibility and safety;
- All gas-fired boilers to meet a minimum standard of <40 mgNO_x/kWh;
- Where emissions are likely to impact on an AQMA, all gas-fired CHP plant to meet a minimum emissions standard of:
 - Spark ignition engine: 250 mgNO_x/Nm³;
 - Compression ignition engine: 400 mgNO_x/Nm³;
 - Gas turbine: 50 mgNO_x/Nm³.
- A presumption should be to use natural gas-fired installations. Where biomass is proposed within an urban area it is to meet minimum emissions standards of 275 mgNO_x/Nm³ and 25 mgPM/Nm³.

A3.5 The guidance also outlines that offsetting emissions might be used as a mitigation measure for a proposed development. However, it states that:

“It is important that obligations to include offsetting are proportional to the nature and scale of development proposed and the level of concern about air quality; such offsetting can be based on a quantification of the emissions associated with the development. These emissions can be assigned a value, based on the “damage cost approach” used by Defra, and then applied as an indicator of the level of offsetting required, or as a financial obligation on the developer. Unless some form of benchmarking is applied, it is impractical to include building emissions in this approach, but if the boiler and CHP emissions are consistent with the standards as described above then this is not essential”.

A3.6 The guidance offers a widely used approach for quantifying costs associated with pollutant emissions from transport. It also outlines the following typical measures that may be considered to offset

emissions, stating that measures to offset emissions may also be applied as post assessment mitigation:

- Support and promotion of car clubs;
- Contributions to low emission vehicle refuelling infrastructure;
- Provision of incentives for the uptake of low emission vehicles;
- Financial support to low emission public transport options; and
- Improvements to cycling and walking infrastructures.

Screening

Impacts of the Local Area on the Development

“There may be a requirement to carry out an air quality assessment for the impacts of the local area’s emissions on the proposed development itself, to assess the exposure that residents or users might experience. This will need to be a matter of judgement and should take into account:

- *the background and future baseline air quality and whether this will be likely to approach or exceed the values set by air quality objectives;*
- *the presence and location of Air Quality Management Areas as an indicator of local hotspots where the air quality objectives may be exceeded;*
- *the presence of a heavily trafficked road, with emissions that could give rise to sufficiently high concentrations of pollutants (in particular nitrogen dioxide), that would cause unacceptably high exposure for users of the new development; and*
- *the presence of a source of odour and/or dust that may affect amenity for future occupants of the development”.*

Impacts of the Development on the Local Area

A3.7 The guidance sets out two stages of screening criteria that can be used to identify whether a detailed air quality assessment is required, in terms of the impact of the development on the local area. The first stage is that you should proceed to the second stage if any of the following apply:

- 10 or more residential units or a site area of more than 0.5 ha residential use; and/or
- more than 1,000 m² of floor space for all other uses or a site area greater than 1 ha.

A3.8 Coupled with any of the following:

- the development has more than 10 parking spaces; and/or

- the development will have a centralised energy facility or other centralised combustion process.

A3.9 If the above do not apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area. If they do apply then you proceed to stage 2, which sets out indicative criteria for requiring an air quality assessment. The stage 2 criteria relating to vehicle emissions are set out below:

- the development will lead to a change in LDV flows of more than 100 AADT within or adjacent to an AQMA or more than 500 AADT elsewhere;
- the development will lead to a change in HDV flows of more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere;
- the development will lead to a realigning of roads (i.e. changing the proximity of receptors to traffic lanes) where the change is 5m or more and the road is within an AQMA;
- the development will introduce a new junction or remove an existing junction near to relevant receptors, and the junction will cause traffic to significantly change vehicle acceleration/deceleration, e.g. traffic lights or roundabouts;
- the development will introduce or change a bus station where bus flows will change by more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere; and
- the development will have an underground car park with more than 100 movements per day (total in and out) with an extraction system that exhausts within 20 m of a relevant receptor.

A3.10 The criteria are more stringent where the traffic impacts may arise on roads where concentrations are close to the objective. The presence of an AQMA is taken to indicate the possibility of being close to the objective, but where whole authority AQMAs are present and it is known that the affected roads have concentrations below 90% of the objective, the less stringent criteria are likely to be more appropriate.

A3.11 On combustion processes (including standby emergency generators and shipping) where there is a risk of impacts at relevant receptors, the guidance states that:

“Typically, any combustion plant where the single or combined NO_x emission rate is less than 5 mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion. As a guide, the 5 mg/s criterion equates to a 450 kW ultra-low NO_x gas boiler or a 30kW CHP unit operating at <95mg/Nm³.

In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings

(including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates.

Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable”.

- A3.12 Should none of the above apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area, provided that professional judgement is applied; the guidance importantly states the following:

“The criteria provided are precautionary and should be treated as indicative. They are intended to function as a sensitive ‘trigger’ for initiating an assessment in cases where there is a possibility of significant effects arising on local air quality. This possibility will, self-evidently, not be realised in many cases. The criteria should not be applied rigidly; in some instances, it may be appropriate to amend them on the basis of professional judgement, bearing in mind that the objective is to identify situations where there is a possibility of a significant effect on local air quality”.

- A3.13 Even if a development cannot be screened out, the guidance is clear that a detailed assessment is not necessarily required:

“The use of a Simple Assessment may be appropriate, where it will clearly suffice for the purposes of reaching a conclusion on the significance of effects on local air quality. The principle underlying this guidance is that any assessment should provide enough evidence that will lead to a sound conclusion on the presence, or otherwise, of a significant effect on local air quality. A Simple Assessment will be appropriate, if it can provide this evidence. Similarly, it may be possible to conduct a quantitative assessment that does not require the use of a dispersion model run on a computer”.

- A3.14 The guidance also outlines what the content of the air quality assessment should include, and this has been adhered to in the production of this chapter.

Assessment of Significance

- A3.15 There is no official guidance in the UK in relation to development control on how to describe the nature of air quality impacts, nor how to assess their significance. The approach within the EPUK/IAQM guidance has, therefore, been used in this assessment. This approach involves a two stage process:

- a qualitative or quantitative description of the impacts on local air quality arising from the development; and
- a judgement on the overall significance of the effects of any impacts.

A3.16 The guidance recommends that the assessment of significance should be based on professional judgement, with the overall air quality impact of the development described as either 'significant' or 'not significant'. In drawing this conclusion, the following factors should be taken into account:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts;
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts;
- the potential for cumulative impacts and, in such circumstances, several impacts that are described as '*slight*' individually could, taken together, be regarded as having a significant effect for the purposes of air quality management in an area, especially where it is proving difficult to reduce concentrations of a pollutant. Conversely, a '*moderate*' or '*substantial*' impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health; and
- the judgement on significance relates to the consequences of the impacts; will they have an effect on human health that could be considered as significant? In the majority of cases, the impacts from an individual development will be insufficiently large to result in measurable changes in health outcomes that could be regarded as significant by health care professionals.

A3.17 The guidance is clear that other factors may be relevant in individual cases. It also states that the effect on the residents of any new development where the air quality is such that an air quality objective is not met will be judged as significant. For people working at new developments in this situation, the same will not be true as occupational exposure standards are different, although any assessment may wish to draw attention to the undesirability of the exposure.

A3.18 A judgement of the significance should be made by a competent professional who is suitably qualified. A summary of the professional experience of the staff contributing to this assessment is provided in Appendix A4.

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A4 Professional Experience

Dr Denise Evans, BSc (Hons) PhD MEnvSc MIAQM

Dr Evans is an Associate Director with AQC, with more than 23 years' relevant experience. She has prepared air quality review and assessment reports for local authorities, and has appraised local authority air quality assessments on behalf of the UK governments, and provided support to the Review and Assessment helpdesk. She has extensive modelling experience, completing air quality and odour assessments to support applications for a variety of development sectors including residential, mixed use, urban regeneration, energy, commercial, industrial, and road schemes, assessing the effects of a range of pollutants against relevant standards for human and ecological receptors. Denise has acted as an Expert Witness and is a Member of the Institute of Air Quality Management.

Jack Buckley, BSc (Hons) MSc AMEnvSc AMIAQM

Mr Buckley is a Senior Consultant with AQC. He has over four years' experience in the field of air quality, carrying out technical work for a range of projects, including road and rail infrastructure schemes, residential and mixed-use developments and industrial facilities. Jack has produced air quality, greenhouse gas and climate change assessments for numerous EIA schemes, using qualitative and quantitative methods, and has air quality monitoring experience. He has also has a strong understanding of relevant local, regional and national policies, having been seconded to the Greater London Authority to undertake technical reviews of planning applications, and has assisted in the development of new Air Quality Neutral and Air Quality Positive guidance. Jack completed a BSc (Hons) in Chemistry and an MSc in Environmental Science and Management, with both dissertations investigating the performance of low-cost air quality sensors. He is an Associate Member of both the Institute of Air Quality Management and the Institution of Environmental Sciences.

Dr Helen Pearce, BSc (Hons) MSc PhD

Dr Pearce is a Consultant with AQC, having joined in September 2021. Prior to joining AQC she was based at the University of Birmingham, completing a BSc in Geography, MSc in Applied Meteorology and Climatology, and PhD in Air Quality. Her PhD research specialised in air quality modelling where she developed a range of tools to estimate real-time pollutant concentrations on Birmingham's road network, and to quantify the impacts of Low Traffic Neighbourhoods on residential population exposure. Additionally, she provided the air quality modelling expertise on the NERC-funded project, 'GI4RAQ' (Green Infrastructure for Roadside Air Quality), to quantitatively assess the impacts of 'green' interventions in street environments. She is now gaining experience in the field of air quality monitoring and assessment.

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A5 Construction Dust Assessment Procedure

A5.1 The criteria developed by IAQM¹⁷ divide the activities on construction sites into four types to reflect their different potential impacts. These are:

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

A5.2 The assessment procedure includes the four steps summarised below:

STEP 1: Screen the Need for a Detailed Assessment

A5.3 An assessment is required where there is a human receptor within 350 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s), or where there is an ecological receptor within 50 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

A5.4 Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is *negligible* and that any effects will be 'not significant'. No mitigation measures beyond those required by legislation will be required.

STEP 2: Assess the Risk of Dust Impacts

A5.5 A site is allocated to a risk category based on two factors:

- the scale and nature of the works, which determines the potential dust emission magnitude (Step 2A); and
- the sensitivity of the area to dust effects (Step 2B).

A5.6 These two factors are combined in Step 2C, which is to determine the risk of dust impacts with no mitigation applied. The risk categories assigned to the site may be different for each of the four potential sources of dust (demolition, earthworks, construction and trackout).

¹⁷ IAQM (2016) Guidance on the Assessment of Dust from Demolition and Construction v1.1

Step 2A – Define the Potential Dust Emission Magnitude

A5.7 Dust emission magnitude is defined as either ‘Small’, ‘Medium’, or ‘Large’. The IAQM guidance explains that this classification should be based on professional judgement, but provides the examples in Table A5.1.

Table A5.1: Examples of How the Dust Emission Magnitude Class May be Defined

Class	Examples
Demolition	
Large	Total building volume >50,000 m ³ , potentially dusty construction material (e.g. concrete), on site crushing and screening, demolition activities >20 m above ground level
Medium	Total building volume 20,000 m ³ – 50,000 m ³ , potentially dusty construction material, demolition activities 10-20 m above ground level
Small	Total building volume <20,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months
Earthworks	
Large	Total site area >10,000 m ² , potentially dusty soil type (e.g. clay, which will be prone to suspension when dry to due small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes
Medium	Total site area 2,500 m ² – 10,000 m ² , moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m – 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes
Small	Total site area <2,500 m ² , soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <20,000 tonnes, earthworks during wetter months
Construction	
Large	Total building volume >100,000 m ³ , piling, on site concrete batching; sandblasting
Medium	Total building volume 25,000 m ³ – 100,000 m ³ , potentially dusty construction material (e.g. concrete), piling, on site concrete batching
Small	Total building volume <25,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber)
Trackout ^a	
Large	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m
Medium	10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m
Small	<10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m

^a These numbers are for vehicles that leave the site after moving over unpaved ground.

Step 2B – Define the Sensitivity of the Area

A5.8 The sensitivity of the area is defined taking account of a number of factors:

- the specific sensitivities of receptors in the area;

- the proximity and number of those receptors;
- in the case of PM₁₀, the local background concentration; and
- site-specific factors, such as whether there are natural shelters to reduce the risk of wind-blown dust.

A5.9 The first requirement is to determine the specific sensitivities of local receptors. The IAQM guidance recommends that this should be based on professional judgment, taking account of the principles in Table A5.2. These receptor sensitivities are then used in the matrices set out in Table A5.3, Table A5.4 and Table A5.5 to determine the sensitivity of the area. Finally, the sensitivity of the area is considered in relation to any other site-specific factors, such as the presence of natural shelters etc., and any required adjustments to the defined sensitivities are made.

Step 2C – Define the Risk of Impacts

A5.10 The dust emission magnitude determined at Step 2A is combined with the sensitivity of the area determined at Step 2B to determine the *risk* of impacts with no mitigation applied. The IAQM guidance provides the matrix in Table A5.6 as a method of assigning the level of risk for each activity.

STEP 3: Determine Site-specific Mitigation Requirements

A5.11 The IAQM guidance provides a suite of recommended and desirable mitigation measures which are organised according to whether the outcome of Step 2 indicates a low, medium, or high risk. The list provided in the IAQM guidance has been used as the basis for the requirements set out in Appendix A7.

STEP 4: Determine Significant Effects

A5.12 The IAQM guidance does not provide a method for assessing the significance of effects before mitigation, and advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, the IAQM guidance is clear that the residual effect will normally be 'not significant'.

A5.13 The IAQM guidance recognises that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all of the time, for instance under adverse weather conditions. The local community may therefore experience occasional, short-term dust annoyance. The scale of this would not normally be considered sufficient to change the conclusion that the effects will be 'not significant'.

Table A5.2: Principles to be Used When Defining Receptor Sensitivities

Class	Principles	Examples
Sensitivities of People to Dust Soiling Effects		
High	users can reasonably expect enjoyment of a high level of amenity; or the appearance, aesthetics or value of their property would be diminished by soiling; and 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	dwellings, museum and other culturally important collections, medium and long term car parks and car showrooms
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; or the appearance, aesthetics or value of their property could be diminished by soiling; or 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	parks and places of work
Low	the enjoyment of amenity would not reasonably be expected; or there is property that would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or 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	playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads
Sensitivities of People to the Health Effects of PM₁₀		
High	locations where members of the public may be exposed for eight hours or more in a day	residential properties, hospitals, schools and residential care homes
Medium	locations where the people exposed are workers, and where individuals may be exposed for eight hours or more in a day.	may include office and shop workers, but will generally not include workers occupationally exposed to PM ₁₀
Low	locations where human exposure is transient	public footpaths, playing fields, parks and shopping streets
Sensitivities of Receptors to Ecological Effects		
High	locations with an international or national designation and the designated features may be affected by dust soiling; or locations where there is a community of a particularly dust sensitive species	Special Areas of Conservation with dust sensitive features
Medium	locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or locations with a national designation where the features may be affected by dust deposition	Sites of Special Scientific Interest with dust sensitive features
Low	locations with a local designation where the features may be affected by dust deposition	Local Nature Reserves with dust sensitive features

Table A5.3: Sensitivity of the Area to Dust Soiling Effects on People and Property ¹⁸

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

¹⁸ For demolition, earthworks and construction, distances are taken either from the dust source or from the boundary of the site. For trackout, distances are measured from the sides of roads used by construction traffic. Without mitigation, trackout may occur from roads up to 500 m from sites with a *large* dust emission magnitude for trackout, 200 m from sites with a *medium* dust emission magnitude and 50 m from sites with a *small* dust emission magnitude, as measured from the site exit. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50 m from the edge of the road.

Table A5.4: Sensitivity of the Area to Human Health Effects ¹⁸

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

Table A5.5: Sensitivity of the Area to Ecological Effects ¹⁸

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

Table A5.6: Defining the Risk of Dust Impacts

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

Appendix: Air Quality

Annex 1: Glossary

Annex 2: Legislative and Planning Policy Context

Annex 3: EPUK & IAQM Planning for Air Quality Guidance

Annex 4: Professional Experience

Annex 5: Construction Dust Assessment Procedure

Annex 6: Modelling Methodology

Annex 7: Construction Mitigation

A6 Modelling Methodology

Model Inputs

- A6.1 Predictions have been carried out using the ADMS-Roads dispersion model (v5). The model requires the user to provide various input data, including emissions from each section of road and the road characteristics (e.g. road width). Vehicle emissions have been calculated based on vehicle flow, composition and speed data using the EFT (Version 11.0) published by Defra¹⁹. Model input parameters are summarised in Table A6.1 and, where considered necessary, discussed further below.

Table A6.1: Summary of Model Inputs

Model Parameter	Value Used
Terrain Effects Modelled?	No
Variable Surface Roughness File Used?	No
Urban Canopy Flow Used?	No
Advanced Street Canyons Modelled?	No
Noise Barriers Modelled?	No
Meteorological Monitoring Site	London City
Meteorological Data Year	2019
Dispersion Site Surface Roughness Length (m)	0.5
Dispersion Site Minimum MO Length (m)	30
Met Site Surface Roughness Length (m)	0.2
Met Site Minimum MO Length (m)	75
Gradients?	No

- A6.2 AADT flows and vehicle fleet composition data have been provided by Vectos, who have undertaken the transport assessment work for the proposed development. Traffic speeds have been estimated based on professional judgement, taking account of the road layout, speed limits and the proximity to a junction. Diurnal and monthly flow profiles for the traffic have been derived from the national profiles published by DfT²⁰.
- A6.3 Road traffic emissions were modelled for 'Without Scheme' and 'With Scheme' scenarios for both the first year of construction works (2024, using peak construction traffic associated with activity in 2026) and the year of earliest occupation of any new homes (2026), although the latter used traffic data for the full completion (2031) of the Proposed Development to be conservative. The traffic data used in this assessment are summarised in Table A6.2.

¹⁹ Defra (2022) Local Air Quality Management (LAQM) Support Website

²⁰ DfT (2020) Road traffic statistics (TRA03)

Table A6.2: Summary of Traffic Data used in the Assessment (AADT Flows)

Road Link	2019		2024 (Without Scheme)		2024 (With Scheme)		2026 (Without Scheme)		2026 (With Scheme)	
	AADT	%HDV	AADT	%HDV	AADT	%HDV	AADT	%HDV	AADT	%HDV
1	3917	1.4	4040	1.4	4041	1.4	4225	1.4	4314	1.4
2	3917	1.4	4040	1.4	4041	1.4	4225	1.4	4314	1.4
3	10238	9.6	10561	9.6	10597	9.9	11045	9.6	14747	7.3
4	10238	9.6	10561	9.6	10597	9.9	11045	9.6	14747	7.3
5	10238	9.6	10561	9.6	10597	9.9	11045	9.6	14747	7.3
6	50	11.1	52	11.1	52	11.1	54	11.1	54	11.3
7	6327	1.8	6526	1.8	6541	2.0	6826	1.8	8318	1.5
8	6327	1.8	6526	1.8	6541	2.0	6826	1.8	8318	1.5
9	6327	1.8	6526	1.8	6541	2.0	6826	1.8	8318	1.5
10	12237	8.4	12623	8.4	12673	8.8	13201	8.4	18407	6.1
11	12237	8.4	12623	8.4	12673	8.8	13201	8.4	18407	6.1
12	12237	8.4	12623	8.4	12673	8.8	13201	8.4	18407	6.1
13	12237	8.4	12623	8.4	12673	8.8	13201	8.4	18407	6.1
14	4936	20.7	5091	20.7	5091	20.7	5325	20.7	5325	21.0
15	15658	10.2	16152	10.2	16357	11.3	16892	10.2	24280	7.2
16	15658	10.2	16152	10.2	16357	11.3	16892	10.2	24280	7.2
17	15658	10.2	16152	10.2	16357	11.3	16892	10.2	0	0.0
18	2215	21.5	2284	21.5	2284	21.5	2389	21.5	2389	21.5
19	2215	21.5	2284	21.5	2284	21.5	2389	21.5	2389	21.5
20	10126	4.3	10445	4.3	10445	4.3	10924	4.3	17226	2.7
21	10126	4.3	10445	4.3	10445	4.3	10924	4.3	17226	2.7
22	10126	4.3	10445	4.3	10445	4.3	10924	4.3	17226	2.7
23	10126	4.3	10445	4.3	10445	4.3	10924	4.3	17226	2.7
24	10261	15.3	10584	15.3	10680	16.0	11069	15.3	18674	9.2
25	10261	15.3	10584	15.3	10680	16.0	11069	15.3	18674	9.2
26	10261	15.3	10584	15.3	10680	16.0	11069	15.3	18674	9.2
27	10574	14.7	10907	14.7	11002	15.4	11407	14.7	18864	9.0
28	10574	14.7	10907	14.7	11002	15.4	11407	14.7	18864	9.0
29	10574	14.7	10907	14.7	11002	15.4	11407	14.7	18864	9.0
30	25353	5.3	26152	5.3	26160	5.3	27351	5.3	28191	5.2
31	25353	5.3	26152	5.3	26160	5.3	27351	5.3	28191	5.2
32	25353	5.3	26152	5.3	26160	5.3	27351	5.3	28191	5.2
33	25353	5.3	26152	5.3	26160	5.3	27351	5.3	28191	5.2
34	25353	5.3	26152	5.3	26160	5.3	27351	5.3	28191	5.2
35	11011	17.2	11358	17.2	11452	17.9	11879	17.2	19335	10.7

Road Link	2019		2024 (Without Scheme)		2024 (With Scheme)		2026 (Without Scheme)		2026 (With Scheme)	
	AADT	%HDV	AADT	%HDV	AADT	%HDV	AADT	%HDV	AADT	%HDV
36	11011	17.2	11358	17.2	11452	17.9	11879	17.2	19335	10.7
37	11011	17.2	11358	17.2	11452	17.9	11879	17.2	19335	10.7
38	12094	12.8	12475	12.8	12514	13.1	13047	12.8	16068	10.6
39	12094	12.8	12475	12.8	12514	13.1	13047	12.8	16068	10.6
40	16899	17.0	17431	17.0	17487	17.3	18230	17.0	22667	13.9
41	16899	17.0	17431	17.0	17487	17.3	18230	17.0	22667	13.9
42	16899	17.0	17431	17.0	17487	17.3	18230	17.0	22667	13.9
43	16899	17.0	17431	17.0	17487	17.3	18230	17.0	22667	13.9
44	2970	17.5	3064	17.5	3065	17.5	3204	17.5	3247	17.6
45	2970	17.5	3064	17.5	3065	17.5	3204	17.5	3247	17.6
46	8726	2.6	9001	2.6	9013	2.8	9414	2.6	10374	2.4
47	8726	2.6	9001	2.6	9013	2.8	9414	2.6	10374	2.4
48	31100	15.0	32080	15.0	32123	15.1	33551	15.0	36985	13.8
49	31100	15.0	32080	15.0	32123	15.1	33551	15.0	36985	13.8
50	31100	15.0	32080	15.0	32123	15.1	33551	15.0	36985	13.8
51	6739	4.4	6951	4.4	6954	4.5	7270	4.4	7504	4.4
52	21399	12.2	22073	12.2	22096	12.3	23085	12.2	24979	11.4
53	21399	12.2	22073	12.2	22096	12.3	23085	12.2	24979	11.4
54	16559	17.4	17081	17.4	17097	17.4	17864	17.4	19170	16.4
55	16559	17.4	17081	17.4	17097	17.4	17864	17.4	19170	16.4
56	16559	17.4	17081	17.4	17097	17.4	17864	17.4	19170	16.4
57	18962	6.5	19559	6.5	19559	6.5	20456	6.5	21168	6.4
58	18962	6.5	19559	6.5	19559	6.5	20456	6.5	21168	6.4
59	1820	30.2	1877	30.2	1878	30.2	1963	30.2	2006	30.0
60	20211	8.4	20847	8.4	20855	8.5	21803	8.4	22423	8.3
61	20211	8.4	20847	8.4	20855	8.5	21803	8.4	22423	8.3
62	25927	5.5	26744	5.5	26867	5.9	27970	5.5	28687	5.4
63	25927	5.5	26744	5.5	26867	5.9	27970	5.5	28687	5.4
64	25927	5.5	26744	5.5	26867	5.9	27970	5.5	28687	5.4
65	18632	2.3	19218	2.3	19227	2.3	20100	2.3	20932	2.2
66	18632	2.3	19218	2.3	19227	2.3	20100	2.3	20932	2.2
67	18632	2.3	19218	2.3	19227	2.3	20100	2.3	20932	2.2
68	18632	2.3	19218	2.3	19227	2.3	20100	2.3	20932	2.2
69	18632	2.3	19218	2.3	19227	2.3	20100	2.3	20932	2.2
70	15392	8.5	15877	8.5	15903	8.7	16605	8.5	19251	7.5
71	15392	8.5	15877	8.5	15903	8.7	16605	8.5	19251	7.5

Road Link	2019		2024 (Without Scheme)		2024 (With Scheme)		2026 (Without Scheme)		2026 (With Scheme)	
	AADT	%HDV	AADT	%HDV	AADT	%HDV	AADT	%HDV	AADT	%HDV
72	15392	8.5	15877	8.5	15903	8.7	16605	8.5	19251	7.5
73	15392	8.5	15877	8.5	15903	8.7	16605	8.5	19251	7.5
74	15392	8.5	15877	8.5	15903	8.7	16605	8.5	19251	7.5
75	15392	8.5	15877	8.5	15903	8.7	16605	8.5	19251	7.5
76	15392	8.5	15877	8.5	15903	8.7	16605	8.5	19251	7.5
77	15392	8.5	15877	8.5	15903	8.7	16605	8.5	19251	7.5
78	30527	4.2	31489	4.2	31497	4.2	32933	4.2	33774	4.1
79	30527	4.2	31489	4.2	31497	4.2	32933	4.2	33774	4.1
80	4787	23.2	4938	23.2	4938	23.2	5165	23.2	5165	23.6
81	3315	1.9	3419	1.9	3421	1.9	3576	1.9	3715	1.8
82	3315	1.9	3419	1.9	3421	1.9	3576	1.9	3715	1.8
83	11017	10.1	11364	10.1	11511	10.8	11885	10.1	0	0.0
84	10503	9.7	10834	9.7	10971	10.3	11331	9.7	0	0.0
85	9883	9.4	10194	9.4	10307	10.1	10662	9.4	0	0.0
86	9349	10.8	9644	10.8	9725	11.3	10086	10.8	0	0.0
87	15933	13.9	16435	13.9	16473	14.0	17189	13.9	19359	12.5
88	12997	12.9	13407	12.9	13453	13.0	14022	12.9	16397	11.2
89	19327	13.1	19936	13.1	19977	13.2	20850	13.1	23151	12.0
90	17025	14.3	17561	14.3	17598	14.4	18366	14.3	20521	13.0
91	23377	4.8	24113	4.8	24194	5.0	25219	4.8	26453	4.6
92	22095	5.1	22791	5.1	22861	5.3	23836	5.1	25180	4.9
93	24127	4.7	24887	4.7	24935	4.8	26028	4.7	27279	4.5
94	23028	4.6	23754	4.6	23797	4.7	24843	4.6	26118	4.5
95	14127	6.0	14572	6.0	14653	6.3	15240	6.0	15629	5.9
96	14886	5.9	15355	5.9	15381	6.1	16059	5.9	16522	5.9
97	14219	5.4	14667	5.4	14685	5.5	15339	5.4	15785	5.4
98	15448	5.6	15935	5.6	16018	5.9	16665	5.6	17088	5.5
99	22099	13.1	22795	13.1	22833	13.2	23840	13.1	25870	12.2
100	20425	13.0	21069	13.0	21101	13.0	22035	13.0	23810	12.2
101	19503	12.1	20117	12.1	20146	12.2	21039	12.1	22600	11.5
102	18243	12.6	18817	12.6	18844	12.6	19680	12.6	21134	11.9
103	14560	11.6	15019	11.6	15031	11.7	15707	11.6	16434	11.3
104	14506	10.0	14963	10.0	14972	10.0	15649	10.0	16339	9.7
105	14943	8.3	15414	8.3	15421	8.3	16120	8.3	16717	8.1
106	-	-	-	-	-	-	-	-	21134	11.9
107	-	-	-	-	-	-	-	-	16434	11.3

A6.4 Figure A6.1 shows the road network included within the model in both the 'Without Scheme' scenarios and the 2024 'With Scheme' scenario (it is assumed the realignment of the road network will not be fully complete in 2024), along with the speed at which each link was modelled. Figure A5.2 shows the road network in the 2026 'With Scheme' scenario.

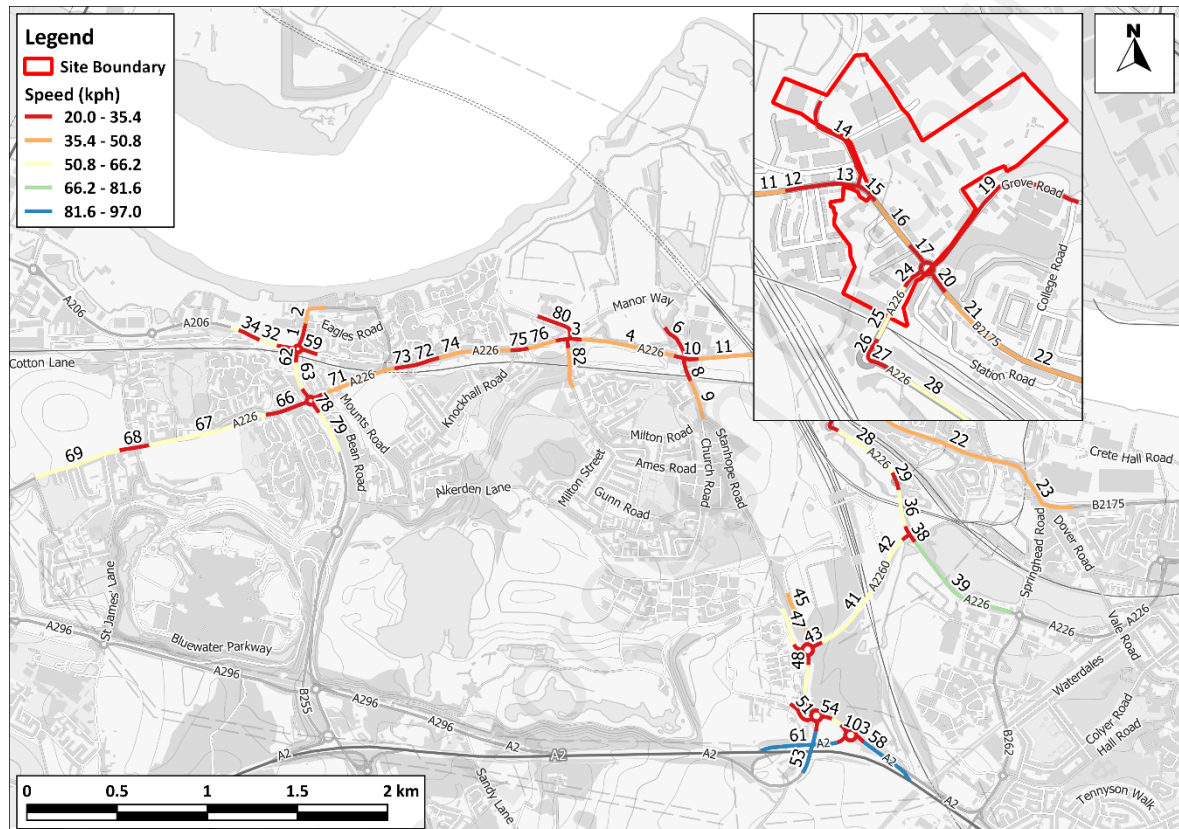


Figure A6.1: Without Scheme Modelled Road Network & Speed

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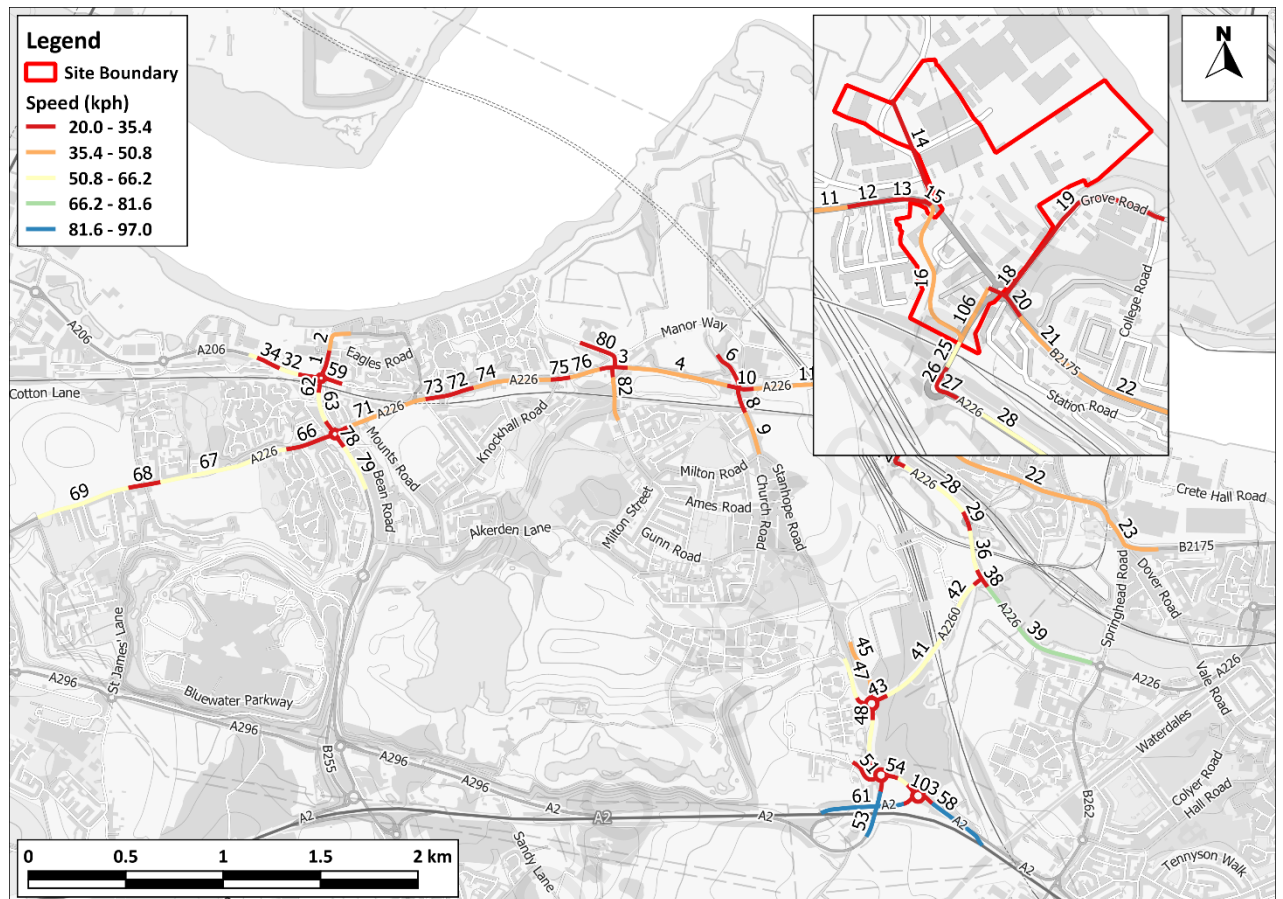


Figure A6.2: With Scheme Modelled Road Network & Speed

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- A6.5 For the purposes of modelling, it has been assumed that the proposed realignment of the A226 Stonebridge Road within the Site is within a tunnel, to be constructed as part of the Proposed Development. This road has, therefore, been modelled as a tunnel in the 2026 'With Scheme' scenario using ADMS-Roads' road tunnel module, with appropriate input parameters determined from plans, and professional judgement. The modelled tunnel is shown in Figure A6.1.
- A6.6 Hourly sequential meteorological data in sectors of 10 degrees from London City for 2019 have been used in the model. The meteorological monitoring station is located at London City Airport, approximately 20 km to the west of the proposed development. Both the application site and the meteorological monitoring station are located in the southeast of England where they will be influenced by the effects of inland meteorology over flat-lying topography. The topography of the model domain is similar to that around the meteorological monitoring station and measurements from this site are considered to provide the most robust basis to predict meteorology within the model

domain. A wind rose for the site for the year 2019 is provided in Figure A6.3. Raw data were provided by the Met Office and processed by AQC for use in ADMS.

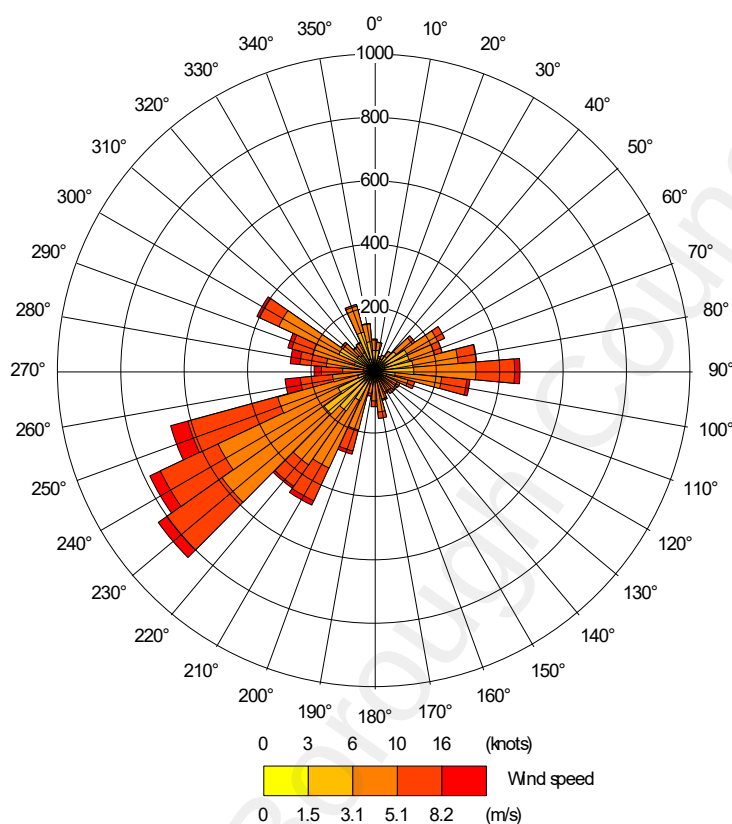


Figure A6.3: Wind Rose

Model Verification

- A6.7 Evidence collected over many years has shown that, in most urban areas, dispersion modelling relying upon Defra's EFT has tended to systematically under-predict roadside nitrogen dioxide concentrations. To account for this, it is necessary to adjust the model against local measurements. The model has been run to predict annual mean nitrogen dioxide concentrations during 2019 at the GR52, GR112 and GR124 diffusion tube monitoring sites operated by Gravesham Borough Council and the DA10, DA38, DA92 and DA93 diffusion tube sites operated by Dartford Borough Council.

Nitrogen Dioxide

- A6.8 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 of nitrogen oxides ($\text{NO}_x = \text{NO} + \text{NO}_2$).
- A6.9 The model output of road- NO_x (i.e. the component of total NO_x coming from road traffic) has been compared with the 'measured' road- NO_x . Measured road- NO_x has been calculated from the

measured NO₂ concentrations and the predicted background NO₂ concentration using the NO_x from NO₂ calculator (Version 8.1) available on the Defra LAQM Support website¹⁹.

- A6.10 The unadjusted model has under predicted the road-NO_x contribution; this is a common experience with this and most other road traffic emissions dispersion models. An adjustment factor has been determined as the slope of the best-fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (Figure A6.4). The calculated adjustment factor of 2.751 has been applied to the modelled road-NO_x concentration for each receptor to provide adjusted modelled road-NO_x concentrations.
- A6.11 The total nitrogen dioxide concentrations have then been determined by combining the adjusted modelled road-NO_x concentrations with the predicted background NO₂ concentration within the NO_x to NO₂ calculator. Figure A6.5 compares final adjusted modelled total NO₂ at each of the monitoring sites to measured total NO₂, and shows a close agreement.

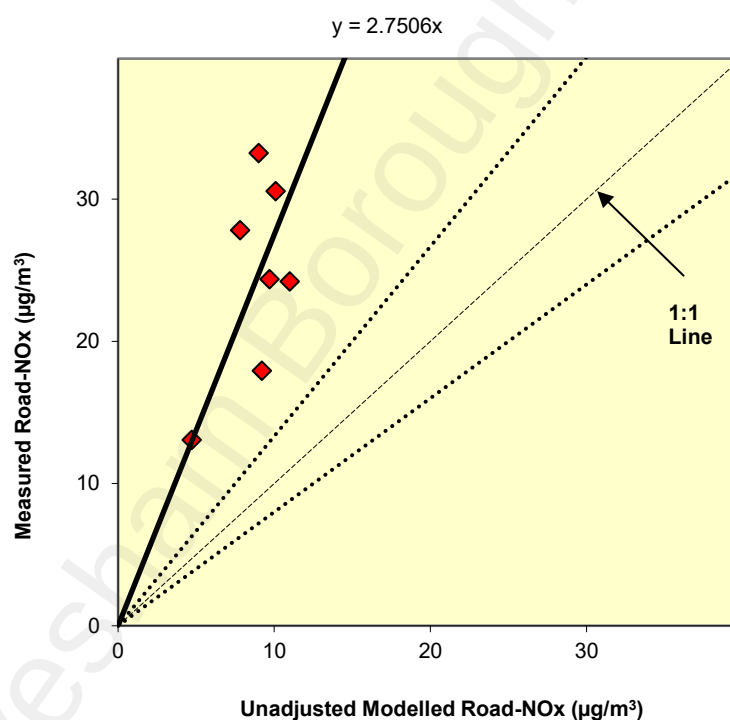


Figure A6.4: Comparison of Measured Road NO_x to Unadjusted Modelled Road NO_x Concentrations. The dashed lines show $\pm 25\%$.

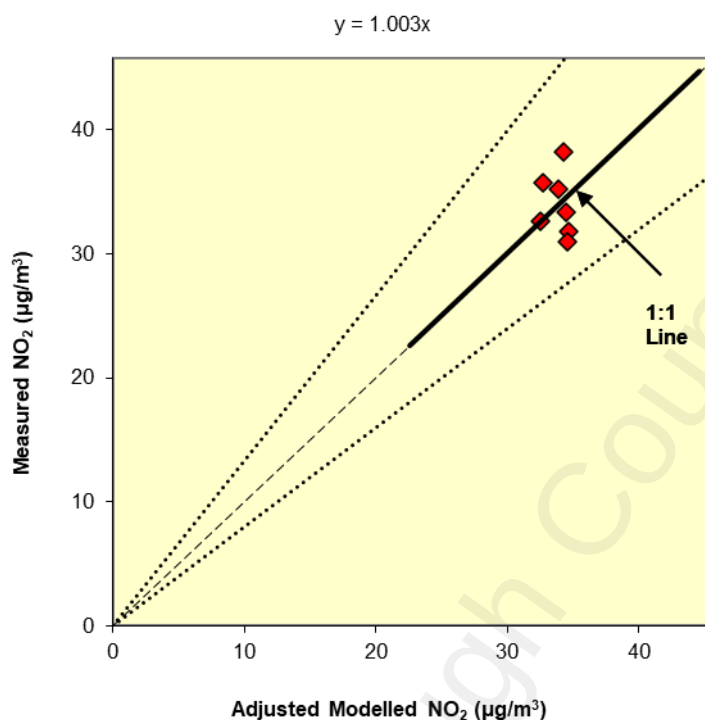


Figure A6.5: Comparison of Measured Total NO₂ to Final Adjusted Modelled Total NO₂ Concentrations. The dashed lines show $\pm 25\%$.

6.11.1 Table A6.3 shows the statistical parameters relating to the performance of the model, as well as the 'ideal' values²¹.

Table A6.3: Statistical Model Performance

Statistical Parameter	Model-Specific Value	'Ideal' Value
Correlation Coefficient ^a	-0.19	1
Root Mean Square Error (RMSE) ^b	2.62	0
Fractional Bias ^c	0.00	0

- ^a Used to measure the linear relationship between predicted and observed data. A value of zero means no relationship and a value of 1 means absolute relationship.
- ^b Used to define the average error or uncertainty of the model. The units of RMSE are the same as the quantities compared (i.e. $\mu\text{g}/\text{m}^3$). TG16²¹ outlines that, ideally, a RMSE value within 10% of the air quality objective ($4\mu\text{g}/\text{m}^3$) would be derived. If RMSE values are higher than 25% of the objective ($10\mu\text{g}/\text{m}^3$) it is recommended that the model is revisited.
- ^c Used to identify if the model shows a systematic tendency to over or under predict. Negative values suggest a model over-prediction and positive values suggest a model under-prediction.

²¹ Defra (2022) Review & Assessment: Technical Guidance LAQM.TG22 August 2022 Version

PM₁₀ and PM_{2.5}

- A6.12 The approach described above for NO_x and nitrogen dioxide determines the road increment of concentrations by subtracting the predicted local background from the roadside measurements. This works well for NO_x because the differences between roadside and background concentrations typically represent a large proportion of the total measured value. The same is not true for PM₁₀ and PM_{2.5} concentrations, which are dominated by non-road emissions, even at the roadside. In practice, the influence of a local road on concentrations can often be smaller than the uncertainty in the mapped background concentration. As an example of this, 31% of all roadside and kerbside sites in London which measured PM_{2.5} in 2019 with >75% data capture, recorded an annual mean concentration lower than the equivalent Defra mapped background value. Using measured background concentrations does not provide any significant benefit, owing largely to the spatial resolution of available measurements, but also because of measurement uncertainty. For example, hourly-mean PM_{2.5} concentrations measured at roadside sites are often lower than those measured at nearby urban background sites, while concentrations at urban background sites are often lower than those measured at rural sites.
- A6.13 For these reasons, it is not appropriate to calculate the annual mean road-increment to PM₁₀ and PM_{2.5} concentrations by subtracting either the mapped background or a local measured background concentration. This, in turn, means that the approach to model adjustment which is described for NO_x and NO₂ is not appropriate for PM₁₀ and PM_{2.5}. Historically, many studies have derived a model adjustment factor for NO_x and applied this to PM₁₀ and PM_{2.5}. This is also not appropriate, since there is no reason to expect the same bias in emissions of NO_x, PM₁₀ and PM_{2.5}.
- A6.14 While there is very strong evidence that EFT-based models have consistently under-predicted road-NO_x concentrations in urban areas, there is no equivalent evidence for PM₁₀ and PM_{2.5}. There is currently no strong basis for applying any adjustment to the model outputs. Predicted concentrations of PM₁₀ and PM_{2.5} have thus not been adjusted.

Post-processing

- A6.15 The model predicts road-NO_x concentrations at each receptor location. These concentrations have been adjusted using the adjustment factor set out above, which, along with the background NO₂, has been processed through the NO_x to NO₂ calculator available on the Defra LAQM Support website¹⁹. The traffic mix within the calculator has been set to “All other urban UK traffic”, which is considered suitable for the study area. The calculator predicts the component of NO₂ based on the adjusted road-NO_x and the background NO₂.

Appendix: Air Quality

Annex 1: Glossary

Annex 2: Legislative and Planning Policy Context

Annex 3: EPUK & IAQM Planning for Air Quality Guidance

Annex 4: Professional Experience

Annex 5: Construction Dust Assessment Procedure

Annex 6: Modelling Methodology

Annex 7: Construction Mitigation

A7 Construction Mitigation

A7.1 Table A7.1 sets out a list of best-practice measures from the IAQM guidance¹⁷ that should be incorporated into the specification for the works. These measures should ideally be written into a Dust Management Plan. Some of the measures may only be necessary during specific phases of work, or during activities with a high potential to produce dust, and the list should be refined and expanded upon in liaison with the construction contractor when producing the Dust Management Plan.

Table A7.1: Best-Practice Mitigation Measures Recommended for the Works

Measure	Desirable	Highly Recommended
Communications		
Develop and implement a stakeholder communications plan that includes community engagement before and during work 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 environmental manager/engineer or the site manager		✓
Display the head or regional office contact information		✓
Dust Management Plan		
Develop and implement a Dust Management Plan (DMP) approved by the Local Authority which documents the mitigation measures to be applied, and the procedures for their implementation and management		✓
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		✓
Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes		✓
Monitoring		
Undertake daily on-site and off-site inspections 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 the site boundary, with cleaning to be provided if necessary		✓

Carry out regular site inspections to monitor compliance with the DMP, 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 is a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction ¹⁷ .		✓
Preparing and Maintaining the Site		
Plan the 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 Vehicle/Machinery and Sustainable Travel		
Ensure all vehicles switch off their 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 15 mph on surfaced and 10 mph on un-surfaced 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)		✓
Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials		✓
Implement a Travel Plan that supports and encourages sustainable staff 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, 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 and burning of waste materials		✓
Measures Specific to Demolition		
Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust)		✓
Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground		✓
Avoid explosive blasting, using appropriate manual or mechanical alternatives		✓
Bag and remove any biological debris or damp down such material before demolition		✓
Measures Specific to Earthworks		
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 from small areas during work, not all at once		✓
Measures 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 smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust	✓	
Measures 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 dry sweeping of large areas		✓
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport		✓

Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;		✓
Record all inspections of haul routes and any subsequent action in a site log book;		✓
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems or mobile water bowzers, 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 should be located at least 10 m from receptors, where possible		✓