

Air Quality Assessment:
Former Police Station,
Windmill Street,
Gravesend

April 2022



Experts in air quality
management & assessment



Document Control

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Executive Summary

The air quality impacts associated with the proposed mixed-use development of the former police station on Windmill Street in Gravesend have been assessed. The proposals are for the construction of a five-storey building comprising 75 retirement living apartments.

The proposed development will generate additional traffic on the local road network, but the assessment has shown that there will be no significant effects at any existing, sensitive receptor.

The assessment has demonstrated that future residents will likely experience acceptable air quality.

During the construction works, a range of best practice mitigation measures will be implemented to reduce dust emissions and the overall effect will be 'not significant'; appropriate measures have been set out in this report, to be included in the Dust Management Plan for the works.

Overall, the construction and operational air quality effects are judged to be 'not significant'.

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1 Introduction

- 1.1 This report describes the potential air quality impacts associated with the proposed mixed-use development of the former police station on Windmill Street in Gravesend (the “application site”). The proposals are for the construction of a five-storey building comprising 75 retirement living apartments (the “proposed development”).
- 1.2 The application site lies close to an Air Quality Management Area (AQMA) declared by Gravesend Borough Council (GBC) for exceedances of the annual mean nitrogen dioxide (NO₂) objective. GBC also operates a number of monitoring sites within 250 m of the application site, three of which have measured high (>40 µg/m³) concentrations in recent years.
- 1.3 The location and setting of the proposed development are shown in Figure 1, along with the extent of the Gravesend A226 AQMA and nearby monitoring sites.

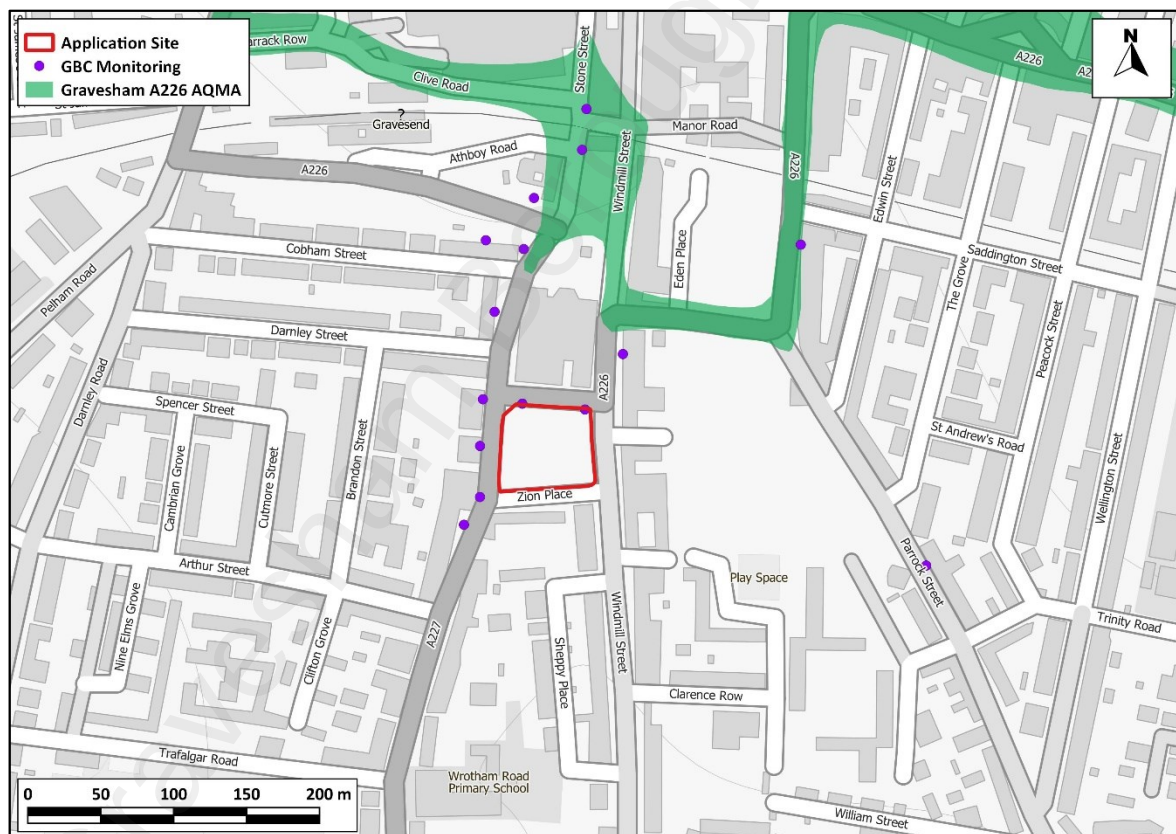


Figure 1: Proposed Development Setting in the Context of Air Quality

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- 1.4 The proposed development will generate additional traffic on the local road network, which may impact on air quality at existing residential properties. An assessment is also required to determine the air quality conditions that future residents will experience. The main air pollutants of concern related to road traffic emissions are NO₂ and fine particulate matter (PM₁₀ and PM_{2.5}).
- 1.5 The new homes within the proposed development will be provided with heat and hot water by roof mounted photovoltaic panels and immersion heaters to each apartment; there will be no centralised energy plant and thus no significant point sources of emissions within the proposed development.
- 1.6 There is also the potential for the construction activities to impact upon existing properties. The main pollutants of concern related to construction activities are dust and PM₁₀.
- 1.7 This report focuses on air quality conditions in 2018 and 2019, which are the latest years of available monitoring prior to the impact of the Covid-19 pandemic¹; the proposed development will not, however, be occupied until 2024. The assessment of construction dust impacts focuses on the anticipated duration of the works.
- 1.8 This report has been prepared taking into account all relevant local and national guidance and regulations.

¹ The influence of the pandemic has generally been to reduce concentrations of the pollutants considered in this assessment.

2 Policy Context

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

Air Quality Strategy

- 2.2 The Air Quality Strategy (Defra, 2007) 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 AQMA and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

Clean Air Strategy 2019

- 2.3 The Clean Air Strategy (Defra, 2019) 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

- 2.4 The Office for Low Emission Vehicles (OLEV) and Department for Transport (DfT) published a Policy Paper (DfT, 2018) 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, and 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 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.
- 2.5 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 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

- 2.6 The UK's new legal framework for protection of the natural environment, the Environment Act 2021 passed into UK law on 9th 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.
- 2.7 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 mean levels of PM_{2.5} is also required. These targets must be set before November 2022; an initial 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

- 2.8 The National Planning Policy Framework (NPPF) (2021) 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".

- 2.9 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 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".

- 2.10 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”.

- 2.11 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”.

- 2.12 The NPPF is supported by Planning Practice Guidance (PPG) (Ministry of Housing, Communities & Local Government, 2019), 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”.

- 2.13 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”.

- 2.14 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 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”*.

- 2.15 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”.

- 2.16 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”.

- 2.17 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

- 2.18 The Local Transport Plan for Kent (LTP4) identifies that there is “*significant out-commuting...causing congestion and poor air quality*” (Kent County Council, 2017). 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

- 2.19 The Gravesham Local Plan Core Strategy (Gravesham Borough Council, 2014) was adopted in 2014, and includes Policy CS19 on ‘Development and Design Principles’ which states:

“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; ...”*

- 2.20 GBC, in conjunction with the Kent and Medway Air Quality Partnership has produced an Air Quality Planning Guidance document (Kent and Medway Air Quality Partnership, 2015), 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. It also states that ‘major’ developments may require an emissions mitigation assessment, including a damage costs calculation, pending consultation with the Council. It has not been possible to agree with the Council whether a damage costs calculation is necessary for this development at this stage.

Building Standards

- 2.21 Part F(1) of the Building Regulations 2010 (Ministry of Housing, Communities & Local Government, 2021) places a duty on building owners, or those responsible for relevant building work², 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.
- 2.22 Approved Document F, which accompanies the Building Regulations, explains that care should be taken to minimise entry of external air pollutants. The versions of Approved Document F which apply from 15 June 2022 explain that 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 (see Paragraph 3.2, later). 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.

Air Quality Action Plans

National Air Quality Plan

- 2.23 Defra has produced an Air Quality Plan to tackle roadside nitrogen dioxide concentrations in the UK (Defra, 2017); a supplement to the 2017 Plan (Defra, 2018) 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 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 Clean Air Zone (CAZ). There is currently no straightforward way to take account of the effects of the 2017 Plan or 2018 Supplement in 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 proposed development. This assessment has principally been

² 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.

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

2.24 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).

2.25 The Urban Area AQMA Action Plan (Gravesham Borough Council, 2006) covers the A226 One-way system AQMA near to the application site and aims to identify how GBC will use its existing powers and work in conjunction with other organisations to achieve the air quality objective for nitrogen dioxide. The measures are targeted at both a local (i.e. specific to each AQMA) and strategic (i.e. across the borough as a whole) level, and of relevance to the A226 include:

- Traffic rerouting using variable message signage;
- Heavy Goods Vehicle rerouting;
- Setting emissions standards for Council fleet and public service vehicles; and
- Improvements to public transport and changes to road prioritisation.

3 Assessment Criteria

- 3.1 The Government has established a set of air quality standards and objectives to protect human health. The 'standards' are set as concentrations below which effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of an individual pollutant. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The objectives for use by local authorities are prescribed within the Air Quality (England) Regulations (2000) and the Air Quality (England) (Amendment) Regulations (2002).
- 3.2 The UK-wide objectives for nitrogen dioxide and PM₁₀ were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. The PM_{2.5} objective was to be achieved by 2020. Measurements across the UK have shown that the 1-hour nitrogen dioxide objective is unlikely to be exceeded at roadside locations where the annual mean concentration is below 60 µg/m³ (Defra, 2021). Measurements have also shown that the 24-hour mean PM₁₀ objective could be exceeded at roadside locations where the annual mean concentration is above 32 µg/m³ (Defra, 2021).
- 3.3 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. Defra explains where these objectives will apply in its Local Air Quality Management Technical Guidance (Defra, 2021). The annual mean objectives for nitrogen dioxide and PM₁₀ are considered to apply at the façades of residential properties, schools, hospitals etc.; they do not apply at hotels. The 24-hour mean objective for PM₁₀ is considered to apply at the same locations as the annual mean objective, as well as in gardens of residential properties and at hotels. The 1-hour mean objective for nitrogen dioxide applies wherever members of the public might regularly spend 1-hour or more, including outdoor eating locations and pavements of busy shopping streets.
- 3.4 European Union (EU) Directive 2008/50/EC (The European Parliament and the Council of the European Union, 2008) sets limit values for nitrogen dioxide, PM₁₀ and PM_{2.5}, and is implemented in UK law through the Air Quality Standards Regulations (2010)³. The limit values for NO₂ and PM₁₀ are the same numerical concentrations as the UK objectives, whilst the limit value for PM_{2.5} is 20 µg/m³. Achievement of the limit values is a national obligation rather than a local one. In the UK, only monitoring and modelling carried out by UK Central Government meets the specification required to assess compliance with the limit values. Central Government does not normally recognise local authority monitoring or local modelling studies when determining the likelihood of the

³ As amended through The Air Quality Standards (Amendment) Regulations 2016 and The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020.

limit values being exceeded, unless such studies have been audited and approved by Defra and DfT's Joint Air Quality Unit (JAQU).

3.5 The relevant air quality criteria for this assessment are provided in Table 1.

Table 1: Air Quality Criteria for Nitrogen Dioxide, PM₁₀ and PM_{2.5}

Pollutant	Time Period	Objective
Nitrogen Dioxide	1-hour Mean	200 µg/m ³ not to be exceeded more than 18 times a year
	Annual Mean	40 µg/m ³
PM ₁₀	24-hour Mean	50 µg/m ³ not to be exceeded more than 35 times a year
	Annual Mean	40 µg/m ³
PM _{2.5} ^a	Annual Mean	25 µg/m ³

^a The PM_{2.5} objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

3.6 In March 2022, Defra began consultation on new targets for PM_{2.5} concentrations in England. One proposed target is to achieve PM_{2.5} concentration of 10 µg/m³ at relevant national monitoring sites by 2040. This would be accompanied by a target to reduce overall population exposure to PM_{2.5}, which will be assessed by national government using its own measurements. If adopted, these targets will apply to national government; it is not yet clear how these will apply to local government and, as such, are not considered further in this assessment.

Construction Dust Criteria

3.7 There are no formal assessment criteria for dust. In the absence of formal criteria, the approach developed by the Institute of Air Quality Management (IAQM)⁴ (2016) has been used. Full details of this approach are provided in Appendix A1.

Screening Criteria

3.8 Environmental Protection UK (EPUK) and the IAQM recommend a two-stage screening approach (Moorcroft and Barrowcliffe et al, 2017) to determine whether emissions from road traffic generated by a development have the potential for significant air quality impacts. The approach, as described in Appendix A2, first considers the size and parking provision of a development; if the development is residential and is for fewer than ten homes or covers less than 0.5 ha, or is non-residential and will provide less than 1,000 m² of floor space or cover a site area of less than 1 ha, and will provide ten or fewer parking spaces, then there is no need to progress to a detailed assessment.

3.9 The second stage then compares the changes in vehicle flows on local roads that a development will lead to against specified screening criteria. The screening thresholds (described in full in

⁴ The IAQM is the professional body for air quality practitioners in the UK.

Appendix A2) inside an AQMA are a change in flows of more than 25 Heavy Duty Vehicles (HDVs) or 100 Light Duty Vehicles (LDVs) per day; outside of an AQMA the thresholds are 100 HDVs or 500 LDVs.

Gravesham Borough Council

4 Assessment Approach

Consultation

4.1 The assessment follows a methodology proposed to GBC in email correspondence from Frances Marshall (Air Quality Consultants Ltd) to Deborah Wilders (Environmental Protection Team Leader at GBC) on 21st March 2022. Specifically, the following key points were proposed:

- the air quality impacts of traffic generated by the proposed development will be assessed through comparison with the EPUK/IAQM screening thresholds;
- concentrations at the façade of the proposed development will be predicted using Defra's 'Fall-off with Distance' calculator;
- predicted concentrations will be compared to the objectives, taking into account any trends in monitoring data, to determine whether future residents will experience acceptable air quality conditions; and
- a construction dust risk assessment will be provided, following the IAQM's guidance.

4.2 The Environmental Protection Team Leader has since advised that a response will be provided upon receipt of this report.

Study Area

4.3 The study area focusses on the roads immediately adjacent to the proposed development. The study area also extends to nearby local monitoring sites to determine whether future occupants will experience acceptable air quality conditions.

Existing Conditions

4.4 Existing sources of emissions and baseline air quality conditions within the study area have been defined using a number of approaches:

- industrial and waste management sources that may affect the area have been identified using Defra's Pollutant Release and Transfer Register (Defra, 2022b);
- local sources have been identified through examination of GBC's latest Air Quality Review and Assessment report (Gravesham Borough Council, 2022);
- information on existing air quality has been obtained by collating the results of monitoring carried out by GBC (Gravesham Borough Council, 2022);
- background concentrations have been defined using Defra's 2018-based background maps (Defra, 2022e). These cover the whole of the UK on a 1x1 km grid. The background annual mean nitrogen dioxide maps for 2019 have been calibrated against concurrent measurements from national monitoring sites (AQC, 2020). The calibration factor

calculated has also been applied to future year backgrounds. Mapped background concentrations of PM₁₀ and PM_{2.5} have not been adjusted; and

- whether or not there are any exceedances of the annual mean limit value for nitrogen dioxide in the study area has been identified using the maps of roadside concentrations published by Defra (2020; 2022c). These are the maps used by the UK Government, together with the results from national Automatic Urban and Rural Network (AURN) monitoring sites that operate to the required data quality standards to identify and report exceedances of the limit value. The national maps of roadside PM₁₀ and PM_{2.5} concentrations (Defra, 2022c), which are available for the years 2009 to 2019, show no exceedances of the limit values anywhere in the UK in 2019.

Construction Impacts

4.5 The construction dust assessment considers the potential for impacts within 350 m of the site boundary, or within 50 m of roads used by construction vehicles. The assessment methodology is that provided by IAQM (2016). This follows a sequence of steps:

- Step 1 is a basic screening stage, to determine whether the more detailed assessment provided in Step 2 is required;
- Step 2a determines the potential for dust to be raised from on-site works and by vehicles leaving the site. Step 2b defines the sensitivity of the area to any dust that may be raised. Step 2c combines the information from Steps 2a and 2b to determine the risk of dust impacts without appropriate mitigation; and
- Step 3 uses this information to determine the appropriate level of mitigation required to ensure that there should be no significant impacts.

4.6 Appendix A1 explains the approach in more detail.

Road Traffic Impacts

Impacts of the Proposed Development on the Local Area

4.7 The first step in considering the road traffic impacts of the proposed development has been to screen the development and its traffic generation against the criteria set out in the EPUK/IAQM guidance (Moorcroft and Barrowcliffe et al, 2017), as described in Paragraph 3.8 and detailed further in Appendix A2.

4.8 Where impacts can be screened out there is no need to progress to a more detailed assessment, and a qualitative assessment will suffice, as presented in this report.

Impacts of Existing Sources on Future Residents of the Proposed Development

- 4.9 The suitability of the site for residential development has been assessed semi-quantitatively. The assessment considers air quality conditions within the site, taking account of local air quality monitoring data and proximity to the local road network.
- 4.10 The assessment examines air quality in 2019⁵, and assumes these conditions are representative of air quality conditions at the time the development is occupied in 2024. This assumption is considered to be worst-case, as it is generally expected that pollutant concentrations will decline in future years; this is discussed further in Section 5.

Assessment of Significance

Construction Dust Significance

- 4.11 Guidance from the IAQM (2016) is that, with appropriate mitigation in place, the effects of construction dust will be 'not significant'. The assessment thus focuses on determining the appropriate level of mitigation so as to ensure that effects will normally be 'not significant'.

Operational Significance

- 4.12 There is no official guidance in the UK in relation to development control on how to assess the significance of air quality impacts. The approach developed jointly by EPUK and the IAQM (Moorcroft and Barrowcliffe et al, 2017) has therefore been used. The overall significance of the air quality impacts is determined using professional judgement; the experience of the consultants preparing the report is set out in Appendix A3. Full details of the EPUK/IAQM approach are provided in Appendix A2.

⁵ In early 2020, activity in the UK was disrupted by the Covid-19 pandemic and concentrations of traffic-related air pollutants fell appreciably (Defra Air Quality Expert Group, 2020). While the pandemic may cause long-term changes to travel activity patterns, it is reasonable to expect a return to more typical activity levels in the future. As 2019 data were collected prior to the pandemic, it is judged appropriate to use these data to provide a worst-case assessment.

5 Baseline Conditions

Relevant Features

- 5.1 The proposed development is located on a vacant site to the south of Gravesend town centre, and is bounded by Woodville Place to the north, Windmill Street to the east, Zion Place to the south and Wrotham Road to the west. The area surrounding the application site is principally occupied by residential and commercial buildings.
- 5.2 The proposed development is located 50 m south of the A226 One-way system AQMA, as highlighted in Figure 1.

Industrial sources

- 5.3 No significant industrial sources have been identified that are likely to affect the proposed development, in terms of air quality.

Local Air Quality Monitoring

- 5.4 GBC operates two automatic monitoring stations within its area, both of which are located over 2.5 km from the application site. GBC also operates a number of nitrogen dioxide monitoring sites using diffusion tubes prepared and analysed by SOCOTEC Didcot (using the 50% TEA in acetone method). These include 15 deployed within 250 m of the application site, including three that are located within the AQMA.
- 5.5 Annual mean results for the years 2015 to 2020 are summarised in Table 2, and the monitoring locations are shown in Figure 2. Exceedances of the objectives are shown in bold. The monitoring data have been taken from GBC's 2021 Annual Status Report (Gravesham Borough Council, 2022).

Table 2: Summary of Annual Mean NO₂ Monitoring (µg/m³)^a

Site ID	Site Type	Location	2015	2016	2017	2018	2019	2020 ^b
GR39	Roadside	19 Stone Street	34.0	36.7	34.1	35.8	35.0	28.3
GR96	Roadside	Parrock Street	26.0	30.1	30.8	32.4	31.4	27.3
GR118	Roadside	40 Windmill Street	29.7	31.4	32.5	34.8	34.9	29.0
GR119	Roadside	Woodville Place	42.4	39.5	49.2	53.4	49.5	37.6
GR122	Roadside	King & Taylor 10-12 Wrotham Road	31.5	31.1	35.9	36.1	37.0	30.7
GR125	Roadside	Café Taj, 170 Parrack Street	30.4	32.7	32.7	32.1	33.2	27.5
GR128	Roadside	1a Railway Place	30.3	34.5	29.6	30.9	31.8	26.0
GR129	Roadside	20 Stone Street	21.4	27.9	29.0	27.8	28.4	24.7

Site ID	Site Type	Location	2015	2016	2017	2018	2019	2020 ^b
GR130	Roadside	6 Wrotham Road	25.9	28.8	29.1	30.6	31.3	26.0
GR131	Roadside	7 Wrotham Road	21.3	25.9	25.6	24.9	26.4	22.5
GR133	Roadside	23 Wrotham Road	32.6	32.8	36.9	36.3	36.2	28.7
GR134	Roadside	17 Wrotham Road	31.5	33.1	31.4	32.8	33.7	24.9
GR135	Roadside	25 Wrotham Road	41.5	41.1	46.8	44.8	43.9	36.8
GR136	Roadside	Woodville Place	36.4	34.3	35.8	39.3	37.4	32.3
GR143	Roadside	29 Wrotham Road	-	-	47.5	36.6	37.0	29.5
Objective			40					

^a Exceedances of the objectives are shown in bold.

^b While 2020 results have been presented, they are not relied upon in any way as they will not be representative of 'typical' air quality conditions due to the considerable impact of the Covid-19 pandemic on traffic volumes and thus pollutant concentrations.

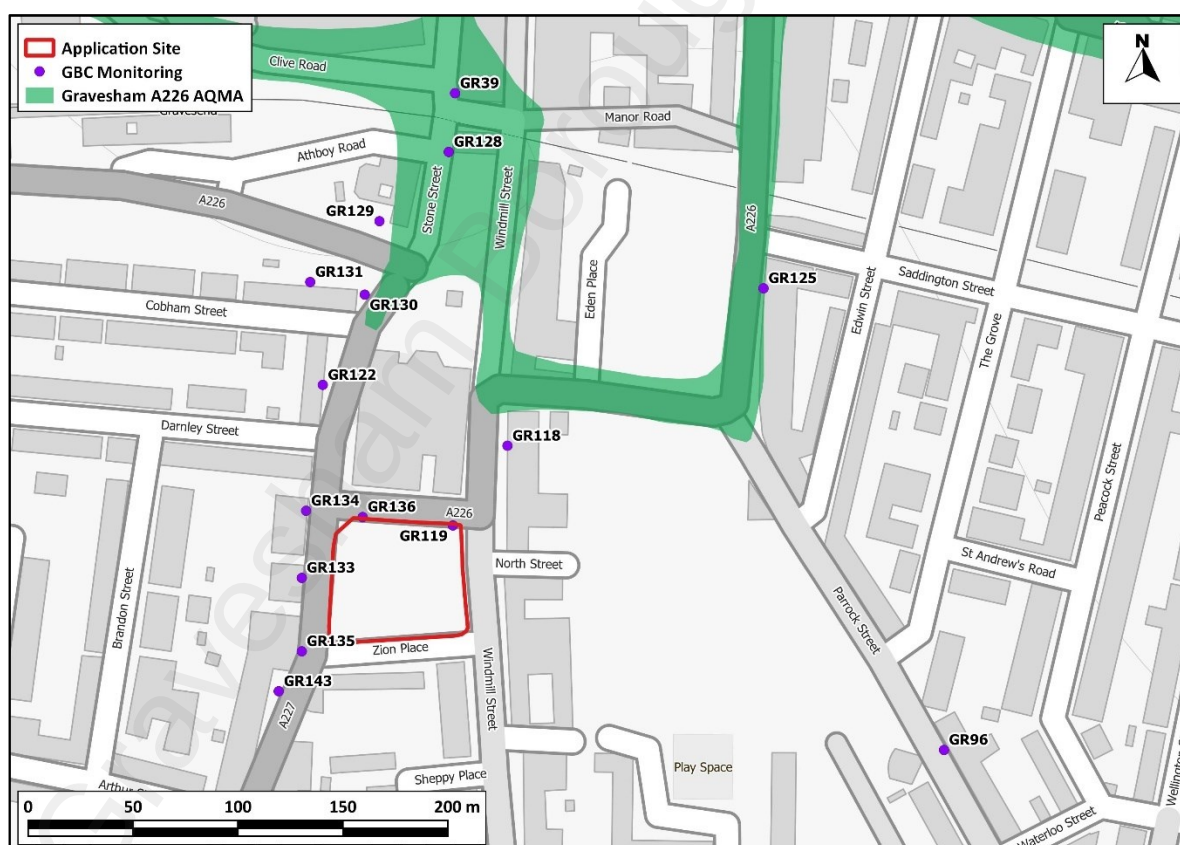


Figure 2: Monitoring Locations

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- 5.6 Measured concentrations have consistently exceeded the annual mean objective at two monitoring sites (GR119 and GR135), neither of which are in the AQMA⁶; concentrations at all other sites have been below the annual mean objective in all years. There is no clear pattern of reducing concentrations over time.
- 5.7 Sites GR119 and GR136 are located adjacent to the northern boundary of the application site, however, both are within 2 m of the road. The façade of the development buildings will be set back by over 5 m, thus concentrations throughout the development will be lower than those measured at the monitoring sites.
- 5.8 No monitoring of PM₁₀ concentrations is undertaken in the study area, however, measured concentrations at both automatic monitoring sites have been consistently well below the annual mean objective. It is, therefore, reasonable to conclude that measured concentrations in the study area are also below the objective. No monitoring of PM_{2.5} is undertaken by GBC.

Exceedances of Limit Value

- 5.9 There are no AURN (Defra, 2022d) monitoring sites within the study area with which to identify exceedances of the annual mean nitrogen dioxide limit value. Defra's roadside annual mean nitrogen dioxide concentrations (Defra, 2022c), which are used to identify and report exceedances of the limit value, do not identify any exceedances within the study area in 2019. As such, there is considered to be no risk of a limit value exceedance in the vicinity of the proposed development by the time that it is operational.

Background Concentrations

- 5.10 Estimated background concentrations at the proposed development in 2019 are set out in Table 3 and are all well below the objectives.

Table 3: Estimated Annual Mean Background Pollutant Concentrations in 2019 (µg/m³)

Year	NO ₂	PM ₁₀	PM _{2.5}
2019	20.4	17.4	12.1
Objective	40	40	25 ^a

^a The 25 µg/m³ PM_{2.5} objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

⁶ An AQMA is only required if concentrations exceed the level of the objective in locations with relevant exposure (see Paragraph 3.3).

6 Construction Phase Impact Assessment

Construction Traffic

- 6.1 The applicant has advised that a maximum of six heavy duty vehicles per day will leave the site during the construction works. Typical traffic volumes generated by the site will be much lower than the relevant screening criteria recommended by EPUK/IAQM guidance (Moorcroft and Barrowcliffe et al, 2017). It is, therefore, not considered necessary to assess the impacts of traffic emissions during the construction phase, and it can be concluded that the effect of construction traffic will be 'not significant'.

On-Site Exhaust Emissions

- 6.2 The IAQM guidance (IAQM, 2016) states:

"Experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. For site plant and on-site traffic, consideration should be given to the number of plant/vehicles and their operating hours and locations to assess whether a significant effect is likely to occur".

The proposed development is relatively small, thus the number of NRMM able to operate at any one time will be limited. The contractors will ensure that there will be no idling when vehicles are not in use, and machinery will be located away from sensitive receptors as far as possible. It is, therefore, judged that there will be no risk of significant effects at existing receptors as a result of on-site machinery emissions.

Construction Dust and Particulate Matter Emissions

- 6.3 The construction works will give rise to a risk of dust impacts during demolition, earthworks and construction, as well as from trackout of dust and dirt by vehicles onto the public highway. Step 1 of the assessment procedure is to screen the need for a detailed assessment.
- 6.4 There are receptors within the distances set out in the guidance (see Appendix A1), thus a detailed assessment is required. The following section sets out Step 2 of the assessment procedure.

Potential Dust Emission Magnitude

Demolition

- 6.5 The site is mostly vacant; however, a small amount of demolition will be required to remove the remaining reinforced concrete walls and floor slabs, totalling approximately 900 m³. Demolition will take approximately four weeks during the summer of 2023 and will involve crushing and screening

equipment. Based on the example definitions set out in Table A1.1 in Appendix A1, the dust emission class for earthworks is considered to be *small*.

Earthworks

- 6.6 The characteristics of the soil at the site have been defined using the British Geological Survey's UK Soil Observatory website (British Geological Survey, 2022), as set out in Table 4. Overall, it is considered that, when dry, this soil has the potential to be slightly dusty.

Table 4: Summary of Soil Characteristics

Category	Record
Soil Layer Thickness	Deep - Intermediate
Soil Parent Material Grain Size	Arenaceous ^a
European Soil Bureau Description	Prequaternary Marine / Estuarine Sand
Soil Group	Light to Medium
Soil Texture	Sand to Sandy Loam ^b

^a grain size 0.06 – 2.0 mm.

^b a loam is composed mostly of sand and silt.

- 6.7 The site covers 3,616 m² and most of this will be subject to earthworks. Dust will arise mainly from vehicles travelling over unpaved ground, of which there are expected to be four active at any one time, and from the handling of dusty materials (such as dry soil). Approximately 4,000 tonnes of material will be removed. Based on the example definitions set out in Table A1.1 in Appendix A1, the dust emission class for earthworks is considered to be *medium*.

Construction

- 6.8 The construction phase will involve the erection of a five-storey building, with a building volume of 18,933 m³. Dust will arise from vehicles travelling over unpaved ground, the handling and storage of dusty materials, the cutting of concrete and from piling; there will, however, be no onsite concrete batching or sand blasting. Construction will take approximately two years to complete. Adopting a conservative approach based on the example definitions set out in Table A1.1 in Appendix A1, the dust emission class for construction is considered to be *medium*.

Trackout

- 6.9 A maximum of six heavy vehicles will exit the site, which may track out dust and dirt. Based on the example definitions set out in Table A1.1 in Appendix A1, the dust emission class for trackout is considered to be *small*.
- 6.10 Table 5 summarises the dust emission magnitude for the proposed development.

Table 5: Summary of Dust Emission Magnitude

Source	Dust Emission Magnitude
Demolition	Small
Earthworks	Medium
Construction	Medium
Trackout	Small

Sensitivity of the Area

- 6.11 This assessment step combines the sensitivity of individual receptors to dust effects with the number of receptors in the area and their proximity to the site. It also considers additional site-specific factors such as topography and screening, and in the case of sensitivity to human health effects, baseline PM₁₀ concentrations.
- 6.12 The IAQM guidance explains that residential properties are 'high' sensitivity receptors to dust soiling. The nearby function rooms and theatres are judged to be a 'medium' sensitivity receptor (Table A1.2 in Appendix A1). Residential properties are also classified as being of 'high' sensitivity to human health effects, while places of work are classified as being of 'medium' sensitivity. There are approximately 17 residential properties within 20 m of the site, most of which are on Wrotham Road and Zion Place, as well as the Ruckland House Function Rooms and The Woodville theatre (see Figure 3).

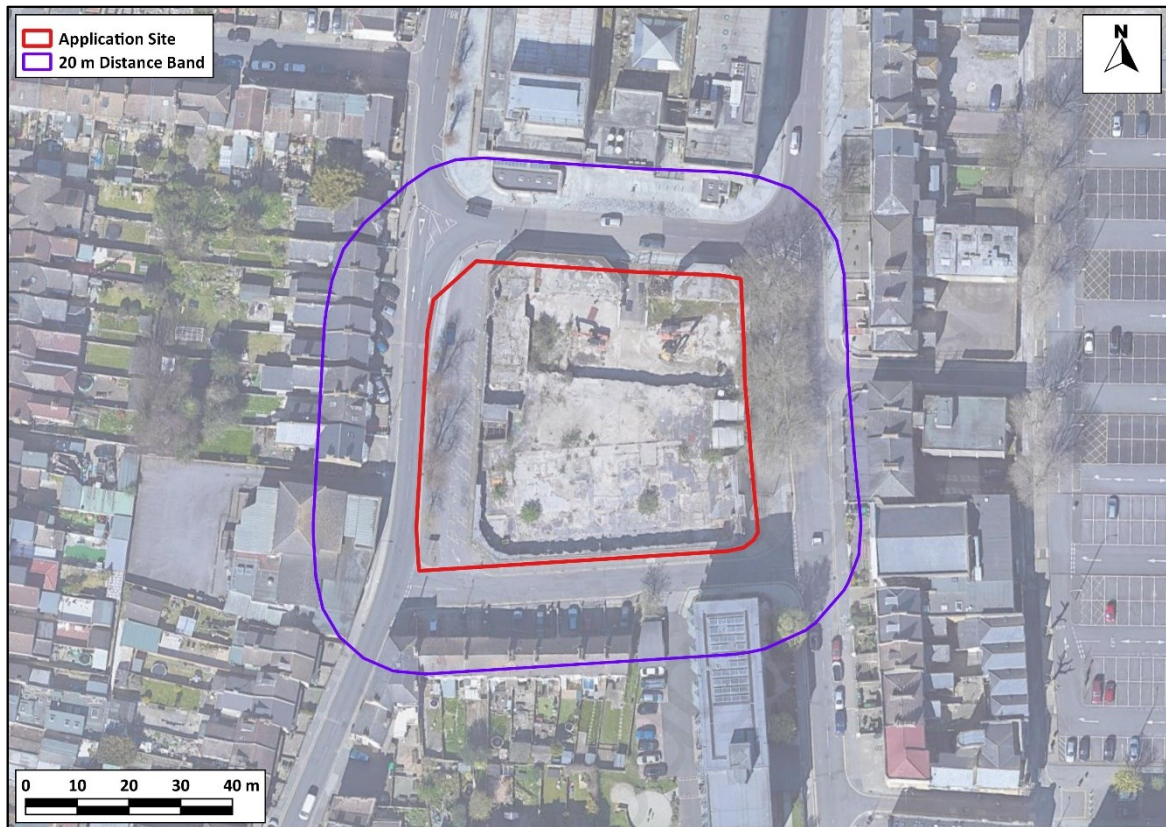


Figure 3: 20 m Distance Band around Application Site Boundary

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- 6.13 Table 5 shows that the dust emission magnitude for trackout is *small* and Table A1.3 in Appendix A1 thus explains that there is a risk of material being tracked 50 m from the site exit. It has been assumed that vehicles will exit the site on Woodville Place and follow the one-way system. Construction vehicles may then travel southbound on Wrotham Road or northbound on the A227. There are approximately 11 residential properties on Wrotham Road within 20 m of the roads along which material could be tracked (see Figure 4).

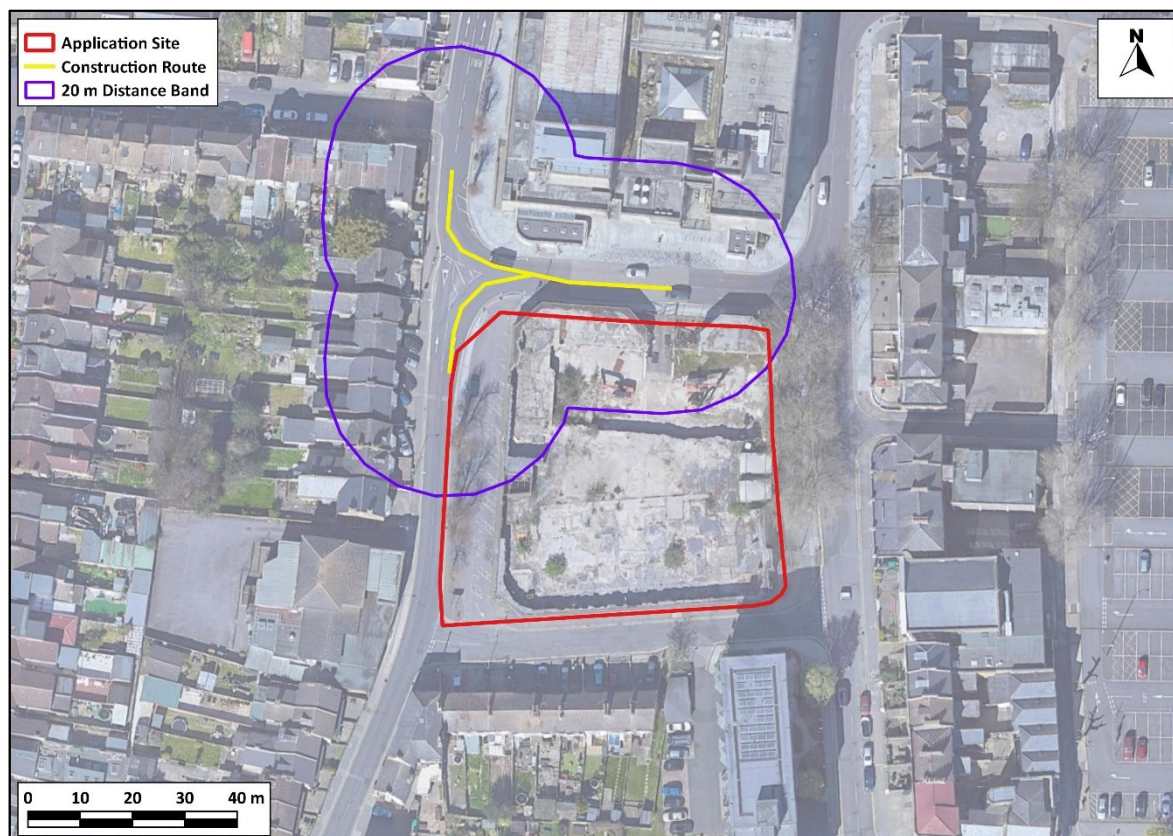


Figure 4: 20 m Distance Bands around Roads Used by Construction Traffic Within 50 m of the Main Site Exit

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Sensitivity of the Area to Effects from Dust Soiling

- 6.14 Using the information set out in Paragraph 6.12 and Figure 3 alongside the matrix set out in Table A1.3 in Appendix A1, the area surrounding the onsite works is of 'high' sensitivity to dust soiling. Using the information set out in Paragraph 6.13 and Figure 4 alongside the same matrix, the area is also of 'high' sensitivity to dust soiling due to trackout.

Sensitivity of the Area to any Human Health Effects

- 6.15 The matrix in Table A1.4 in Appendix A1 requires information on the baseline annual mean PM₁₀ concentration in the area. There are no roadside PM₁₀ monitors in the study area, however, measured concentrations at the GBC automatic monitors have consistently been below the threshold concentration (24 µg/m³) for 'low' area sensitivity in Table A1.4 in Appendix A1. As such, using the information set out in Paragraphs 6.12 and Figure 3 alongside the matrix, the area surrounding the onsite works is of 'low' sensitivity to human health effects. Using the information set out in Paragraph 6.13 and Figure 4 alongside the same matrix, the area surrounding roads along which material may be tracked from the site is also of 'low' sensitivity.

Sensitivity of the Area to any Ecological Effects

- 6.16 The guidance only considers designated ecological sites within 50 m to have the potential to be impacted by the construction works. There are no designated ecological sites within 50 m of the site boundary or those roads along which material may be tracked, thus ecological impacts are not considered further.

Summary of the Area Sensitivity

- 6.17 Table 6 summarises the sensitivity of the area around the proposed construction works.

Table 6: Summary of the Area Sensitivity

Effects Associated With:	Sensitivity of the Surrounding Area	
	On-site Works	Trackout
Dust Soiling	High Sensitivity	High Sensitivity
Human Health	Low Sensitivity	Low Sensitivity

Risk and Significance

- 6.18 The dust emission magnitudes in Table 5 have been combined with the sensitivities of the area in Table 6 using the matrix in Table A1.6 in Appendix A1, in order to assign a risk category to each activity. The resulting risk categories for the four construction activities, without mitigation, are set out in Table 7. These risk categories have been used to determine the appropriate level of mitigation as set out in Section 8 (Step 3 of the assessment procedure).

Table 7: Summary of Risk of Impacts Without Mitigation

Source	Dust Soiling	Human Health
Demolition	Medium Risk	Negligible
Earthworks	Medium Risk	Low Risk
Construction	Medium Risk	Low Risk
Trackout	Low Risk	Negligible

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' (IAQM, 2016).

7 Operational Phase Impact Assessment

Impacts at Existing Receptors

- 7.1 The proposed development is expected to generate a total of 133 vehicle trips during the 12-hour period 07:00 to 19:00; the transport consultants have advised that there will then be a small number of additional trips outside of this window.
- 7.2 The site access is located on Woodville Place which is a one-way road. As such there will be approximately half the number of vehicles on Woodville Place (50% accessing from the east, 50% departing to the west), which will then distribute further at the junction with the A227 Wrotham Road. Given that monitoring on Woodville Place is above the air quality objective, it is judged that the more stringent screening criteria of 100 LDVs recommended for use inside an AQMA in the EPUK/IAQM guidance (Moorcroft and Barrowcliffe et al, 2017) (see Paragraph 3.9) is applicable. Taking into account the one-way system, it is unlikely that traffic flows will exceed the screening threshold of 100 LDVs on any link. The proposed development will also generate very few operational heavy vehicle trips. Further, on Woodville Place, where the development traffic flows are expected to be greatest, there are no existing receptors relevant to the annual mean objectives (theatres are not relevant exposure with respect to annual mean concentrations).
- 7.3 As such, it is judged that the relevant screening thresholds will not be exceeded and there is no requirement for a detailed assessment of road traffic impacts at existing receptors; it can be concluded that the proposed development will not have a significant effect on local roadside air quality.

Impacts of Road Traffic Emissions on Future Occupants of the Development

Fall-off With Distance Calculations

- 7.4 Two monitoring sites are located adjacent to the application site; GR119 and GR136. Four monitoring sites (including GR135) are also located close to the application site, but on opposite sides of the road (see Figure 2).
- 7.5 Monitoring site GR119 is located within 2 m of Woodville Place, whilst monitoring site GR135 is located 1.6 m from the junction between Wrotham Road (A227) and Zion Road (Gravesham Borough Council, 2022). Measured concentrations at both monitoring sites have exceeded the annual mean nitrogen dioxide objective in most years between 2015 and 2019 (see Table 2). Monitoring site GR136, which is 1.8 m from Woodville Place, has consistently measured concentrations below the objective.
- 7.6 The building façades within the proposed development will be located at least 5 m from Woodville Place, and at least 6 m from Wrotham Road (A227), as shown in Figure 5. Concentrations reduce

with distance from the emission source (such as the edge of a road), such that concentrations throughout the site will be lower than those measured at the monitoring sites.

- 7.7 Defra has issued a fall-off with distance calculator to estimate concentrations at user-defined distances from the roadside, based on local monitoring and background concentrations. Since measured concentrations at the monitoring sites have varied between 2018 and 2019, the calculation has been completed for both years, to account for meteorological variations in the measurements, and for the three sites identified in Figure 5. These three sites have been considered as they have measured the highest concentrations in proximity to the site. The inputs for the fall-off calculation are presented in Table 8, along with the predicted concentrations. The predicted concentrations correspond to the development building's façade, at a height of the monitors, which is specified in GBC's ASR as 2.5 m (Gravesham Borough Council, 2022).

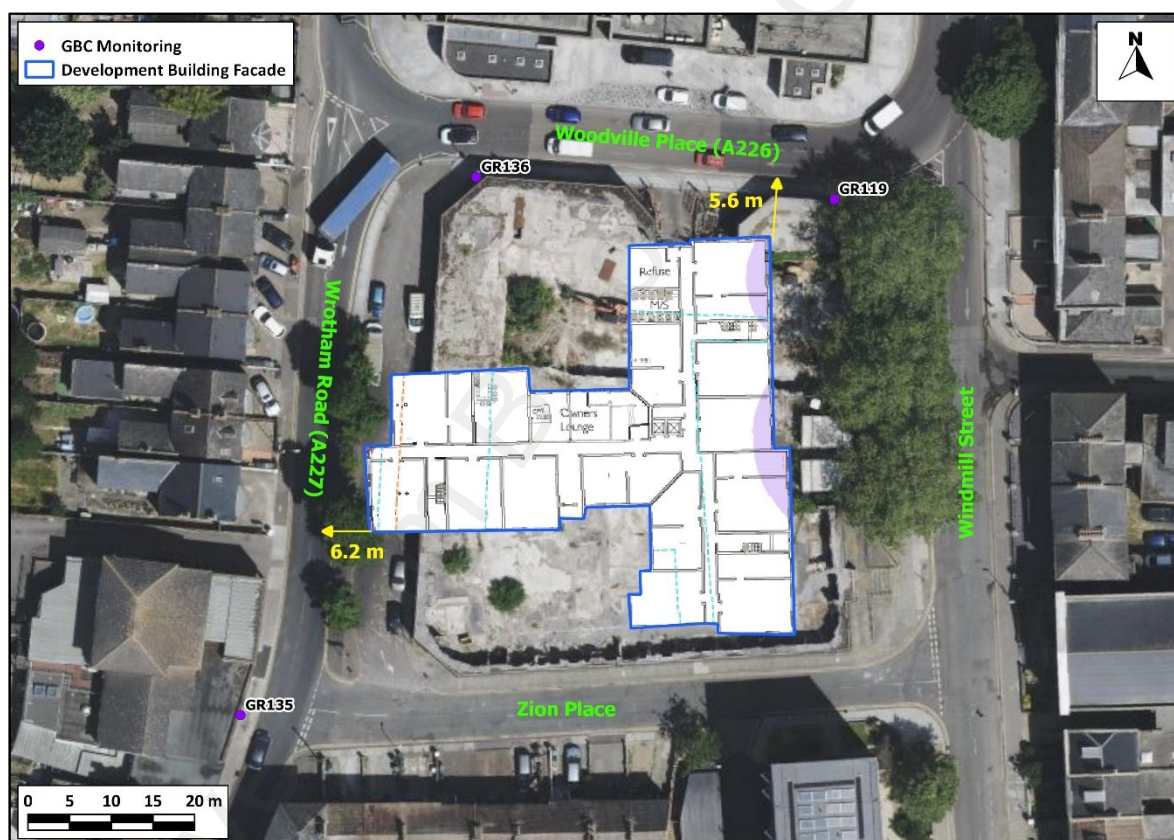


Figure 5: Site Context for Fall-off With Distance Calculations

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Table 8: Defra's Fall-off with Distance Calculations ($\mu\text{g}/\text{m}^3$)^a

Monitoring Site	Year	Distance (m)		NO ₂ Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)		
		Monitoring Site to Kerb ^b	Receptor to Kerb ^c	Background ^d	Measured ^b	Predicted at Facade
GR119	2018	2.0	5.6	21.1	53.4	45.6
	2019	2.0	5.6	20.4	49.5	42.5
GR135	2018	1.6	6.2	21.1	44.8	38.2
	2019	1.6	6.2	20.4	43.9	37.3
GR136	2018	1.8	5.6	21.1	39.3	34.6
	2019	1.8	5.6	20.4	37.4	33.0
Objective	-	-	-	40		

^a Exceedances of the annual mean objective shown in bold.

^b Data taken from GBC's 2021 ASR (Gravesham Borough Council, 2022) and verified using Google Streetview imagery.

^c Measured, based on site plans.

^d Background concentrations have been defined using Defra's 2018-based background maps (Defra, 2022e).

Analysis

- 7.8 Based on the most recent monitoring data, as shown in Table 8, the predicted annual mean concentrations, corresponding to a height of 2.5 m above ground level, at the building façades could range between 33.0 $\mu\text{g}/\text{m}^3$ (below the objective) and 45.6 $\mu\text{g}/\text{m}^3$ (above the objective).
- 7.9 It is important to note that monitoring site GR119, from which the only predicted façade concentrations greater than 40 $\mu\text{g}/\text{m}^3$ have been derived, is on the junction with Windmill Street, and very close to a high wall, which will limit dispersion and allow emissions from road vehicles to build up. The façade of the building is further from the junction and, importantly, will not be within the same canyon-like environment as the diffusion tube. The project team for the current assessment includes the lead author of Defra's fall off with distance calculator and it is their view that using measurements from site GR119 in this way will cause concentrations at the façade of the development to have been over-predicted.
- 7.10 Based on the calculation in Table 8, concentrations at the façade of the development fronting Wrotham Road will likely experience acceptable air quality, since the predicted concentrations are below the annual mean objective. In addition, façades fronting Windmill Street and Zion Place will also likely experience acceptable air quality, by virtue of these being more minor roads. Concentrations will continue to reduce with distance from the roadside, such that air quality at the rear of the development blocks will be acceptable.

- 7.11 Whilst the maximum predicted concentrations at the Woodville Place façade exceed the objective, the calculation has been based upon recent (2018 / 2019) concentrations. Measured concentrations at nearby monitoring sites have historically not shown a downward trend in concentrations as is the case nationally, however improvements in air quality, delivered through policy and legislation (such as the Council's Action Plan, and the Government's Road to Zero Strategy) can reasonably be expected to occur between now and the earliest year of occupation (2024), and to continue going forward as the UK vehicle fleet moves toward lower-emission, and ultimately zero-exhaust emission, vehicles.
- 7.12 Defra has published a series of projection factors based on changes in traffic activity, NO_x emission factors and primary NO₂ fractions (Defra, 2022a). Applying these projection factors to the predicted concentrations at GR119, the concentrations at the Woodville Place façade are projected to range between 32.3 µg/m³ and 33.0 µg/m³, which are below the objective. Even if concentrations in Gravesend do not decrease as quickly as predicted by Defra, there can still be confidence that nitrogen dioxide concentrations will, ultimately, fall and thus any exceedances of the objective at the Woodville Place façade will be both marginal and transient.
- 7.13 Since the predicted concentrations throughout the proposed development are well below 60 µg/m³, an exceedance of the 1-hour mean objective is considered highly unlikely at any location.
- 7.14 With regard to concentrations of particulate matter, GBC has not recorded an exceedance of the PM₁₀ objectives at any location within the borough; it is, therefore, reasonable to assume that future particulate matter concentrations will also be acceptable at the site.

Significance of Operational Air Quality Effects

- 7.15 The operational air quality effects without mitigation are judged to be 'not significant'. This professional judgement is made in accordance with the methodology set out in Appendix A2, and takes account of the assessment that:
- the proposals will not generate sufficient volumes of additional traffic to lead to significant effects on local roadside air quality; and
 - the likelihood of any air quality objectives being exceeded within the site itself, once the proposed development is occupied, is considered to be low. Furthermore, in the event that the annual mean nitrogen dioxide objective is exceeded in part of the site, the scale of exceedance will be small and the duration of exceedance will be transient.

8 Mitigation

Good Design and Best Practice

8.1 The EPUK/IAQM guidance advises that good design and best practice measures should be considered, whether or not more specific mitigation is required. The proposed development incorporates the following good design and best practice measures:

- adoption of a Dust Management Plan (DMP) to minimise the environmental impacts of the construction works;
- setting back of the development buildings from roads by at least 5 m;
- provision of passive electric vehicle charging technology on all parking spaces that can be converted in the future;
- provision of a detailed travel plan setting out measures to encourage sustainable means of transport (public, cycling and walking);
- provision of pedestrian and cycle access to the new development, including cycle parking; and
- use of photovoltaic panels and immersion heaters to avoid the need for on-site combustion.

Recommended Mitigation

Construction Impacts

8.2 Measures to mitigate dust emissions will be required during the construction phase of the development in order to minimise effects upon nearby sensitive receptors. The IAQM guidance is clear that, with appropriate mitigation in place, the residual effects will normally be 'not significant'.

8.3 The site has been identified as a *Medium Risk* site during demolition, earthworks and construction, and *Low Risk* for trackout, as set out in Table 7. Comprehensive guidance has been published by IAQM (2016) that describes measures that should be employed, as appropriate, to reduce the impacts, along with guidance on monitoring during demolition and construction (IAQM, 2018). This reflects best practice experience and has been used, together with the professional experience of the consultant who has undertaken the dust impact assessment and the findings of the assessment, to draw up a set of measures that should be incorporated into the specification for the works. These measures are described in Appendix A4. With these measures in place and effectively implemented the residual effects are judged to be 'not significant'.

8.4 The mitigation measures will be written into a DMP. The DMP may be integrated into a Code of Construction Practice or the Construction Environmental Management Plan and may require monitoring. The IAQM guidance does, however, recognise that, even with a rigorous DMP 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. During these events, short-term dust annoyance may occur, however, the scale of this would not normally be considered sufficient to change the conclusion that overall the effects will be 'not significant'.

- 8.5 Where mitigation measures rely on water, it is expected that only sufficient water will be applied to damp down the material. There should not be any excess to potentially contaminate local watercourses.

Road Traffic Impacts

- 8.6 Measures to reduce pollutant emissions from road traffic are principally being delivered in the longer term by the introduction of more stringent emissions standards, largely via European legislation (which is written into UK law) and through the increased use of electric vehicles.
- 8.7 While it has not been possible to definitively discount the potential for exceedances of the annual mean nitrogen dioxide objective at the façade with Woodville Place, any exceedance, even in the year of opening, is unlikely. Nonetheless, if the objective is exceeded, this will be both marginal and transient. Taking account of sustainability concerns, it is not considered appropriate to implement a mechanical ventilation system solely for the purpose of addressing a marginal and temporary effect. Ventilation will be required to meet the requirements of Part F of the Building Regulations (Ministry of Housing, Communities & Local Government, 2021).

9 Conclusions

- 9.1 The assessment has considered the impacts of the proposed development on local air quality in terms of dust and particulate matter emissions during construction and emissions from road traffic generated by the completed and occupied development. It has also identified the air quality conditions that future occupants will experience. The assessment has principally been based on measurements made during 2018 and 2019, and pre-pandemic activity, to ensure a worst-case assessment that does not take into account temporary reductions in pollutant concentrations as a result of reduced activity levels during the Covid-19 pandemic.

Construction Impacts

- 9.2 The construction works have the potential to create dust. During construction it will therefore be necessary to apply a package of mitigation measures to minimise dust emissions. Appropriate measures have been recommended and, with these measures in place, it is expected that any residual effects will be 'not significant'.

Operational Impacts

Impacts

- 9.3 There is considered to be minimal risk that any air quality objective will be exceeded within the proposed development by the time it is operational. With respect to 1-hour mean nitrogen dioxide concentrations and particulate matter, air quality conditions for future occupants of the proposed development have been shown to be acceptable, with concentrations below the air quality objectives throughout the site. If the annual mean nitrogen dioxide objective is exceeded, the magnitude of exceedance will be small, and its duration will be limited.

Significance

- 9.4 The overall operational air quality effects of the proposed development are judged to be 'not significant'. This conclusion is based on the assessment that, in the unlikely event that an air quality objective is exceeded within the proposed development, this will be both small and temporary. The proposed development will also not lead to any significant air quality effect at any existing sensitive location.

Policy Implications

- 9.5 Taking into account these conclusions, it is judged that the proposed development is consistent with Paragraph 185 of the NPPF, being appropriate for its location both in terms of its effects on the local air quality environment and the air quality conditions for future residents. It is also consistent with Paragraph 186, as it will not affect compliance with relevant limit values or national objectives.

- 9.6 The proposed development is also consistent with Policy CS19 of GBC's Local Plan, since it will avoid adverse environmental impacts from pollution, both on existing and future receptors

Gravesham Borough Council

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11 Glossary

AADT	Annual Average Daily Traffic
AQC	Air Quality Consultants
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
CAZ	Clean Air Zone
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMP	Dust Management Plan
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
HDV	Heavy Duty Vehicles (> 3.5 tonnes)
HMSO	Her Majesty's Stationery Office
IAQM	Institute of Air Quality Management
ICCT	International Council on Clean Transportation
JAQU	Joint Air Quality Unit
LAQM	Local Air Quality Management
LDV	Light Duty Vehicles (<3.5 tonnes)
µg/m³	Microgrammes per cubic metre
NO₂	Nitrogen dioxide
NPPF	National Planning Policy Framework
NRMM	Non-road Mobile Machinery
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
TEA	Triethanolamine – used to absorb nitrogen dioxide

12 Appendices

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A1 Construction Dust Assessment Procedure

A1.1 The criteria developed by IAQM (2016) divide the activities on construction sites into four types to reflect their different potential impacts. These are:

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

A1.2 The assessment procedure includes the four steps summarised below:

STEP 1: Screen the Need for a Detailed Assessment

A1.3 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).

A1.4 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

A1.5 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).

A1.6 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).

Step 2A – Define the Potential Dust Emission Magnitude

A1.7 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 A1.1.

Table A1.1: 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 <10,000 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

A1.8 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.

- A1.9 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 A1.2. These receptor sensitivities are then used in the matrices set out in Table A1.3, Table A1.4 and Table A1.5 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

- A1.10 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 A1.6 as a method of assigning the level of risk for each activity.

STEP 3: Determine Site-specific Mitigation Requirements

- A1.11 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 A4.

STEP 4: Determine Significant Effects

- A1.12 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'.
- A1.13 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 A1.2: 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 A1.3: Sensitivity of the Area to Dust Soiling Effects on People and Property ⁷

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

⁷ 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 A1.4: Sensitivity of the Area to Human Health Effects ⁷

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 A1.5: Sensitivity of the Area to Ecological Effects ⁷

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

Table A1.6: 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

A2 EPUK & IAQM Planning for Air Quality Guidance

- A2.1 The guidance issued by EPUK and IAQM (Moorcroft and Barrowcliffe et al, 2017) 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

- A2.2 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”.

- A2.3 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.

- A2.4 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;
- 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.

A2.5 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”.

A2.6 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

A2.7 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.

A2.8 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.

A2.9 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.

A2.10 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.

A2.11 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”.

- A2.12 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”.

- A2.13 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”.

- A2.14 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 report.

Assessment of Significance

- A2.15 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.

- A2.16 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.

A2.17 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.

A2.18 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 A3.

A3 Professional Experience

Dr Ben Marner, BSc (Hons) PhD CSci MEnvSc MIAQM

Dr Marner is the Director of Air Quality Modelling and Assessment at AQC and has over 20 years' relevant experience. He has been responsible for air quality and greenhouse gas assessments of road schemes, rail schemes, airports, power stations, waste incinerators, commercial developments and residential developments in the UK and abroad. He has acted as expert witness at public inquiries, where he has presented evidence on health-related air quality impacts, the impacts of air quality on sensitive ecosystems, and greenhouse gas impacts. He has developed a range of widely-used air quality models and contributed to the development of best practice. Dr Marner has provided support and advice to foreign governments, Highways England, Transport Scotland, Transport for London, Greater London Authority, the Joint Nature Conservation Committee, the Environment Agency, and numerous local authorities. He is a Member of the Institute of Air Quality Management and a Chartered Scientist. He currently advises the UK Government on air quality as part of its Air Quality Expert Group (AQEG), where his specific area of expertise relates to air quality assessment in the development control process.

Lucy Hodgins, BSc (Hons) CSci MEnvSc MIAQM

Miss Hodgins is a Principal Consultant with AQC with over ten years' experience in the field of air quality. She has extensive experience in the assessment of air quality impacts for a range of industrial, commercial and residential projects, using qualitative and quantitative methods to assess road traffic and point source emissions utilising a variety of models, including ADMS-Roads, Breeze Roads, ADMS-5 and Breeze Aermol. She has prepared assessments for energy from waste, anaerobic digestion and waste biomass facilities for a range of air pollutants, along with nuisance dust and odour assessments. Lucy has also been involved in air quality management and assessment work for local authorities, including air quality modelling for Clean Air Zones as well as microsimulation modelling for junction improvement schemes. She has also undertaken numerous operational dust assessments for mineral and waste facilities, as well as assessments of construction dust emissions. She is a Chartered Scientist and a Member of the Institute of Air Quality Management and the Institution of Environmental Sciences.

Dr Frances Marshall, MSci PhD MEnvSc MIAQM

Dr Marshall is a Senior Consultant with AQC with over eight years' relevant experience. Prior to joining AQC, she spent four years carrying out postgraduate research into atmospheric aerosols at the University of Bristol. Dr Marshall has experience preparing air quality assessments for a range of projects, including residential and commercial developments, road traffic schemes, energy centres, energy from waste schemes and numerous power generation schemes. She has experience in producing air quality assessments for EIA schemes, and has also assessed the

impacts of Local Plans on designated ecological areas, prepared Annual Status Reports for Local Authorities, and undertaken diffusion tube monitoring studies. She is a Member of both the Institute of Air Quality Management and the Institution of Environmental Sciences.

Gravesham Borough Council

A4 Construction Mitigation

A4.1 Table A4.1 sets out a list of best-practice measures from the IAQM guidance (IAQM, 2016) 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 A4.1: 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		✓
Monitoring		
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 (IAQM, 2018)		✓

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		✓
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	✓	