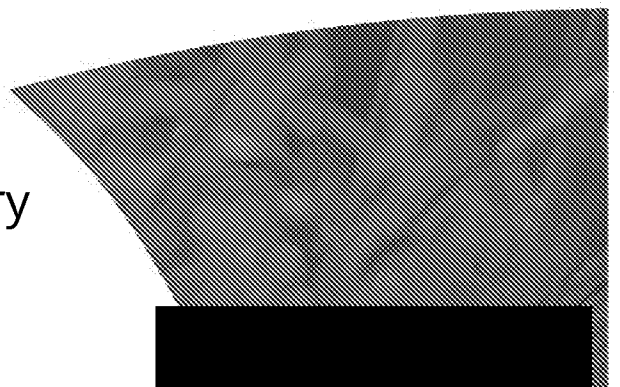




Air Quality Assessment

Land Adjacent to Woodgate Nursery
September 2021



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September 2021

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Document Control:

Project no.	Project
10946	Land Adjacent to Woodgate Nursery

Report No.	Ver/rev	Written By:	Checked by:	Authorised by:	Date
10946	V0	H. Parfitt	M. Peasley	R. Boakes	22/09/2020
	V1	H. Parfitt	M. Peasley	R. Boakes	24/09/2020

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Appendix A: IAQM Recommended Mitigation Measures for Medium Risk Sites

1. Introduction

- *****
- 1.1 Phlorum Ltd was commissioned by Hanbury Am Limited to undertake an Air Quality Assessment (AQA) for an Outline planning application with all matters reserved apart from access, for the proposed residential development of Land Adjacent to Woodgate Nursery, Lidsey Road, Woodgate, West Sussex. The National Grid Reference for the centre of the site is 493706, 103852. The site location is included in Figure 1.
 - 1.2 The proposed development includes the erection of up to 95 dwellings with associated public open space and landscaping.
 - 1.3 The proposed development comprises a parcel of land west of Lidsey Road, located to the south of the village of Woodgate. Land-use in the vicinity of the site is dominated by agriculture; however, the application site surrounds a residential dwelling on three sides (north, south, and west) and further residential use abuts the site to the north.
 - 1.4 The main sources of air pollution in the vicinity of the application site are from vehicles travelling on the local road network, particularly the A29 Lidsey Road.
 - 1.5 Arun District Council (ADC), the local planning authority, has not declared any Air Quality Management Areas (AQMA) in the district as air pollution remains below national Air Quality Standards (AQS).
 - 1.6 This report assesses both the proposed development's sensitivity to, and impact on, local air quality, considering both the operational and construction phases, recommending mitigation where necessary.

2. Policy Context

The UK Air Quality Strategy

- 2.1 The UK Air Quality Strategy (UKAQS)¹ sets out air quality standard (AQS) concentrations for a number of key pollutants that are to be achieved at sensitive receptor locations across the UK by corresponding air quality objective (AQO) dates. The sensitive locations at which the standards and objectives apply are those where the population are reasonably expected to be exposed to said pollutants over the particular averaging period.
- 2.2 For those objectives to which an annual mean standard applies, the most common sensitive receptor locations used to compare concentrations against the standards are areas of residential housing. It is reasonable to expect that people living in their homes could be exposed to pollutants over such a period of time.
- 2.3 Schools and children's playgrounds are also often used as sensitive locations for comparison with annual mean objectives due to the increased sensitivity of young people to the effects of pollution (regardless of whether or not their exposure to the pollution could be over an annual period). For shorter averaging periods of between 15 minutes, 1 hour or 1 day, the sensitive receptor location can be anywhere where the public could be exposed to the pollutant over these shorter periods of time. A summary of the AQS relevant to this assessment are included in Table 2.1, below.

Table 2.1 UK Air Quality Standards and Objectives.

Pollutant	Averaging Period	Air quality standard ($\mu\text{g.m}^{-3}$)	Air quality objective
Nitrogen dioxide (NO_2)	1 hour	200	200 $\mu\text{g.m}^{-3}$ not to be exceeded more than 18 times a year
	Annual	40	40 $\mu\text{g.m}^{-3}$
Particulate Matter (PM_{10})	24 hour	50	50 $\mu\text{g.m}^{-3}$ not to be exceeded more than 35 times a year
	Annual	40	40 $\mu\text{g.m}^{-3}$
Particulate Matter ($\text{PM}_{2.5}$)	Annual	25	25 $\mu\text{g.m}^{-3}$

1 Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2) July 2007.

- 2.4 The objectives adopted in the UK are based on the Air Quality (England) Regulations 2000², as amended, for the purpose of Local Air Quality Management. These Air Quality Regulations have been adopted into UK law from the limit values required by European Union Daughter Directives on air quality.
- 2.5 Obligations under the Environment Act 1995 require local authorities to declare an AQMA at sensitive receptor locations where an objective concentration has been predicted to be exceeded. In setting an AQMA, the local authority must then formulate an Air Quality Action Plan (AQAP) to seek to reduce pollution concentrations to values below the objective levels.
- 2.6 ADC has no current AQMAs in the district.

National Planning Policy Framework

- 2.7 The National Planning Policy Framework (NPPF)³, which was updated in July 2021, sets out the Government's planning policy for England. At its heart is an intention to promote more sustainable development. A core principle in the NPPF that relates to air quality effects from development is that planning should "contribute to conserve and enhance the natural and local environment". In achieving this, it states in paragraph 174 that:

"Planning policies and decisions should contribute to and enhance the natural and local environment by: [...]

preventing new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability [...]"

- 2.8 With regard to assessing cumulative effects the NPPF states the following at paragraph 185:

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

- 2.9 Regarding compliance with relevant limit values and national objectives for pollutants the NPPF, paragraph 186 states:

2 The Air Quality (England) (Amendment) Regulations 2002 - Statutory Instrument 2002 No.3043.

3 Department for Communities and Local Government (DCLG), (2019), National Planning Policy Framework.

"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."

- 2.10 The NPPF offers a broad framework but does not afford a detailed methodology for assessments. Specific guidance for air quality continues to be provided by organisations such as the Department for Environment, Food and Rural Affairs (Defra), Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM).

National Planning Practice Guidance

- 2.11 Reference ID 32 (Air Quality) of the National Planning Practice Guidance (PPG)⁴, which was updated in November 2019, provides guiding principles on how planning can take account of the impact of new development on air quality. The PPG summarises the importance of air quality in planning and the key legislation relating to it.
- 2.12 As well as describing the importance of International, National and Local Policies (detailed elsewhere in this report), it summarises the key sources of air quality information. It also explains when air quality is likely to be relevant to a planning decision, stating:

"Considerations that may be relevant to determining a planning application include whether the development would:

- ❖ Lead to changes (including any potential reductions) in vehicle-related emissions in the immediate vicinity of the proposed development or further afield. This could be through the provision of electric vehicle charging infrastructure; altering the level of traffic congestion; significantly changing traffic volumes, vehicle speeds or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; could add to turnover in a large car park; or involve construction*

⁴ Planning Practice Guidance (PPG) 32. (updated Nov 2019). Air Quality.
<http://planningguidance.planningportal.gov.uk/blog/guidance/air-quality/>.

sites that would generate large Heavy Goods Vehicle flows over a period of a year or more;

- ☞ *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; biomass boilers or biomass-fuelled Combined Heat and Power plant; centralised boilers or plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area; or extraction systems (including chimneys) which require approval or permits under pollution control legislation;*
- ☞ *Expose people to harmful concentrations of air pollutants, including dust. This could be by building new homes, schools, workplaces or other development in places with poor air quality;*
- ☞ *Give rise to potentially unacceptable impacts (such as dust) during construction for nearby sensitive locations;*
- ☞ *Have a potential adverse effect on biodiversity, especially where it would affect sites designated for their biodiversity value."*

2.13 Details are also provided of what should be included within an air quality assessment. Key considerations include:

- ☞ Baseline local air quality;
- ☞ Whether the proposed development could significantly affect local air quality during construction/operation; and
- ☞ Whether the development is likely to expose more people to poor air quality.

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

Local Planning Policy

2.15 The Arun Local Plan 2011-2031⁵ provides the local policy framework against which planning applications are assessed in the district. It contains policy of direct relevance to air quality and this assessment, including *Policy QE SP1 Quality of the environment*, which states:

⁵ ADC (2018) Adoption Arun Local Plan 2011-2031 (July 2018)

"The Council requires that all development contributes positively to the quality of the environment and will ensure that development does not have a significantly negative

impact upon residential amenity, the natural environment or upon leisure and recreational activities enjoyed by residents and visitors to the District.

The location of existing industrial and commercial uses, including waste management uses, must be taken into consideration when assessing proposals for development sensitive to noise, light, odour and outputs to air. This is to ensure that land allocated for these uses are protected and to ensure that the amenity of new developments and facilities is safeguarded from the impacts of incompatible land uses."

2.16 Also relevant is Policy QE DM3 Air pollution, which states:

"All major development proposals will be required to assess the likely impacts of the development on air quality and mitigate any negative impacts by:

- a. Ensuring the development is located within easy reach of established public transport services;*
- b. Maximising provision for cycling and pedestrian facilities;*
- c. Encouraging the use of cleaner transport fuels on site, through the inclusion of electric car charging points; and*
- d. Contributing towards the improvement of the highway network where the development is predicted to result in increased congestion on the highway network.*

Development proposed nearby any Air Quality Management Area (AQMA) declared

within the District within the Plan period, will require an air quality assessment to identify likely impacts of development upon the designated area. Developers will be required to ensure delivery of the actions set out within any Air Quality Action Plan.

Industrial development which is regulated by environmental permits (that creates or results in dust, smell, fumes, smoke, heat, radiation, gases, steam or other forms of pollution) must be located in such a position which ensures that the health, safety and amenity of users of the site or surrounding land is not put at risk and the quality of the environment would not be damaged or put at risk.

Developments shall also be consistent with all other Local Plan policies"

3. Assessment Methodology

Consultation

- 3.1 The pre-application response to the proposed development stated the following:

"The applicant shall submit an Air Quality Impact assessment to assess impacts of NO₂, PM₁₀, and PM_{2.5} from both the construction operational phases of the development. The AQIA shall include emissions mitigations cost calculations in accordance with Air Quality & Emissions Mitigation Guidance for Sussex (2013)"

- 3.2 To agree the exact details of the air quality assessment, the scope of assessment (as set out below) was shared, via email, with ADC's Environmental Health Officer (EHO) on the 17/09/2021. At the time of writing there has been no reply.

Guidance

- 3.3 Defra's Local Air Quality Management Technical Guidance (LAQM.TG(16))⁶ was followed in carrying out the assessment. Guidance published by the IAQM⁷ on the 'Assessment of Dust from Demolition and Construction' was also used to assess the risk of dust emissions during the construction phase of the proposed development. The Greater London Authority (GLA) Supplementary Planning Guidance⁸ on the control of dust from construction has also been referred to, which is considered best practice guidance for the UK. It details a number of mitigation measures that should be adopted to minimise adverse impacts from dusts and fine particles.
- 3.4 The latest Environmental Protection UK (EPUK) & IAQM guidance on 'Planning for Air Quality'⁹ and ADC's Air Quality Developer's Guidance were also considered throughout the assessment.
- 3.5 The emissions mitigation assessment (EMA) has been produced following Sussex Air's Air quality and emissions mitigation guidance for Sussex (2021)¹⁰. The Sussex Air guidance sets out the methodology for assessing the potential health impact of the developments transport emissions, to calculate potential mitigation costs, stating:

6 Defra. (2021). Part IV of the Environment Act 1995, Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management, Technical Guidance LAQM. TG(16). London: Defra.

7 IAQM. (2014). Guidance on the assessment of dust from demolition and construction.

8 Greater London Authority. (2014). The Control of Dust and Emissions During Construction and Demolition.

9 EPUK & IAQM. (2017). Land-Use Planning & Development Control: Planning For Air Quality.

10 Sussex Air Quality Partnership, 2021 (V1.1 April 2021)

"The purpose of this assessment is to quantify the monetised health damage value associated with transport emissions from the proposed development."

Baseline

- 3.6 The baseline air quality conditions in the vicinity of the site were established through the compilation and review of appropriately sourced background concentration estimates and local monitoring data.
- 3.7 Defra provides estimated background concentrations of the UKAQS pollutants at the UK Air Information Resource (UK-AIR) website¹¹. These estimates are produced using detailed modelling tools and are presented as concentrations at central 1km² National Grid square locations across the UK. At the time of writing, the most recent background maps were from August 2020 and based on monitoring data from 2018.
- 3.8 Being background concentrations, the UK-AIR data are intended to represent a homogenous mixture of all emissions sources within the general area of a particular grid square location. Concentrations of pollutants at various sensitive receptor locations can, therefore, be calculated by modelling the emissions from a nearby pollution source, such as a busy road, and then adding this to the appropriate UK-AIR background datum.
- 3.9 Monitoring at background locations is considered an appropriate source of data for the purposes of describing baseline air quality. ADC's monitoring data were reviewed to establish baseline air quality. The most recent available data at the time of writing, from ADC annual status report (ASR)¹², have been included and assessed.

Construction Phase

- 3.10 The construction phase of the proposed development will involve a number of activities that could potentially produce polluting emissions to air. Predominantly, these will be emissions of dust. However, they could also include releases of odours and/or more harmful gases and particles.

¹¹ Defra: UK-AIR. www.uk-air.defra.gov.uk

¹² ADC (2020) 2020 Air Quality Annual Status Report (ASR)

- 3.11 The IAQM's guidance to assess the impacts of construction on human and ecological receptors has been followed in carrying out this air quality assessment. The guidance suggests that where a receptor is located within 350m (50m for statutory ecological receptors) of a site boundary and/or 50m of a route used by construction vehicles, up to 500m from the site entrance, a dust assessment should be undertaken. High sensitivity receptors are considered particularly sensitive when located within 20m of a works area. Figure 2 shows receptors that could be sensitive to dust that are located within 350m of the boundaries of the site.
- 3.12 The Multi Agency Geographic Information for the Countryside (MAGIC) website¹³, which incorporates Natural England's interactive maps, has been reviewed to identify whether any statutory ecological sensitive receptors are situated within 50m of the site boundary or within 50m of any routes used by construction vehicles on the public highway, up to 500m from the site entrance. The closest designated ecological receptor is located over 2,000m from the site. Therefore, the impact of construction dusts on ecological receptors can be screened out on distance alone and are not considered further in this report.

Construction Significance

- 3.13 The IAQM guidance suggests that Demolition, Earthworks, Construction and Trackout should all be assessed individually to determine the overall significance of the construction phase.
- 3.14 In the IAQM dust guidance, the first step in assessing the risk of impacts is to define the potential dust emission magnitude. This can be considered 'Negligible', 'Small', 'Medium' or 'Large' for each of the construction stages. Whilst the IAQM provides examples of criteria that may be used to assess these magnitudes, the vast number of potential variables mean that every site is different and therefore professional judgement must be applied by what the IAQM refer to as a "technically competent assessor". The construction phase assessment therefore relies on the experience of the appraiser.
- 3.15 As such, attempts to define precisely what constitutes a negligible, small, medium or large dust emission magnitude should be treated with caution. Factors such as the scale of the work, both in terms of size and time, the construction materials and the plant to be used must be considered.
- 3.16 The second step is to define the sensitivity of the area around the construction site. As stated in the IAQM guidance:

"the sensitivity of the area takes into account a number of factors:

13 Natural England and MAGIC partnership organisations. Multi Agency Geographic Information for the Countryside.
<http://www.magic.gov.uk/> (accessed September 2021).

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

- 3.17 Based on these factors, the area is categorised as being of 'Low', 'Medium' or 'High' sensitivity.
- 3.18 When dust emission magnitudes for each stage and the sensitivity of the area have been defined, the risk of dust impacts can be determined. The IAQM provides a risk of impacts matrix for each construction stage. The overall significance for the construction phase can then be judged from the stages assessed. Again, this is subject to professional judgement.
- 3.19 Combustion exhaust gases from diesel-powered plant and construction vehicles accessing the site will also be released. However, the volumes and periods over which these releases will occur are unlikely to result in any significant peaks in local air pollution concentrations and therefore this has been scoped out of the assessment.

Operational Phase

Road Transport Sources

- 3.20 Vehicle emissions will arise from the combustion of fossil fuels in vehicle engines and their subsequent release to atmosphere via tailpipe exhausts. The most significant pollutants released by cars and other vehicles are oxides of nitrogen (NO₂/NO_x) and particulate matter (PM₁₀ and PM_{2.5}). Releases of carbon monoxide (CO) and some volatile hydrocarbons (e.g. benzene and 1,3-butadiene) are of less significance and are not assessed further in this report.
- 3.21 As it is elevated annual mean concentrations of NO₂ and PM₁₀ that have resulted in the declaration of most AQMAs across the UK, these are the pollutants of most concern and they have therefore been the focus of this air quality assessment. PM_{2.5}, which is another fraction of particulate matter, has also been considered.

Roads Assessment

- 3.22 The latest EPUK & IAQM planning guidance⁹ provides indicative thresholds for changes in traffic flows which would require a detailed air quality assessment, when not in or close to an AQMA. These are a change in 24-hour average annual daily traffic (AADT) flows of >500 light duty vehicles (LDV) and/or >100 heavy duty vehicles (HDV) (or >100 LDV or >25 HDV within an AQMA). Changes below these thresholds can be reasonably considered to have an insignificant impact on air quality.
- 3.23 In addition, it is necessary to determine whether the proposed development could introduce sensitive receptors into an area of existing poor air quality. The need to include a dispersion model to both assess the potential impact of the development at existing receptor locations and to assess the suitability of the site, in air quality terms, has been scoped out. Further details of the screening process are provided in Section 6 of this report.

Emissions Mitigation Assessment

- 3.24 The purpose of an emissions mitigation assessment is to determine an appropriate level of mitigation required from a development. They are an alternative way to assess the impact of a development on air quality and they ensure that all developments, even those which have no significant impact on air quality, include appropriate mitigation to minimise their impact.
- 3.25 The assessment was undertaken in line with guidance provided by Sussex Air¹⁰. As the proposed development would be classified as *Major* under this guidance, an emissions cost calculation was required.

Emissions Cost Calculation

- 3.26 The emissions calculation utilised the latest Defra Emission Factor Toolkit (EFT v10.1)¹⁴ to determine the total transport related emissions (NO_x & PM_{2.5}) that would be generated by the proposed development.
- 3.27 Defra provides 'damage costs'¹⁵, which are set of impact values, defined per tonne of pollutant for use in this calculation. Damage costs estimate the societal costs associated with changes in pollutant emissions and are then combined with the forecasted emissions changes to provide an approximation valuation of the cost (or benefit) to society caused by development.
- 3.28 Defra's Appraisal Toolkit¹⁶, which incorporates the latest damage cost values, was used in the calculation. The principal of the calculation is summarised in the equation below:

14 Defra (2020) Emission Factor Toolkit (v.10.1)

15 Defra. Damage Cost (2021). <https://www.gov.uk/government/publications/assess-the-impact-of-air-quality/air-quality-appraisal-damage-cost-guidance>

16 Defra (2021). Air quality damage cost appraisal toolkit.

EFT output x Damage costs x 5 years = 5 year exposure cost value (in £)

- 3.29 As a number of the inputs are based on assumptions, the resulting figure should be treated with caution, but it can be used to give an idea of the scale of a development in terms of total generated transport emissions and therefore a gauge of what level of mitigation might be appropriate.
- 3.30 It is usual for costs established in this way to be apportioned to low emission measures associated with a proposed development. In doing this it should be possible for damage costs to be offset.

4. Baseline Assessment

- 4.1 The baseline air quality conditions in the vicinity of the site are established through the compilation and review of appropriately sourced local monitoring data.

UK-AIR Background Pollution

- 4.2 The UK-AIR predicted background pollution concentrations for NO₂, PM₁₀ and PM_{2.5} for 2018 to 2023 are presented in Table 4.1. These data were taken from the central grid square location closest to the application site (i.e. grid reference: 493500, 103500).

Table 4.1: 2018 to 2023 background concentrations of pollutants at the application site.

Pollutant	Predicted background concentration (µg.m ⁻³)						Averaging Period	Air quality standard concentration (µg.m ⁻³)
	2018	2019	2020	2021	2022	2023		
NO ₂	10.1	9.8	9.5	9.2	8.9	8.7	annual mean	40
PM ₁₀	14.9	14.7	14.5	14.3	14.1	13.9	annual mean	40
PM _{2.5}	9.3	9.2	9.0	8.9	8.7	8.6	annual mean	25

- 4.3 The data in Table 4.1 show that annual mean background concentrations of NO₂, PM₁₀ and PM_{2.5}, in the vicinity of the application site between 2018 and 2023, were predicted to be well below their respective AQs. Annual mean background pollutant concentrations are, therefore, likely to be well below their respective AQs at the application site.
- 4.4 Concentrations of all pollutants were predicted to decline each year. These reductions are principally due to the forecast effect of the roll out of cleaner vehicles, but also due to UK national and international plans to reduce emissions across all sectors.

Local Sources of Monitoring Data

- 4.5 Air quality monitoring is considered an appropriate source of data for the purposes of describing baseline air quality. At the time of writing, the most recent ASR¹² released by ADC included 2019 data.

Automatic Monitoring

- 4.6 ADC does not undertake automatic (continuous) monitoring in the district.

Non-Automatic Monitoring

- 4.7 ADC operates an extensive non-automatic, NO₂ diffusion tube monitoring network. The most recent available monitoring data for diffusion tubes within 3.5km of the application site are included in Table 4.2.

Table 4.2: Monitoring data from ADC NO₂ diffusion tubes

Monitor	Type	Distance from the Site (km)	Distance to kerb(m)	NO ₂ annual mean concentration (µg.m ⁻³)				
				2015	2016	2017	2018	2019
13	R	0.4	1.5	21.0	25.8	25.7	28.0	24.0
20	R	2.2	1.3	-	-	20.7	20.0	18.0
12	R	2.5	1.5	29.6	25.6	28.3	31.0	26.0
21	R	2.5	1.2	-	-	26.5	29.0	26.0
18	R	3.2	11.5	-	-	-	21.0	18.0
11	UB	3.3	1.2	15.4	15.1	-	-	-

Note: "R" = Roadside; "UB" = Urban Background; **Bold** denotes exceedance of 40µg.m⁻³ AQS

- 4.8 The data in Table 4.2 show that annual mean concentrations of NO₂ were generally well below the 40µg.m⁻³ annual mean AQS, within 3.5km of the site, between 2015 and 2019, even at roadside locations.
- 4.9 The highest annual mean concentration recorded in 2019 was 26.0µg.m⁻³. This concentration was recorded at diffusion tubes 12 and 21 and was 35% below the annual mean AQS. Diffusion tube 12 is located at a roundabout within 2m of the A259 Rowan Way, on the edge of the built-up area of Bognor Regis. As such, concentrations recorded here are likely to be higher than recorded at the application site which is in a far more rural location.
- 4.10 The data in Table 4.2. does not provide evidence for a downward trend in annual mean concentrations of NO₂, as suggested by Table 4.1.

5. Construction Phase Impacts

- 5.1 The construction phase of the proposed development will involve a number of activities that could produce polluting emissions to air. Predominantly, these will be emissions of dust.
- 5.2 The estimates for the dust emission magnitude for demolition, earthworks, construction and trackout below are based on the professional experience of Phlorum's consultants, information provided by the client and Google Earth imagery.
- 5.3 As the application is at Outline stage, there are no details of the construction methods. As such, and in the absence of detailed information, the estimates used in this assessment are highly conservative.

Dust Emission Magnitude

Demolition

- 5.4 The application site is a greenfield site and as such, no demolition is required.

Earthworks

- 5.5 The total area of the site within the red line boundary is approximately 3.55 Ha which falls into the IAQM's 'Large' dust emission category. At this stage, there is no detail concerning the amount of earth to be moved, or the number of vehicles moving earth and as such, for conservative purposes the overall dust emission magnitude for the earthworks stage is considered to be *Large*.

Construction

- 5.6 During construction, activities that have the potential to cause emissions of dust may include concrete batching, sandblasting and piling. Localised use of cement powder and general handling of construction materials also have the potential to generate dust emissions, as does the effect of wind-blow from stockpiles of friable materials.
- 5.7 The proposed development is predicted to have a total construction volume of between 25,000m³ and 100,000m³, falling into the IAQMs 'Medium' category.
- 5.8 The overall dust emission magnitude during construction is considered to be *Medium*.

Trackout

- 5.9 Construction traffic, when travelling over soiled road surfaces, has the potential to generate dust emissions and to also add soil to the local road network. During dry weather, soiled roads can lead to dust being emitted due to physical and turbulent effects of vehicles.

- 5.10 It is understood that more than 50m of unpaved road surfaces could be utilised during construction. This falls into the IAQM's 'Large' dust emission magnitude for trackout.
- 5.11 As such, the dust emission magnitude for the trackout phase is considered to be *Large*.

Emission Magnitude Summary

- 5.12 A summary of the dust emission magnitude as a result of the activities of Demolition, Earthworks, Construction and Trackout as specified in the IAQM guidance, and discussed above, are listed in Table 5.1 below.

Table 5.1: Dust Emission Magnitude for the construction activities, based on the IAQM's guidance.

Activity	Dust Emission Magnitude
Demolition	NA
Earthworks	Large
Construction	Medium
Trackout	Large

Sensitivity of the Area

- 5.13 Having established the emission magnitudes for each phase above, the sensitivity of the area must be considered to establish the significance of effects. The effect of dust emissions depends on the sensitivity of each receptor.
- 5.14 High sensitivity human receptors include residential dwellings, schools and hospitals, but can include locations such as car showrooms when considering the impacts of dust soiling.
- 5.15 The impacts of dust emissions from the sources discussed above have the potential to cause an annoyance to human receptors living in the local area. Within distances of 20m of the site boundary there is a high risk of dust impacts, regardless of the prevailing wind direction. Up to 100m from the construction site, there may still be a high risk, particularly if the receptor is downwind of the dust source.
- 5.16 With the exponential decline in dust with distance from dust generating activities, it is considered that for receptors more than 350m from the site boundary, the risk is negligible. Furthermore, the risks at over 100m only have the potential to be significant in certain weather conditions, e.g. downwind of the source during dry periods.
- 5.17 The approximate number of high sensitivity human receptors in the vicinity of the site is detailed in Table 5.2 below and shown in Figure 2.

Table 5.2: Approximate number of High and Medium Sensitivity Receptors close to the site.

Distance to site (m)	Approximate number of receptors	Receptor Details
Medium Sensitivity Receptors		
<20	2	Commercial properties to the east
High Sensitivity Receptors		
<20	1-10	Residential dwellings on Lidsey Road
<50	10-20	Residential dwellings on Lidsey Road
<100	10-20	Residential dwellings on Lidsey Road
<350	100+	Residential dwellings found in the south of Woodgate and Willows Caravan Park.

- 5.18 Figure 3 shows that the predominant wind direction at the closest meteorological station (Charlwood) is from the south-west. There are few highly sensitive receptors (Willows Caravan Park) within 100m and downwind of the application site. However, as there are between 1-10 highly sensitive receptors within 20m of the application site; as such, the sensitivity of the area to dust soiling is considered to be *Medium*.
- 5.19 UK-AIR predicted annual mean concentrations of PM₁₀ are below 24µg.m⁻³ at the site. This provides a good indication that PM₁₀ concentrations for both annual mean and daily mean concentrations are likely to be below the respective AQs at the site and adjacent uses. Therefore, the sensitivity of the area to human health impacts is defined as *Low*.

Risk of Impacts

- 5.20 Having established the potential dust emission magnitudes and sensitivity of the area, the risk of impacts can be determined in accordance with the IAQM guidance. These are summarised in Table 5.3.

Table 5.3: Summary of Impact Risk by Construction Stage based on the IAQM's dust guidance.

Stage	Impact Risk		
	Nuisance Dust	Ecology	PM ₁₀
Demolition	NA	NA	NA
Earthworks	Medium	Negligible	Low
Construction	Medium	Negligible	Low
Trackout	Medium	Negligible	Low

- 5.21 Overall, the proposed development is considered to be *Medium Risk* for nuisance dust soiling effects, *Low* for PM₁₀ health effects and to be *Negligible* for ecology, in the absence of mitigation.

Site Specific Mitigation

- 5.22 The GLA guidance⁸ suggests a number of mitigation measures that should be adopted in order to minimise impacts from dusts and fine particles. Appropriate measures that could be included during construction of the proposed development include:
- ☛ ideally cutting, grinding and sawing should not be conducted on-site and pre-fabricated material and modules should be brought in where possible;
 - ☛ where such work must take place, water suppression should be used to reduce the amount of dust generated;
 - ☛ skips, chutes and conveyors should be completely covered and, if necessary, enclosed to ensure that dust does not escape;
 - ☛ no burning of any materials should be permitted on site;
 - ☛ any excess material should be reused or recycled on-site in accordance with appropriate legislation;
 - ☛ developers should produce a waste or recycling plan;
 - ☛ following earthworks, exposed areas and soil stockpiles should be re-vegetated to stabilise surfaces, or otherwise covered with hessian or mulches;
 - ☛ stockpiles should be stored in enclosed or bunded containers or silos and kept damp where necessary;
 - ☛ hard surfaces should be used for haul routes where possible;

- ☛ haul routes should be swept/washed regularly;
 - ☛ vehicle wheels should be washed on leaving the site;
 - ☛ all vehicles carrying dusty materials should be securely covered; and
 - ☛ delivery areas, stockpiles and particularly dusty items of construction plant should be kept as far away from neighbouring properties as possible.
- 5.23 In addition, the IAQM lists recommended mitigation measures for low, medium and high Dust Impact Risks. The highly recommended mitigation measures for Medium Risk sites are included in Appendix A of this report.
- 5.24 Where dust generation cannot be avoided in areas close to neighbouring properties, additional mitigation measures should be put in place, such as: windbreaks, sprinklers, and/or time/weather condition limits on the operation of some items of plant or the carrying out of activities that are likely to generate a particularly significant amount of dust.

Residual Effects

- 5.25 After the implementation of the mitigation measures listed above and in Appendix A, the significance of each phase of the construction programme will be reduced and the residual significance of impact for the construction phase is expected to be *Negligible*.

6. Operational Phase Impacts

Site Suitability

- 6.1 LAQM.TG(19) guidance⁶ classifies monitoring locations based on their relation and distance to sources of pollution. The guidance states that roadside sites are typically found between *“one to five metres of the kerb of busy roads”*, with background sites found *“away from roads”* and at locations not *“dominated by single sources”*.
- 6.2 The closest proposed residential dwelling is located at least 15m from Lidsey Road, to the west of the northbound carriageway (upwind of the prevailing) and as such, all residential dwellings within the proposed development would be categorised as being at “background” locations, with pollutant concentrations akin to those set out in Table 4.1.
- 6.3 LAQM.TG(16) states that where the annual mean concentration is below $60\mu\text{g.m}^{-3}$, there are not likely to be exceedances of the 1-hour mean objective ($200\mu\text{g.m}^{-3}$ not to be exceeded more than 18 times per year).
- 6.4 For PM_{10} the following equation can be used to derive the number of days that the daily mean limit of $50\mu\text{g.m}^{-3}$ AQS is likely to be exceeded:
- $$\text{No. 24 hour exceedances} = -18.5 + 0.00145 \times \text{annual mean}^3 + \left(\frac{206}{\text{annual mean}} \right)$$
- 6.5 Using this equation, a concentration of $31.8\mu\text{g.m}^{-3}$ would indicate a likely exceedance of the 24-hour mean AQS for PM_{10} .
- 6.6 UK-AIR background data and ADC monitoring did not identify *any* location within the district where exceedances of the long term or short-term objectives for PM_{10} , $\text{PM}_{2.5}$ or NO_2 would be expected. As such, it is considered almost certain that pollutant concentrations would be below the relevant AQSs across the site.
- 6.7 Therefore, the site is anticipated to be suitable, in air quality terms, for its proposed end use, and no further assessment of site suitability is required.

Impact on Local Air Quality

- 6.8 The latest EPUK & IAQM planning guidance⁹ provides indicative thresholds for changes in traffic flows which would require a detailed air quality assessment. These are a change in 24-hour average annual daily traffic (AADT) flows of >500 LDVs and/or >100 HDVs.

- 6.9 The project's transport consultants, Highgate Transportation Limited, estimate that the proposed development would generate 347 AADT, with negligible HDV flows. Therefore, it is anticipated that the proposed development's traffic generation would remain well below the indicative EPUK & IAQM threshold, and the proposed development can be reasonably assumed to have an insignificant impact on local air quality.
- 6.10 Based on the above, it is considered highly unlikely that the proposed development would introduce new receptors into an area of existing poor air quality, or have a significant adverse impact on local air quality.

7. Emissions Mitigation Assessment

- 7.1 Sussex Air Guidance requires an emissions mitigation statement, including a damage cost calculation, to be produced to help identify the overall impacts from major developments on air quality.
- 7.2 The latest Defra Emissions Factor Toolkit was used to determine the total transport related emissions (NO_x and PM_{2.5}) that would be generated by the proposed development; the inputs used in the calculation are shown in Table 7.1.

Table 7.1: Emission Factor Toolkit Calculation Inputs

Input	Value	Unit	Source/guidance
Trip Length	10	km	Sussex-Air AQEMGFS guidance
Net Traffic Flow LDV (HDV)	347	AADT	Transport Consultant – Highgate Transportation
EFT Road Type	Urban (not London)	-	EFT
EFT Year	2022-2026	-	Opening year + 4 years (In line with EFT estimates)
Average Speed	50	km.hr ⁻¹	Sussex-Air AQEMGFS guidance
Appraisal period	5	years	Sussex-Air AQEMGFS guidance

- 7.3 The outputs from the EFT (i.e. the estimated increases in NO_x and PM_{2.5}) were input into Defra's appraisal toolkit. Damage cost values representing 'Road Transport Urban Small' were selected to describe the changes in both pollutants and a total 'damage' cost was calculated for road transport. The results of which are presented in Tables 7.2 and 7.3 below.

Table 7.2: Emission Cost Calculation for NO_x.

NO _x Road Transport Urban Small					
Year	2022	2023	2024	2025	2026
Reduction in emissions (tonnes)	0.288	0.262	0.237	0.214	0.192
Central Damage Costs (£)	7453	7602	7754	7909	8067
Central Benefit (£)	2147	1990	1838	1691	1552
Discounted Central Benefit (£)	2147	1922	1716	1525	1353
Central Present Value	£8,663				

Table 7.3: Emission Cost Calculation for PM_{2.5}.

PM _{2.5} Road Transport Urban Small					
Year	2022	2023	2024	2025	2026
Reduction in emissions (tonnes)	0.023	0.022	0.022	0.022	0.022
Central Damage Costs (£)	66501	67831	69187	70571	71982
Central Benefit (£)	1510	1522	1539	1559	1583
Discounted Central Benefit (£)	1510	1471	1437	1407	1379
Central Present Value	£7,203				

7.4 The total damage cost is summarised as follows:

NO _x emission 'damage' (cost, £)	= £8,663+
PM _{2.5} emission 'damage' (cost, £)	= £7,203
TOTAL (cost, £)	= £15,886

Mitigation

7.5 The total damage cost (£15,886) is indicative of the value that should be apportioned to an air quality mitigation package designed to minimise impacts from the proposed development.

7.6 Sussex Air guidance sets out that residential development should include the following mitigation as standard:

- ☛ Gas-fired boilers meeting a minimum standard of <40mgNO_x/kWh;
- ☛ Consideration to renewable sources of energy, e.g. air source heat pumps, as an alternative.
- ☛ Electric vehicle (EV) charging at the rates set out in West Sussex County Council (WSCC) parking guidance.

7.7 The guidance then provides a non-exhaustive list of mitigation measures that residential development could incorporate to further minimise impacts:

- ❖ *"Invest in EV charging infrastructure within the development over and above the current recommended parking standards;*
- ❖ *Provide vouchers for alternatives to private car use;*
- ❖ *Provide public transport subsidy for residents;*
- ❖ *Set up a car club within the development or contribute to the cost of a local car club*
- ❖ *Set up or join an existing car sharing scheme for residents*
- ❖ *Designate parking spaces for car club/car sharing vehicles*
- ❖ *Designate parking spaces for low emission vehicles*
- ❖ *Provide electric bikes*
- ❖ *Improve cycle paths to link to the existing local cycle network*
- ❖ *Provide secure cycle storage*
- ❖ *Invest in additional evergreen infrastructure to reduce particulates and other pollutants".*

7.8 The proposed development commits to the following mitigation at this stage:

- ❖ Meeting the EV charging point standards prescribed by ADC and West Sussex County Council (WSCC);
- ❖ Travel Plan, including mechanisms to discourage high emission vehicle use and encourage uptake of low emissions technologies;
- ❖ A welcome pack available to all new occupants to encourage the use of sustainable transport modes;
- ❖ "Cable to Property" broadband provision to enable working from home. Woodgate House (adjacent to the site) has access to Superfast Broadband 74mbps DL, 20mbps UL;
- ❖ Cycle Storage;

- ☛ Improvements/connections to cycle paths and the local cycle network:
The proposed development introduces a dedicated footway along site frontage. This will connect with the same from adjacent development sites, significantly improving walking through Woodgate to Westergate facilities. Development will also seek to integrate with facilities and routes to be provided by BEW strategic development of 2700-4000 homes.

7.9 Given the comprehensive list of measures above, it is considered that the proposed development includes a sufficient amount of mitigation to more than offset its 'damage cost'.

8. Conclusions

- *****
- 8.1 Phlorum Ltd was commissioned by Hanbury Am Limited to undertake an Air Quality Assessment (AQA) for an Outline planning application with all matters reserved apart from access, for the proposed residential development of Land Adjacent to Woodgate Nursery, Lidsey Road, Woodgate, West Sussex.
 - 8.2 UK-AIR background concentrations and local air quality monitoring from the wider area suggest that air quality within the surrounding area is good and that pollution concentrations across the site are likely to be below the relevant UK Air Quality Strategy standard concentrations. As such, the site is considered acceptable for the proposed introduction of new residential receptors.
 - 8.3 The need for detailed pollutant dispersion modelling has been screened out using Defra, EPUK and IAQM guidance. Increases in pollution concentrations as a result of scheme generated traffic are therefore not expected to have a significant impact on local air quality.
 - 8.4 Nevertheless, the proposals include a suite of mitigation measures that would further minimise any air quality impacts.
 - 8.5 During construction, adopting appropriate mitigation measures should prevent any significant air quality effects on the surrounding area.
 - 8.6 The proposed development is expected to comply with all relevant air quality policy. Air quality should not, therefore, pose any significant obstacles to the planning process.

Figures and Appendices

Figure 1: Site Location Plan

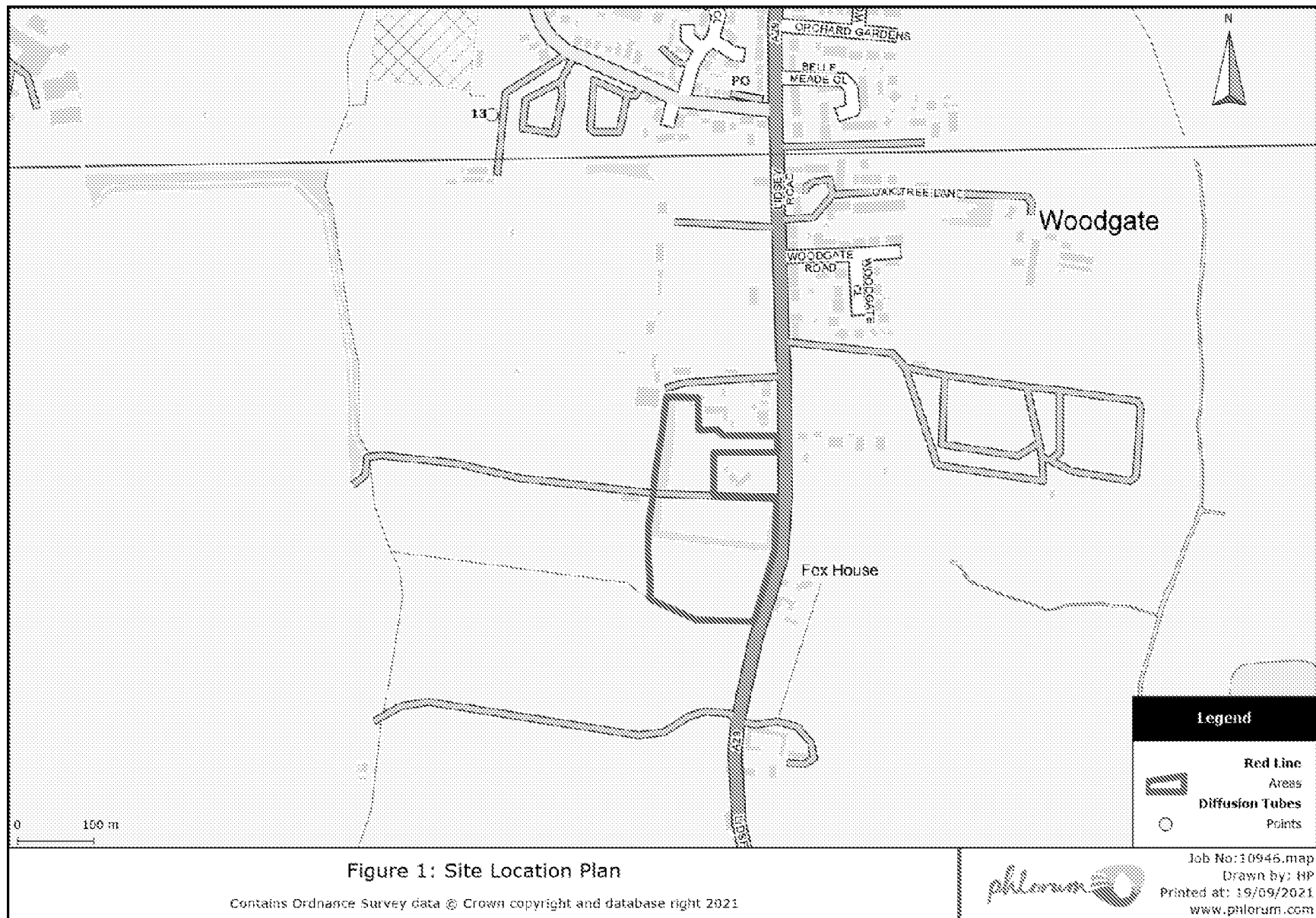


Figure 2: Construction Phase Receptors

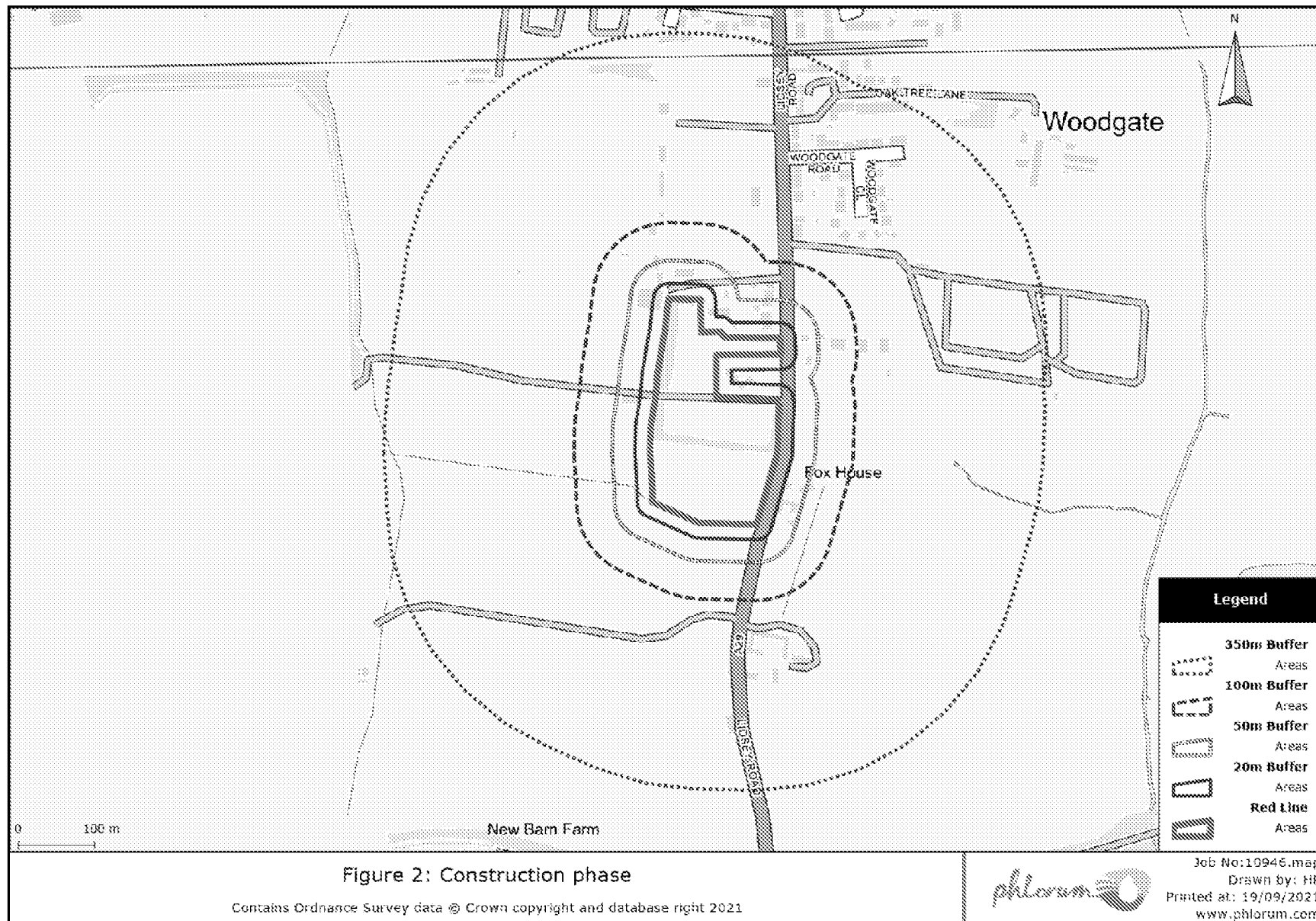
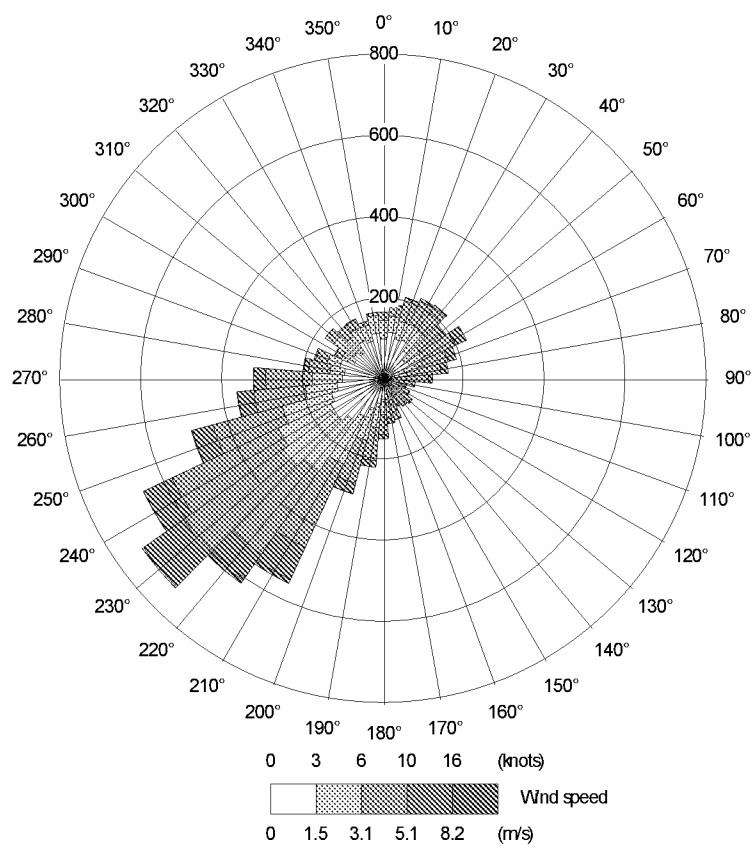


Figure 3: Wind Rose for Charlwood/Gatwick 2019



Appendix A: IAQM Highly Recommended Mitigation Measures for Medium Risk Sites

IAQM Highly Recommended Mitigation Measures for sites with a Medium Risk of Dust Impacts

Please refer to the IAQM's Construction Dust Guidance (*Guidance on the assessment of dust from demolition and construction (2014)*)¹⁷ and *Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites (2018)*¹⁸ for further, "desirable", mitigation measures.

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.
- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this Appendix. The DMP may include monitoring of dust deposition, dust flux, real-time PM₁₀ continuous monitoring and/or visual inspections.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exception 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 Dust Management Plan, record inspection results, and make an inspection log available to the local authority when asked.
- Increase the frequency of 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 PM₁₀ continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it is a large site, before work on a phase commences. Further guidance is provided by the IAQM¹⁹ on *monitoring during demolition, earthworks and construction*.

Preparing and Maintaining the Site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as 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

¹⁷ IAQM (2014) Guidance on the assessment of dust from demolition and construction

¹⁸ IAQM. (2018). Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites.

https://iaqm.co.uk/text/guidance/guidance_monitoring_dust_2018.pdf

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 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.

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on 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.

Demolition

- 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.

Construction

- 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.

Trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.

- Record all inspections of haul routes and any subsequent action in a site log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10m from receptors where possible.

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