GUILDFORD PLAZA, GUILDFORD

Proposed Residential Development

Air Quality Assessment

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1.0 INTRODUCTION

SLR Consulting Ltd (SLR) has been commissioned by Tiger Developments Ltd to undertake an air quality assessment in support of a planning application for a proposed residential development (the 'Proposed Development'), on land to the east of the A3100 Portsmouth Road, Guildford (the 'Site'). The planning application seeks approval for a co-living complex (i.e. sui generis use) comprising a mix of 25% communal studios and 75% studios.

The Site is located within Guildford, currently comprising a vacant brownfield site, and covers an area of 0.3ha. The approximate National Grid Reference (NGR) for the site is x499370, y149280. The Site is currently bounded by:

- The Cannon Public House to the north, with commercial premises and the A3100 beyond;
- Bury Street to the east and south, with commercial and residential properties beyond; and
- The A3100 Portsmouth Road and Millmead Terrace to the west, with residential dwellings beyond.

1.1 Scope of Assessment

Consultation was undertaken with the Environmental Health Officer (EHO) at Guildford Borough Council (GBC)[1] to discuss the extent and methodology of the air quality assessment. The following scope of works was proposed to GBC:

- Construction Phase Dust Assessment – A construction phase dust assessment to be undertaken in accordance with *Guidance on the Assessment of Dust from Demolition and Construction (Institute of Air Quality Management - IAQM, 2016)*; and
- Site Suitability Assessment – Onsite air quality to be assessed using the atmospheric dispersion model ADMS-Roads and the assessment will be undertaken in accordance with guidance published within *LAQM.TG(16)* and modelled concentrations compared to the relevant air quality standards and objectives.

It was proposed to undertake a screening assessment of development-generated vehicle emissions on nearby receptors.

In response, Mr. Gary Durrant, Senior Specialist for Environmental Protection at GBC, confirmed that the methodology for the construction phase dust assessment was agreed and stated (i) that the area of the Site / adjacent road network is likely to form part an Air Quality Management Area (AQMA) in the near future and (ii) that nitrogen dioxide (NO_2) concentrations are being monitored within the area.

[1] Email consultation with Gary Durrant of GBC, dated 21st to 22nd July 2021.

2.0 RELEVANT AIR QUALITY LEGISLATION AND GUIDANCE

2.1 Legislative Context

2.1.1 Air Quality Standards

The Air Quality Standards Regulations 2010[2] (AQSR) transpose both the EU Ambient Air Quality Directive (2008/50/EC)[3], and the Fourth Daughter Directive (2004/107/EC)[4] within UK legislation, in order to align and bring together in one statutory instrument the Government's obligations. The AQSR includes Limit Values, Target Values, Objectives, Critical Levels and Exposure Reduction Targets for the protection of human health and the environment. Limit values are legally binding and are considered to apply everywhere with the exception of the carriageway and central reservation of roads and any location where the public do not have access (e.g. industrial sites). Compliance is regulated at a national level (based upon a series of zones/agglomerations).

The UK nationally has failed to meet the Limit Values, as outlined in the Ambient Air Quality Directive (2008/50/EC), for NO_2 by the 2010 target date. As a result, the Government has had to submit time extension applications for compliance with the EU Limit Values, which has since passed and its continued failure to achieve these limits is currently giving rise to infraction procedures being implemented. In July 2017, the Government published its plan for tackling roadside NO_2 concentrations[5], to achieve compliance with EU Limit Values. This sets out Government policies for bringing NO_2 concentrations within statutory limits in the shortest time period possible.

In the interim period the UK has formally left the EU, however despite this, EU rules and regulations referred above have subsequently been written into UK law and are still relevant - although there is uncertainty as to who will enforce these requirements domestically.

2.1.2 Air Quality Strategy

Irrespective of the above, the UK Government and the devolved administrations are required under the Environment Act 1995 to produce a national air quality strategy to improve air quality. The latest Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland was published in 2007[6]. The AQS provides the over-arching strategic framework for air quality management in the UK and contains non-statutory national air quality standards and objectives established by the UK Government and Devolved Administrations for the protection of public health and the environment, taking into account epidemiological evidence and international regulations, as well as economic efficiency, practicability and technical feasibility. There is no legal requirement to meet these objectives except where they mirror an equivalent legally binding Limit Value as prescribed within EU legislation, however compliance is regulated at a local level by local planning authorities.

The AQS objectives apply at locations outside buildings or other natural or man-made structures above or below ground, where members of the public are regularly present and might reasonably be expected to be exposed to pollutant concentrations over the relevant averaging period – herein referred to as relevant exposure. Table 2-2 provides an indication of those locations.

The ambient air quality standards of relevance to human receptors in this assessment (collectively termed Air Quality Assessment Levels (AQALs) throughout this report) are provided in Table 2-1.

[2] The Air Quality Standards Regulations (England) 2010, Statutory Instrument No 1001, The Stationary Office Limited.
[3] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe.
[4] Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004.
[5] Defra, DfT (2017), UK plan for tackling roadside nitrogen dioxide concentrations.
[6] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Defra. July 2007.

Table 2-1
Relevant Ambient AQALs

Pollutant	Standard (µg/m^3)	Measured As	Equivalent percentile
NO_2	40	Annual Mean	-
	200	1-hour Mean	99.79th percentile of 1-hour means (equivalent to 18 1-hour exceedences)
Fine Particle Matter (PM_{10})	40	Annual Mean	-
	50	24-hour mean	90.41th percentile of 24-hour means (equivalent to 35 24-hour exceedences)
Fine Particle Matter ($PM_{2.5}$)	25	Annual Mean	-

Table 2-2
Human Health Relevant Exposure

AQAL Averaging Period	Relevant Locations	AQALs should apply at	AQALs should not apply at
Annual Mean	Where individuals are exposed for a cumulative period of 6-months in a year	Building facades of residential properties, schools, hospitals etc.	Facades of offices Hotels Gardens of residences Kerbside sites
24-hour mean	Where individuals may be exposed for eight hours or more in a day	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure is expected to be short term
1-hour mean	Where individuals might reasonably be expected to spend one hour or longer	As above together with kerbside sites of regular access, car parks, bus stations etc.	Kerbside sites where public would not be expected to have regular access

2.2 Local Air Quality Management

As reinforced within the AQS, Part IV of the Environment Act 1995 induces a statutory duty for local authorities to undergo a process of Local Air Quality Management (LAQM). This requires local authorities to Review and Assess air quality within their boundaries to determine the likeliness of compliance, regularly and systematically.

Where any of the prescribed AQS objectives are not likely to be achieved, the authority must designate an AQMA. For each AQMA, the local authority is required to prepare an Air Quality Action Plan (AQAP), which details measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the objective. AQMAs can give rise to potential constraints to development, or at least a higher degree of scrutiny to air quality assessment work. Local authorities therefore have formal powers to control air quality through a combination of LAQM and through application of wider planning policies.

After a high number of declarations across the UK, it has become standard practice for planning authorities to require an air quality assessment to be carried out for a proposed development.

2.3 Clean Air Strategy

The Clean Air Strategy (CAS)[7], published in 2019, sets out the Government's proposals aimed at delivering cleaner air in England, and also indicates how devolved administrations intend to make emissions reductions. It sets out the comprehensive action that is required from across all parts of government and society to deliver clean air.

2.4 General Nuisance Legislation

Part III of the Environmental Protection Act (EPA) 1990 (as amended) contains the main legislation on Statutory Nuisance and allows LA and individuals to take action to prevent a statutory nuisance. Section 79 of the EPA defines, amongst other things, smoke, fumes, dust, and smells emitted from industrial, trade or business premises so as to be prejudicial to health or a nuisance, as a potential Statutory Nuisance.

Fractions of dust greater than 10µm (i.e. greater than PM_{10}) in diameter typically relate to nuisance effects as opposed to potential health effects and therefore are not covered within the UK AQS. In legislation there are currently no numerical limits in terms of what level of dust deposition constitutes a nuisance.

2.5 Planning Policy

2.5.1 National Policy

The 2021 update to the National Planning Policy Framework[8] (NPPF) sets out planning policy for England. The NPPF states that the planning system should prevent new development from contributing to, or being adversely affected by, unacceptable concentrations of air pollution and development should, wherever possible, help to improve local environmental conditions, such as air quality.

In specific relation to air quality policy, the document states:

Chapter 15 - Conserving and Enhancing the Natural Environment

> *"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."*

The NPPF is accompanied by web based supporting Planning Practice Guidance (PPG) which includes guiding principles on how planning can take account of the impacts of new development on air quality. In regard to air quality, the PPG states:

> *"Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU 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."*
>
> *"Whether or not 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 generate air quality impact in an area where*

[7] The Clean Air Strategy, Defra. January 2019.

[8] National Planning Policy Framework (2021). Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2

air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife)".

The PPG sets out the information that may be required within the context of a supporting air quality assessment, stating that "*assessments should be proportional to the nature and scale of development proposed and the level of concern about air quality* […] *Mitigation options where necessary, will depend on the proposed development and should be proportionate to the likely impact*".

The policies within the NPPF and accompanying PPG in relation to air pollution are considered within this AQA.

2.5.2 Local Policy

GBC's Local Plan[9] sets out the Council's vision for the future by dealing with the key issues of local importance and providing direction to deliver a high quality of life in a sustainable way. Planning applications will be determined against the policies and proposals of the Local Plan.

Policy ID3: Sustainable Transport for New Developments of Guildford Borough Council's Local Plan states the following:

'New development will be required to provide and/or fund the provision of suitable access and transport infrastructure and services that are necessary to make it acceptable, including the mitigation of its otherwise adverse material impacts, within the context of the cumulative impacts of approved developments and site allocations. This mitigation … will address otherwise adverse material impacts on communities and the environment including impacts on … air pollution.'

Within the justification for the policy, the following is stated:

'Development must mitigate its otherwise adverse material impacts, including on traffic, the community and the environment … well designed developments may actively help to enhance air quality and reduce overall emissions, therefore reducing possible health impacts.'

The above policy contained within the Local Plan has been considered within this assessment.

2.6 Assessment Guidance

This assessment has been carried out in accordance with the following principles contained within the guidance documents below.

2.6.1 Local Air Quality Management Technical Guidance (2016)

Department of Environment Food and Rural Affairs (Defra) Local Air Quality Management Technical Guidance (LAQM.TG(16))[10] was published for use by local authorities in their LAQM review and assessment work. The document provides key guidance in aspects of air quality assessment, including screening, model verification, use of monitoring data, and use of background data that are applicable to all air quality assessments.

2.6.2 Land-Use Planning and Development Control: Planning for Air Quality

Environmental Protection UK (EPUK) and the IAQM have together published guidance[11] to help ensure that air quality is appropriately accounted for in the development control process. The guidance clarifies when an air quality assessment should be undertaken, as well as the likely proportional scope, with reference to indicative screening

[9] Guildford Borough Local Plan: Strategy and Sites (2015 – 2034), adopted April 2019.

[10] Local Air Quality Management Technical Guidance (16), Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland. February 2018.

[11] Environmental Protection UK and Institute of Air Quality Management, Land-Use Planning and Development Control: Planning for Air Quality', v1.2 2017.

criteria, and provides a significance criterion for use to evaluate and describe potential developmental impacts and effects.

2.6.3 Construction and Demolition Dust Guidance

Guidance on the assessment of dust from demolition and construction has been published by the IAQM[12]. The guidance provides a series of matrices to determine the risk magnitude of potential dust sources associated with construction activities to identify appropriate mitigation measures that are defined within further IAQM guidance.

[12] Institute of Air Quality Management (IAQM), Guidance on the assessment dust from demolition and construction, v1.1 (2016).

3.0 ASSESSMENT METHODOLOGY

3.1 Construction Phase

The assessment has been undertaken in accordance with IAQM guidance[13]. The assessment of risk is determined by considering the risk of dust effects arising from four activities in the absence of mitigation:

- Demolition;
- Earthworks;
- Construction; and
- Track-out.

The assessment methodology considers three separate dust impacts with account being taken of the sensitivity of the area that may experience these effects:

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

The first stage of the assessment involves a screening to determine if there are sensitive receptors within threshold distances of the site activities associated with the construction phase of the scheme. A detailed assessment is required where a:

- Human receptor is located within 350m of the Site, and/or within 50m of routes used by construction vehicles, up to 500m from the site entrance(s); and/or
- Ecological receptor is located within 50m of the Site, and/or within 50m of routes used by construction vehicles, up to 500m from the site entrance(s).

The dust emission class (or magnitude) for each activity is determined based on the guidance, indicative thresholds and expert judgement. The risk of dust effects arising is based upon the relationship between the dust emission magnitude and the sensitivity of the area. The risk of impact is then used to determine the appropriate mitigation requirements, whereby through effective application residual effects are considered to be 'not significant'.

Given the short-term nature of the construction phase and the comparatively low volume of vehicle movements that will likely arise, there is not considered to be any potential for significant air quality effects from development related road traffic emissions during the construction phase. Such potential effects have therefore been scoped out from requiring detailed assessment based on their assumed insignificant impact.

3.2 Operational Phase Assessment

The operational phase assessment is required to:

- Consider the air quality impacts associated with the Proposed Development on the existing environment (Impact Assessment); and
- Ensure the Site is suitable for residential use (Site Suitability Assessment).

3.2.1 Impact Assessment

The assessment of air quality effects in relation to the Proposed Development's operational phase has been undertaken qualitatively, in accordance with EPUK & IAQM Guidance.

[13] Institute of Air Quality Management (IAQM), Guidance on the assessment dust from demolition and construction, v1.1 (2016).

The EPUK & IAQM guidance provides a series of indicative screening criteria where, if exceeded, a detailed assessment is consequently required. If the Proposed Development is found not to exceed any of the relevant indicative criteria presented, then a detailed impact assessment can be screened out. Impacts, therefore, can be considered as having an insignificant effect on local air quality.

The indicative screening criteria relevant for this assessment is as follows:

- Outside of an AQMA:
  - A change of Light-Duty Vehicle (LDV) flows of more than 500 Annual Average Daily Traffic (AADT); and/or
  - A change of Heavy-Duty Vehicle (HDV) flows of more than 100 AADT.
- Within or adjacent to an AQMA:
  - A change of LDV flows of more than 100 AADT; and/or
  - A change of HDV flows of more than 25 AADT.

3.2.2 Site Suitability Assessment

In relation to road traffic emissions, a Site Suitability Assessment is required to assess the likely exposure that future residents associated with the Proposed Development may experience, to ensure the Site is suitable for residential use. As per the EPUK & IAQM guidance, the Site Suitability assessment is required to consider:

- Background and future baseline air quality and whether this will be likely to approach or exceed an AQAL;
- The presence and location of an AQMA as an indicator of local hotspots where the AQALs may be exceeded; and
- The presence of a heavily trafficked road, with emissions that could give rise to sufficiently high concentrations of pollutants (in particular NO_2), that would cause unacceptably high exposure for users of the new development.

A detailed Site Suitability Assessment has been undertaken using the Cambridge Environmental Research Consultants (CERC) ADMS-Roads v5.0.0.1 dispersion model. The assessment has been informed by guidance published within *LAQM.TG(16)* and modelled concentrations compared to the relevant AQAL.

The assessment has focussed on concentrations of NO_2, PM_{10} and $PM_{2.5}$ for the following scenarios:

- 2019 Baseline (2019 BC) – Base flows for 2019 to allow for verification of the ADMS-Roads model; and
- 2024 Do Something (2024 DS) – Adjusted base flows to the opening year of the development (2024).

Details of model inputs are discussed in turn, below, whereas advanced inputs are presented in Appendix A.

3.2.3 Traffic Inputs

The ADMS-Roads assessment incorporates numbers of road traffic vehicles, vehicle speeds and the composition of the traffic fleet.

Traffic data was provided by Curtins – the appointed transport consultant. Traffic speeds were modelled at the relevant speed limit for the assessed road. However, where appropriate, the speeds have been reduced to simulate queues at junctions, traffic lights and other locations where queues or slower traffic are known to be an issue in accordance with LAQM.TG(16). Traffic speeds have been assumed to be consistent across all of the modelled scenarios.

The Emissions Factors Toolkit (EFT) version 10.1 developed by Defra[14] has been used to determine vehicle emission factors for input into the ADMS-Roads dispersion model.

Details of the traffic flows used in this assessment are provided in Table A-2 in Appendix A, whilst the modelled roads in relation to the Site are presented in Figure 4-1.

3.2.4 Meteorological Data

To calculate pollutant concentrations at identified sensitive receptor locations the dispersion model uses sequential hourly meteorological data, including wind direction, wind speed, temperature, cloud cover and stability, which exert significant influence over atmospheric dispersion.

The dispersion modelling has been undertaken using 2019 data from the Farnborough meteorological station, located approximately 14km to the north-west of the Site – the closest representative meteorological station relative to the Site.

LAQM.TG(16) recommends that meteorological data should have a percentage of usable hours greater than 85%. 2019 meteorological data from Farnborough meteorological station includes 8,760 lines of usable hourly data for the year, i.e. 100% usable data. This is therefore suitable for the dispersion modelling exercise.

A wind rose is presented in Figure 3-1.

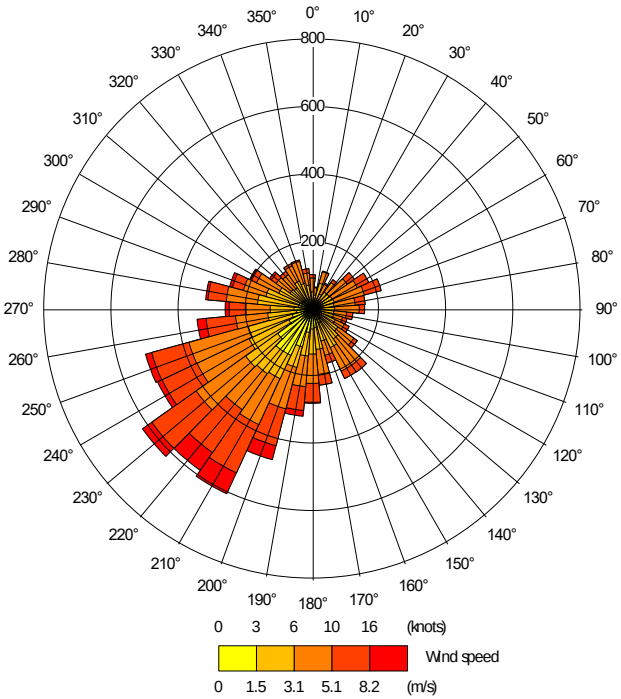

Figure 3-1
Wind rose for Farnborough Meteorological Station (2019)

[14] Defra, EFT v10.1 (2020). https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html.

3.2.5 Background Concentrations

GBC operate an 'urban background' passive NO_2 diffusion tube within Guildford (ref. GD 3 – Josephs Road). However, as the monitoring equipment is situated in north Guildford, approximately 1.5km from the Site, within relatively close proximity to the A25 and A3 (approximately 105m to the A25 and 225m to the A3 at the closest point), it is considered that the location is not representative of the Site.

Therefore, in the absence of locally representative background monitoring sites, annual mean background concentrations used for the purpose of the assessment have been obtained from the Defra supplied background maps (2018 reference year)[15], based on the 1km grid square which covers the modelled area. Further detail on these datasets can be found in Section 4.0.

3.2.6 Sensitive Receptors

Future onsite receptors considered in the assessment of emissions from road traffic are shown Table 3-1 and Figure 4-1. The receptors, PSR 1 – PSR 18, have been selected at the locations of worst-case exposure on the Site relative to the surrounding modelled road network and proposed Site layout.

All receptors were considered in relation to exposure at breathing height relative to the adjacent modelled road. Receptor locations represent relevant exposure – in accordance with LAQM.TG(16) presented in Table 2-2.

Table 3-1
Receptor Locations Considered

Receptor	Location	X	Y	Height (m)
PSR 1	Representative of north-western façade of block A	499364	149307	0[i]
				1.5[ii]
				4[iii]
				6.5[iv]
PSR 2		499349	149276	0[i]
				1.5[ii]
				4[iii]
				6.5[iv]
PSR 3	Representative of north-western corner of block D	499338	149251	0[i]
				1.5[ii]
				4[iii]
				6.5[iv]
PSR 4	Representative of south-eastern façade of block A	499378	149298	1.5[ii]
				20[v]
PSR 5		499365	149268	1.5[ii]
				20[v]
PSR 6	Representative of eastern façade of block D	499348	149245	1.5[ii]
				20[v]

Notes:
[i] Representative of the lower-ground floor

[15] Background mapping data for local authorities – http://uk-air.defra.gov.uk/data/laqm-background-home.

Receptor	Location	X	Y	Height (m)
[ii] Representative of ground floor [iii] Representative of upper-ground floor [iv] Representative of first floor [v] Representative of roof level				

3.2.7 Model Outputs

The background pollutant values discussed in Section 4.0 have been used in conjunction with the concentrations predicted by the ADMS-Roads model to calculate predicted total annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ for each respective scenario.

For the prediction of annual mean NO_2 concentrations for all modelled scenarios at receptor locations, the road NO_x contributions (adjusted as per Appendix A) have been converted to total NO_2 following the methodology in LAQM.TG(16) using the latest version of Defra's NO_x to NO_2 conversion tool (v8.1)[16]. The modelled NO_2 road contribution was then added to the appropriate NO_2 background concentration value to obtain an overall total annual mean NO_2 concentration.

For the prediction of short-term NO_2 impacts, LAQM.TG(16) advises that it is valid to assume that exceedences of the 1-hour mean AQAL for NO_2 are unlikely to occur where the annual mean NO_2 concentration is <60µg/m^3. This approach has thus been adopted for the purposes of this assessment, at relevant receptor locations with an applicable exposure period.

For the prediction of short-term PM_{10}, LAQM.TG(16) provides an empirical relationship between the annual mean and the number of exceedences of the 24-hour mean AQAL for PM_{10} that can be calculated as follows:

$$\text{No. 24-hour mean exceedences} = -18.5 + 0.00145 \times \text{annual mean}^3 + (206/\text{annual mean})$$

This relationship has thus been adopted to determine whether exceedences of the short-term PM_{10} AQAL are likely in this assessment.

Verification of the ADMS-Roads road assessment has been undertaken, as per Appendix A. All results presented in the assessment are those calculated following the process of model verification, using an adjustment factor of 2.4907 for NO_2, PM_{10} and $PM_{2.5}$.

3.2.8 Assessing Significance

To determine the significance of predicted air quality impacts based upon a site-suitability assessment, the EPUK & IAQM guidance states:

> *"Where the air quality is such that an air quality objective at the building façade is not met, the effect on residents or occupants will be judged as significant, unless provision is made to reduce their exposure by some means."*

As such, comparison of modelled pollutant concentrations at future exposure locations on-Site have been compared with the relevant AQALs to determine suitability and significance.

3.2.9 Uncertainty

Dispersion modelling is inherently uncertain and is principally reliant on the accuracy and representativity of its inputs. In acknowledgement of this, the ADMS-Roads dispersion model has been verified with the latest publicly available local monitoring data, as collected by GBC.

[16] Defra NO_x to NO_2 Calculator v8.1 (2020), available at https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc.

In addition, there is a widely acknowledged disparity between NO_2 emission factors and ambient NO_2 monitoring data[17]. To help minimise any associated uncertainty when forming conclusions from the results, this assessment has (i) utilised the latest EFT version 10.1, utilising COPERT 5.3 emission factors, and associated tools/datasets published by Defra and (ii) included a sensitivity analysis which assumes no improvement in 2019 baseline background NO_x / NO_2 concentrations, fleet composition or vehicle emission factors.

[17] Carslaw, et al. (2011). Trends in NO_x and NO_2 emissions and ambient measurements in the UK.

4.0 BASELINE ENVIRONMENT

4.1 Baseline Air Quality

4.1.1 LAQM Review and Assessment

The Site is located within the jurisdiction of GBC. The latest publicly available Annual Status Report (ASR) for the Council at the time of writing is the 2020 GBC ASR[18]. This ASR has been consulted to determine existing baseline air quality conditions, relative to the preceding five years' monitoring (i.e. 2020 ASR includes monitoring data for the period 2015 - 2019), where available.

As part of statutory LAQM obligations, GBC annually reviews and assesses concentrations of key air pollutants in the area to ascertain the requirement, or otherwise, to declare an AQMA. As a result of the process, GBC presently have two declared AQMAs. The nearest AQMA relative to the Site (Shalford AQMA), declared for exceedance of the annual mean NO_2 objective, is located approximately 1.6km south-east of the Site within Shalford. Therefore, the Site is not situated within a known area of air quality concern.

However, it is noted that, following initial evidence of potential air quality exceedences through diffusion tube monitoring, GBC will be progressing detailed assessment works for Guildford town centre and the road gyratory system. It is noted that the A3100 Portsmouth Road, adjacent to the Site, is included within the study area for the detailed assessment and that the area comprising the site / local road network may form part an AQMA in the near future. However, at this stage, the extent of any AQMA declaration relative to the Site is unknown.

4.1.2 Review of Air Quality Monitoring

Automatic Air Quality Monitoring

GBC do not currently undertake automatic air quality monitoring within their administrative area. Furthermore, there are no automatic monitoring locations situated within Guildford as part of DEFRA's Automatic Urban and Rural Network.

Passive Diffusion Tube Monitoring

Passive NO_2 diffusion tube monitoring is currently undertaken by GBC, within their administrative area, at numerous locations – in fulfilment of their statutory LAQM obligations.

The details and results of the monitoring locations of relevance to the Site are presented in Table 4-1 and Table 4-2 respectively, whilst their locations are illustrated in Figure 4-1. All monitoring results presented have been ratified and adjusted (where necessary) by GBC.

Table 4-1
LAQM Diffusion Tube Monitoring Sites: Details

Site ID	Site Location	Site Type	NGR (m)		Height (m)	Within AQMA	Approximate Distance to Site (m)
			X	Y			
PR 1	Wycliffe Buildings	Roadside*	499317	149213	2.14	No	35
PR 3	Oppo The Cannon	Roadside*	499360	149326	2.57	No	25

* Roadside classification defined as: *A site sampling typically within 1-5 meters of the kerb of a busy road (although distance can be up to 15m from the kerb in some cases) – LAQM.TG(16).*

[18] Guildford Borough Council (GBC), 2020 Annual Status Report (July 2020).

Table 4-2
LAQM Diffusion Tube Monitoring Sites: Results

Site ID	2019 Data Capture %	Annual Mean NO_2 Concentration (µg/m^3)				
		2015	2016	2017	2018	2019
PR 1	100	-	-	-	41	36
PR 3	100	-	-	-	-	28
Note: Data for PR 1 available for 2018 and 2019 only. Data for PR 3 available for 2019 only.						

In 2019, both non-automatic monitoring locations reported NO_2 annual mean concentrations to be below the AQAL (40µg/m^3) for the period assessed. It is noted, however, that in 2018 PR 1 recorded an annual mean NO_2 concentration just above the annual mean AQAL. Both monitoring locations are considered to be representative of the Site.

The empirical relationship given in LAQM.TG(16) states that exceedences of the 1-hour mean AQAL for NO_2 is unlikely to occur where annual mean concentrations are <60µg/m^3. This indicates that an exceedence of the 1-hour mean AQAL is unlikely to have occurred at these monitoring sites between 2018 and 2019.

GBC also operate an 'urban background' passive NO_2 diffusion tube within Guildford (ref. GD 3 – Josephs Road). However, as the monitoring equipment is situated in north Guildford, approximately 1.5km from the Site, within relatively close proximity to the A25 and A3 (approximately 105m to the A25 and 225m to the A3 at the closest point), it is considered that the location is not representative of the Site.

4.1.3 Defra Mapped Background Concentrations

Defra maintains a nationwide model of existing and future background air quality concentrations at a 1km grid square resolution which is routinely used to support LAQM requirements and air quality assessments. The data sets include annual average concentration estimates for NO_x, NO_2, PM_{10} and $PM_{2.5}$ using a base year of 2018 (the year in which comparisons between modelled and monitoring are made)[19].

The Defra mapped annual mean background concentrations for 2019 and 2024 (i.e. the modelled scenarios, see 3.2.2) are presented in Table 4-3. All of the mapped background concentrations presented are well below the respective annual mean AQALs.

Table 4-3
Defra Background Pollutant Concentrations

Grid Square (X, Y)	Year	Annual Mean Background Concentration (µg/m^3)			
		NO_X	NO_2	PM_{10}	$PM_{2.5}$
499500, 149500	2019	24.2	17.3	15.2	10.5
	2024	19.5	14.3	14.2	9.7
AQAL		**-**	***40***	***40***	***25***

[19] Defra Background Maps (2018 Reference)

Figure 4-1
Local Monitoring Locations, Modelled Receptor Locations and Modelled Road Links

5.0 CONSTRUCTION PHASE ASSESSMENT

This section presents the potential air quality impacts and effects associated with the construction of the Proposed Development.

5.1 Construction Dust Assessment

Where figures relating to area of the site, volume of the site, approximate number of construction vehicles or distances to receptors are given, these relate to thresholds as defined in the IAQM guidance to guide the assessor to define the dust emissions magnitude and sensitivity of the area.

5.1.1 Assessment Screening

As shown in Figure 5-1, there are 'human receptors' within 350m of the Site but no designated habitat sites within 50m of the Site boundary or up to 200m of the Site entrance(s) / 50m of the roads anticipated to experience construction traffic movements. Therefore, an assessment of construction dust on human receptors is required only.

5.1.2 Potential Dust Emissions Magnitude

Demolition

The Site is currently a vacant brownfield site with no buildings or structures that require demolition, with the exception of a small outhouse. As such, impacts associated with demolition have been screened out of this assessment.

Earthworks

The Proposed Development comprises a co-living complex, consisting of 25% communal studios and 75% studios, and associated infrastructure. The total Site area is between 2,500 and 10,000m^2. Consistent with a phased approach to construction, the number of heavy earth moving vehicles is considered to be less than 10 at any one time. The dust emission magnitude for earthworks is therefore initially considered to be 'medium'.

Construction

Construction activities at the Site will include a total building volume expected to be greater than 100,000m^3. The dust emission magnitude for construction is therefore initially considered to be 'large'.

Trackout

Construction vehicles will access the Site via the A3100 or Bury Street. Details are unavailable at the time of the assessment on the number of additional HDV movements associated with the construction works. However, it is considered unlikely that the outward HDV movements will be greater than 50 on a worst-case day. The dust emission magnitude for trackout is therefore initially considered to be 'medium'.

Summary

A summary of the anticipated dust emission magnitude for the relevant activities is detailed in Table 5-1.

Table 5-1
Potential Dust Emission Magnitude

Activity	Dust Emission Magnitude
Earthworks	Medium
Construction	Large
Trackout	Medium

5.1.3 Sensitivity of the Area

Dust Soiling Impacts

The Site is situated within a suburban location, with both commercial and residential premises located within close proximity. Overall, there are estimated to be between 10 and 100 highly sensitive residential receptors within 20m of the Site and more than 100 receptors within 50m. There are also more than 100 residential properties located less than 20m from the access route(s) within 200m of the Site entrance (assumed to be off the A3100 in accordance with a conservative approach) - commensurate of a medium site[20].

The sensitivity of the area with respect to dust soiling effects on people and property in relation to earthworks, construction and trackout is therefore considered to be 'high'.

Human Health Impacts

The 2021 mapped background PM_{10} concentration (2018 reference year) for the $1km^2$ grid square for the Site is estimated to be 14.17µg/m³ (i.e. falls into the <24µg/m^3 class). No local background automatic monitoring exists within the development locale.

Given the above information regarding the number of residential receptors within 20m of the Site boundary and within 20m of the identified worst-case trackout route along the A3100, the sensitivity of the area with respect to human health impacts in relation to earthworks and construction is therefore considered to be 'low'. The sensitivity of the area with respect to human health impacts in relation trackout is considered to be 'medium'.

Summary

A summary of the sensitivity of the surrounding area is detailed in Table 5-2, whilst the spatial density of nearby receptors is provided in Figure 5-1.

Table 5-2
Sensitivity of the Area

Potential Impact	Sensitivity of Surrounding Area		
	Earthworks	Construction	Trackout
Dust Soiling Impacts	High	High	High
Human Health Impacts	Low	Low	Medium

5.1.4 Risk of Impacts (Unmitigated)

The outcome of the assessment of the potential 'magnitude of dust emissions', and the 'sensitivity of the area' are combined in Table 5-3 below to determine the risk of impact which is used to inform the selection of appropriate mitigation.

Table 5-3
Risk of Dust Impacts

Potential Impact	Earthworks	Construction	Trackout
Dust Soiling Impacts	Medium Risk	High Risk	Medium Risk
Human Health Impacts	Low Risk	Low Risk	Low Risk

Following the construction dust assessment, the Site is found to be at worse a 'High Risk' in relation to dust soiling effects on people and property, and 'Low Risk' in relation to human health impacts. However, potential dust effects

[20] As per the IAQM's 'Guidance on the Assessment of Dust from Demolition and Construction', without site-specific mitigation, trackout may occur along the public highway up to 500m from large sites, 200m from medium sites and 50m from small sites (determined by the calculated trackout dust emission magnitude), as measured from the site exit.

during the construction phase are considered to be temporary in nature and may only arise at particular times (i.e. certain activities and/or meteorological conditions).

Nonetheless, commensurate with the above designation of dust risk, mitigation measures, as identified by IAQM guidance are required to ensure that any potential impacts arising from the construction phase of the Proposed Development are reduced and, where possible, completely removed. In accordance with IAQM guidance, providing effective mitigation measures are implemented, such as those outlined in Section 7.1, construction dust effects are considered to be 'not significant'.

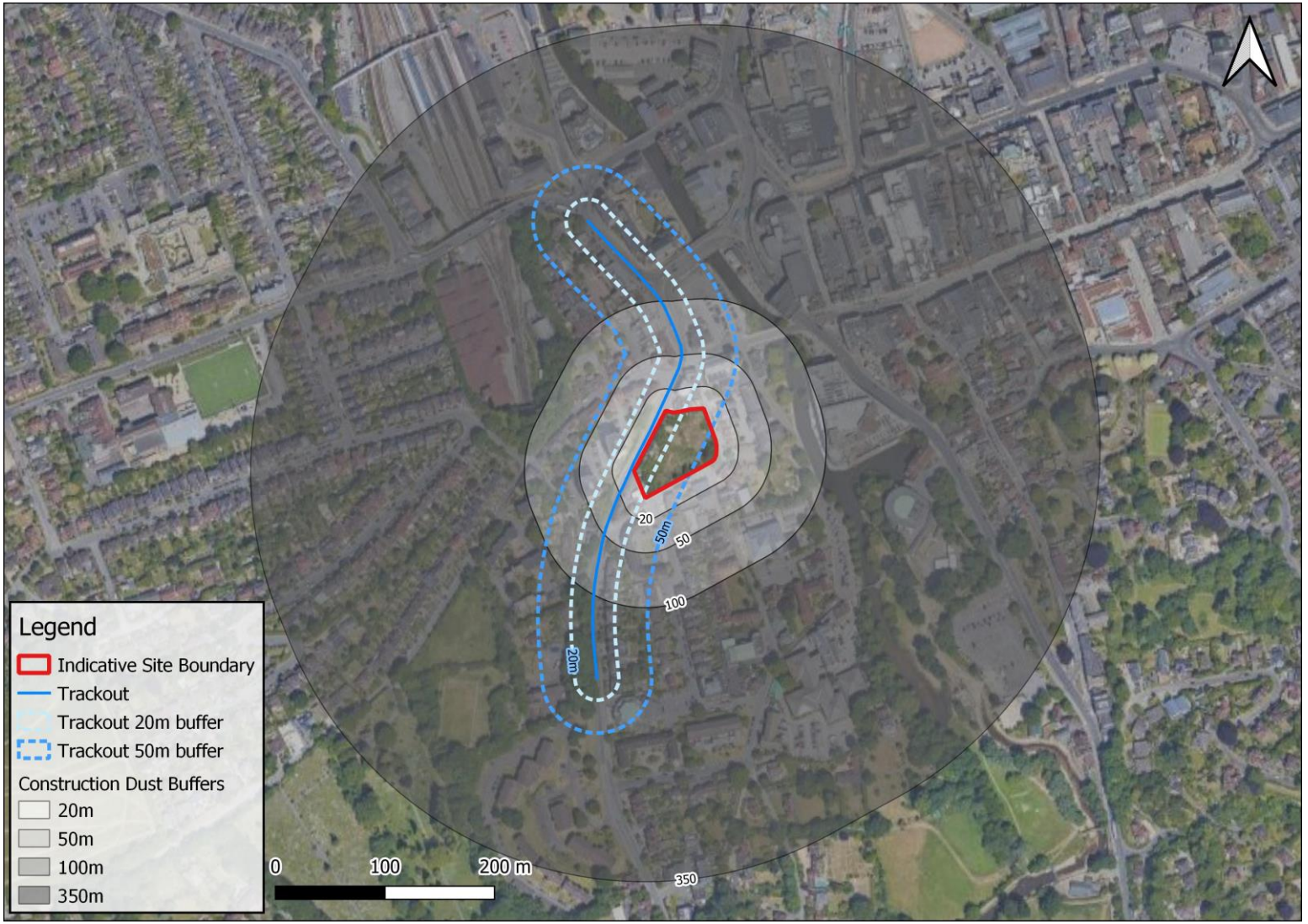

Figure 5-1
Construction Dust Assessment Buffers

6.0 OPERATIONAL PHASE ASSESSMENT

This section presents the potential air quality impacts and effects associated with the operation of the Proposed Development.

6.1 Impact Assessment

The Proposed Development will provide only six onsite car parking bays and it is understood, from the appointed transport consultant Curtins, that the primary generator of vehicle trips will be associated with service and delivery vehicles. Therefore, Curtins confirmed that the 24-hour AADT trip generation for the Proposed Development will fall below the following EPUK & IAQM indicative air quality assessment screening criteria[21]:

- Within or adjacent to an AQMA:
  - A change of LDV flows of more than 100 AADT; and/or
  - A change of HDV flows of more than 25 AADT.

Although the Site is not currently situated within an AQMA, it is understood that the area of the Site / adjacent road network is likely to form part an AQMA in the near future[22]. Therefore, it is considered appropriate and precautionary to compare the Proposed Development's trip generation to the more stringent screening criteria for AQMAs. As the trip generation for the Proposed Development falls below the EPUK & IAQM screening criteria for AQMAs, potential impacts associated with the development are considered to have an insignificant effect on local air quality.

6.2 Site Suitability Assessment

The results of the Site Suitability Assessment are presented in Table 6-1, Table 6-2 and Table 6-3. To help minimise any associated uncertainty when forming conclusions from the results, this assessment has utilised the latest EFT version 10.1, utilising COPERT 5.3 emission factors, and associated tools/datasets published by Defra. Furthermore, a sensitivity analysis has also been undertaken which assumes no improvement in 2019 baseline background NO_x / NO_2 concentrations, fleet composition or vehicle emission factors (see Appendix B).

6.2.1 NO_2 Modelling Results

Table 6-1 presents the annual mean NO_2 concentrations predicted at all assessed receptor locations for the 2024 DS scenario.

Table 6-1
Predicted Annual Mean NO_2 Concentrations – 2024 Development Opening Year

Receptor	Modelled Height (m)	Predicted Annual Mean NO_2 Concentration (µg/m^3)	% of 2024 DS Relative to AQAL
		2024 DS	
PSR 1	0	30.0	75.0
	1.5	27.5	68.8
	4	20.0	49.9
	6.5	16.9	42.1
PSR 2	0	30.0	75.0

[21] Environmental Protection UK and Institute of Air Quality Management, Land-Use Planning and Development Control: Planning for Air Quality', v1.2 2017.

[22] Email consultation with Gary Durrant of GBC, dated 21st to 22nd July 2021.

Receptor	Modelled Height (m)	Predicted Annual Mean NO_2 Concentration (µg/m^3)	% of 2024 DS Relative to AQAL
		2024 DS	
	1.5	27.5	68.8
	4	19.9	49.8
	6.5	16.8	42.1
PSR 3	0	29.7	74.3
	1.5	27.3	68.2
	4	19.9	49.7
	6.5	16.8	42.0
PSR 4	1.5	19.1	47.7
	20	14.6	36.5
PSR 5	1.5	18.8	47.1
	20	14.6	36.5
PSR 6	1.5	20.0	50.0
	20	14.6	36.4

The maximum predicted annual mean NO_2 concentration (2024 DS), at all receptors newly introduced by the Proposed Development, is at Receptor PSR 1 / PSR 2. The maximum predicted concentration is 30.0µg/m^3, which represents 75% of the AQAL. PSR 1 and PSR 2 are representative of the north-western façade of block A, immediately adjacent to the A3100 Portsmouth Road.

To determine the overall significance with respect to the suitability of the Site for future occupants and likely exposure to pollutant concentrations, the EPUK & IAQM guidance states: *"Where the air quality is such that an air quality objective at the building façade is not met, the effect on residents or occupants will be judged as significant, unless provision is made to reduce their exposure by some means."*

As the maximum predicted annual mean NO_2 concentration is below the annual mean AQAL, it is considered that the effects associated with annual mean NO_2 concentrations at all assessed Site receptor locations are considered to be 'not significant'.

The empirical relationship given in LAQM.TG(16) states that exceedences of the 1-hour mean NO_2 AQAL are unlikely to occur where annual mean concentrations are <60µg/m^3. Annual mean NO_2 concentrations predicted at all receptor locations are well below this limit. Therefore, it is unlikely that an exceedence of the 1-hour mean AQAL will occur. Effects associated with likely 1-hour mean NO_2 concentrations at all assessed Site receptor locations are therefore considered to be 'not significant'.

6.2.2 PM_{10} Modelling Results

Table 6-2 presents the annual mean PM_{10} concentrations predicted at all assessed receptor locations of relevant exposure for the 2024 DS scenario.

Table 6-2
Predicted Annual Mean PM_{10} Concentrations – 2024 Development Opening Year

Receptor	Modelled Height (m)	Predicted Annual Mean PM_{10} Concentration (µg/m^3)	% of 2024 DS Relative to AQAL
		2024 DS	
PSR 1	0	19.2	48.1

Receptor	Modelled Height (m)	Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)	% of 2024 DS Relative to AQAL
		2024 DS	
	1.5	18.4	46.0
	4	15.9	39.8
	6.5	14.9	37.4
PSR 2	0	19.3	48.1
	1.5	18.4	46.0
	4	15.9	39.8
	6.5	14.9	37.4
PSR 3	0	19.2	47.9
	1.5	18.3	45.8
	4	15.9	39.7
	6.5	14.9	37.3
PSR 4	1.5	15.6	39.1
	20	14.3	35.7
PSR 5	1.5	15.6	38.9
	20	14.3	35.7
PSR 6	1.5	15.9	39.8
	20	14.3	35.6

The maximum predicted annual mean PM_{10} concentration (2024 DS), at all receptors newly introduced by the Proposed Development, is at Receptor PSR 2. The maximum predicted concentration is 19.3µg/m^3, which represents 48% of the AQAL.

As the maximum predicted annual mean PM_{10} concentration is below the annual mean AQAL, it is considered that the effects associated with annual mean PM_{10} concentrations at all assessed Site receptor locations are considered to be 'not significant'.

Based upon the maximum predicted annual mean PM_{10} concentration of 19.3µg/m^3, this equates to less than 3 days where 24-hour mean PM_{10} concentrations are predicted to be greater than 50µg/m^3. This is well below the 35 permitted exceedences, and therefore the number of maximum exceedences is in compliance with the 24-hour mean AQAL. Effects associated with likely 24-hour mean PM_{10} concentrations at all assessed Site receptor locations are therefore considered to be 'not significant'.

6.2.3 $PM_{2.5}$ Modelling Results

Table 6-3 presents the annual mean $PM_{2.5}$ concentrations predicted at all assessed receptor locations of relevant exposure for the 2024 DS scenario.

Table 6-3
Predicted Annual Mean $PM_{2.5}$ Concentrations – 2024 Development Opening Year

Receptor	Modelled Height (m)	Predicted Annual Mean $PM_{2.5}$ Concentration ($\mu g/m^3$)	% of 2024 DS Relative to AQAL
		2024 DS	
PSR 1	0	12.6	50.3

Receptor	Modelled Height (m)	Predicted Annual Mean $PM_{2.5}$ Concentration (µg/m^3)	% of 2024 DS Relative to AQAL
		2024 DS	
	1.5	12.1	48.4
	4	10.7	42.9
	6.5	10.2	40.7
PSR 2	0	12.6	50.3
	1.5	12.1	48.4
	4	10.7	42.9
	6.5	10.2	40.7
PSR 3	0	12.5	50.1
	1.5	12.1	48.2
	4	10.7	42.8
	6.5	10.2	40.7
PSR 4	1.5	10.6	42.2
	20	9.8	39.2
PSR 5	1.5	10.5	42.1
	20	9.8	39.2
PSR 6	1.5	10.7	42.9
	20	9.8	39.2

The maximum predicted annual mean $PM_{2.5}$ concentration (2024 DS), at all receptors newly introduced by the Proposed Development, is at Receptor PSR 1 / PSR 2. The maximum predicted concentration is 12.6µg/m^3, which represents 50% of the AQAL.

As the maximum predicted annual mean $PM_{2.5}$ concentration is below the annual mean AQAL, it is considered that the effects associated with annual mean $PM_{2.5}$ concentrations at all assessed Site receptor locations are considered to be 'not significant'.

7.0 MITIGATION MEASURES

This section presents any proportionate mitigation measures required during the construction and operational phases of the Proposed Development.

7.1 Construction Dust Phase

As discussed in Section 5.1, construction impacts associated to the Proposed Development would result in the generation of dust and PM_{10}.

IAQM guidance outlines a number of site-specific mitigation measures based on the assessed site risk. The measures are grouped into those which are highly recommended and those which are desirable. With the effective application of the dust mitigation measures, as detailed in Table 7-1, residual effects are considered 'not significant'. It is understood that the previous planning consent for the Site included a Construction Phase Management Plan, approved by GBC, and that it is likely that a similar approach would be followed for the construction phase of the Proposed Development.

Table 7-1
Construction Dust Mitigation Measures

Site Application	Mitigation Measures
Highly Recommended	
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 document. The desirable measures should be included as appropriate for the site.
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.
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 a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during earthworks and construction.
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 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.
Preparing and Maintaining the Site	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
	Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
	Fully enclose site or specific operations where there is a high potential for dust production and the site is actives 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.
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 offsite, and the action taken to resolve the situation in the logbook.
	Hold regular liaison meetings with other high risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport deliveries which might be using the same strategic road network routes.
	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 to leaving the site where reasonably practicable).
	Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
	Access gates to be located at least 10m from receptors where possible.
Waste Management	Avoid bonfires and burning of waste materials.
Desirable	
Construction	Avoid scabbling (roughening of concrete surfaces) if possible.
	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 power materials ensure bags are sealed after use and stored appropriately to prevent dust.
Earthworks	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
	Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable
	Only remove the cover in small areas during work and not all at once.
Monitoring	Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100m of site boundary, with cleaning to be provided if necessary.
	With respect to operating vehicle/machinery and sustainable travel:
	Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).

7.2 Operational Phase

The operational phase impact assessment concluded that road traffic impacts associated with the operation of the Site can be considered as having an insignificant effect on local air quality. However, it is understood that fast (7kw) EV charging infrastructure will be installed at 20% of the onsite parking bays with a further 20% of the bays serviced with a power supply to provide additional EV charging in the future should demand require.

The Site Suitability Assessment identified that NO_2, PM_{10} and $PM_{2.5}$ concentrations at the Site are anticipated to be below the relevant AQALs within the Proposed Development's opening year of 2024. However, as discussed within Section 3.2.9, there is a widely acknowledged disparity between NO_2 emission factors and ambient NO_2 monitoring data and as such a sensitivity analysis has been undertaken which assumes no improvement in 2019 baseline background NO_x / NO_2 concentrations, fleet composition or vehicle emission factors (see Appendix B).

Whilst considered to comprise a markedly conservative approach, and recent evidence suggests that the current version of the EFT can be relied upon to predict the mostly likely situation in the future[23], the sensitivity analysis indicated that NO_2 concentrations at the north-western façade of block A, as well as the north-western corner of block D, may approach or slightly exceed the annual mean AQAL at ground floor height.

Whilst care has to be taken drawing conclusions from the sensitivity analysis results, particularly as the results of the Site Suitability Assessment predicted no exceedences of the relevant AQALs in 2024, it is recommended that, in accordance with the latest draft guidance for Building Regulations[24], the air intake for the proposed mechanical ventilation system at buildings A and D is (i) placed on a façade away from the A3100 (i.e. located on the opposing façade of the building) and (ii) placed as high off the ground as possible.

Where it is not possible to source air for the ventilation system from a façade away from the A3100 for blocks A and D, it is recommended that all air is taken at a height no lower than the upper-ground floor (i.e. at least 4m from the ground). Where air is sourced at a height lower than the upper-ground floor / 4m from the ground, along the façades of blocks A and D closest to the A3100, NO_x filtration should be applied. All NO_x filters will need to be selected, installed and maintained appropriately.

[23] Air Quality Consultants, Comparison of EFT v10 with EFT v9 (2020)

[24] Approved Document F – Ventilation, Volume 1: Dwellings, Consultation Version (2021)

It is understood that the proposed ventilation system, for Blocks A and D, will be required to source air from façades situated close / adjacent to the A3100. Therefore, on these façades, NO_x filtration will be applied for all air intakes lower than 4m from the ground. On this basis, it is considered that the proposed ventilation system will be sufficient from an air quality perspective as long as the NO_x filters are selected, installed and maintained appropriately for the lifetime of the development.

8.0 CONCLUSIONS

SLR Consulting Ltd has been commissioned by Tiger Developments Ltd to undertake an air quality assessment to support a planning application for a proposed co-living complex comprising a mix of 25% communal studios and 75% studios, on land to the east of the A3100 Portsmouth Road, Guildford.

8.1 Construction Phase

A qualitative assessment of the potential dust impacts during the construction of the development has been undertaken following IAQM guidance.

Following the construction dust assessment, the Site is found to have at worse 'High Risk' in relation to dust soiling effects on people and property, and 'Low Risk' in relation to human health impacts. Providing mitigation measures are implemented, such as those outlined in Section 7.1 of this report, residual impacts from dust emissions during the construction phase would be 'not significant'.

Given the short-term nature of the construction phase, there is predicted to be an insignificant effect on air quality from construction-generated vehicle emissions.

8.2 Operational Phase

The Proposed Development is expected to generate road traffic volumes below the relevant EPUK & IAQM 'indicative criteria for assessment'. As such, road traffic impacts associated with the operation of the Site can be considered as having an insignificant effect on local air quality.

The Site Suitability Assessment identified that NO_2, PM_{10} and $PM_{2.5}$ concentrations at the Site are anticipated to be below the relevant AQALs within the Proposed Development's opening year of 2024. However, as the corresponding sensitivity analysis indicated that NO_2 concentrations at the north-western façade of block A, as well as the north-western corner of block D, may approach or slightly exceed the annual mean AQAL at ground floor height it is recommended that, in accordance with the latest draft guidance for Building Regulations[25], the air intake for the proposed mechanical ventilation system at buildings A and D is (i) placed on a façade away from the A3100 (i.e. located on the opposing façade of the building) and (ii) placed as high off the ground as possible.

Where it is not possible to source air for the ventilation system from a façade away from the A3100 for blocks A and D, it is recommended that all air is taken at a height no lower than the upper-ground floor (i.e. at least 4m from the ground). Where air is sourced at a height lower than the upper-ground floor / 4m from the ground, along the façades of blocks A and D closest to the A3100, NO_x filtration should be applied. All NO_x filters will need to be selected, installed and maintained appropriately.

It is understood that the proposed ventilation system, for Blocks A and D, will be required to source air from façades situated close / adjacent to the A3100. Therefore, on these façades, NO_x filtration will be applied for all air intakes lower than 4m from the ground. On this basis, it is considered that the proposed ventilation system will be sufficient from an air quality perspective as long as the NO_x filters are selected, installed and maintained appropriately for the lifetime of the development.

[25] Approved Document F – Ventilation, Volume 1: Dwellings, Consultation Version (2021).

APPENDIX A – Advanced Model Input and Verification

Advanced Model Input Summary

Advanced modelling input parameters used are summarised in Table A-1.

Table A-1
Summary of Advanced Modelling Inputs

Parameter	Description	Input Variable
Surface Roughness	Surface roughness of the modelling domain as a function of land use	A roughness length z0 of 0.5m was used to represent the surface roughness of the principal study area. This value relates to 'parkland and open suburbia' and is reflective of the principal study area. In addition, a roughness length z0 of 0.02m was used to represent the surface roughness of the meteorological site. This value relates to 'open grassland', reflective of the open space setting of Farnborough meteorological station.
Gradients	Inclusion of gradients	Where appropriate, gradients for the A3100 Portsmouth Road have been calculated and incorporated within the ADMS-Roads dispersion model.
Urban Street Canyons	Inclusion of street canyons	No street canyons were included within the ADMS-Roads dispersion model.

Traffic Data

Table A-2 details the traffic data used within the assessment.

Table A-2
Traffic Data Used Within the Assessment

Link	2019 BC		2024 DS		Speed (kph) [A]
	AADT	% HDV	AADT	% HDV	
A3100 Portsmouth Road	13,786	3.2	14,781	3.3	48

Note:
[A] Speeds based upon National Speed Limits. Traffic speeds have been adjusted to take into account queues and congestion in accordance with LAQM.TG(16).

Model Verification

The ADMS-Roads dispersion model has been widely validated for this type of assessment and is specifically listed in the Defra's LAQM.TG(16) guidance as an accepted dispersion model.

Model validation undertaken by the software developer (CERC) will not likely have included validation in the vicinity of the Site. It is therefore necessary to perform a comparison of modelled results with local monitoring data at relevant locations. This process of verification attempts to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results.

Prior to undertaking model verification, model setup parameters and input data were reviewed to maximise the performance of the dispersion model in relation to the real-world conditions.

NO_x / NO_2 Verification Calculations

For NO_x/NO_2 model verification, 2019 LAQM GBC monitoring data has been used (Table A-3).

Table A-3
Local Monitoring Data Available for Model Verification

Site ID	X	Y	2019 Monitored NO_2 Concentration (µg/m^3)	2019 Data Capture (%)
PR 1	499317	149213	36	100.0
PR 3	499360	149326	28	100.0

NO_x / NO_2 verification relates to the comparison and adjustment of modelled road-NO_x (as output from the ADMS-Roads dispersion model) relative to monitored road-NO_x.

As NO_2 concentrations are solely reported using diffusion tubes, NO_x was back calculated using the latest version of Defra's NO_x to NO_2 Calculator (v8.1). The NO_x to NO_2 Calculator was also used to facilitate the conversion of modelled road-NO_x (as output from the ADMS-Roads dispersion model) into road-NO_2.

Verification was completed using the 2019 Defra background mapped concentrations (2018 base year) for the relevant 1km x 1km grid square (i.e. the square within which the model verification locations are located).

Comparison of the modelled vs. monitored road NO_x/NO_2 contribution at the relevant verification locations is provided in Table A-4. An adjustment factor of 2.4907 has been derived, based on a linear regression forced through zero, as shown in Figure B-1. No further improvement to the ADMS-Roads dispersion model could be achieved.

Table A-4
NO_x / NO_2 Model Verification (2.4907)

Site ID	Monitored Road NOx (µg/m^3)	Modelled Road NOx (µg/m^3)	Ratio (Monitored vs. Modelled Road NO_x)	Adjustment Factor	Adjusted Modelled Total NO_2 (µg/m^3)	Monitored Total NO_2 (µg/m^3)	% Difference (Adjusted Modelled NO_2 vs Monitored NO_2)
PR 1	37.70	14.40	2.62	2.4907	35.26	36.10	-2.33
PR 3	20.88	9.49	2.20		29.46	28.10	4.84

LAQM.TG(16) states that:

> "*In order to provide more confidence in the model predictions and the decisions based on these, the majority of results should be within 25% of the monitored concentrations as a minimum, preferably within 10%*".

As noted in Table A-4, the difference between the adjusted modelled NO_2 and monitored NO_2 is within ±10% at both verification locations and therefore within the ideal tolerances. In addition, a verification factor of 2.4907 reduces the Root Mean Square Error (RMSE) from a value of 8.9µg/m^3 to 1.1µg/m^3 (2.8% of the annual mean AQAL) – within the ideal LAQM.TG(16) prescribed limit. On this basis, the derived verification factor (2.4907) was considered acceptable and was subsequently applied to all road-NO_x concentrations predicted (as output of the ADMS Roads dispersion model).

The adjustment factor of 2.4907 was also applied to road-PM_{10} and $PM_{2.5}$ concentrations (as output of the ADMS Roads dispersion model), following the recommendations of LAQM.TG(16) guidance, in the absence of local fine particulate matter monitoring.

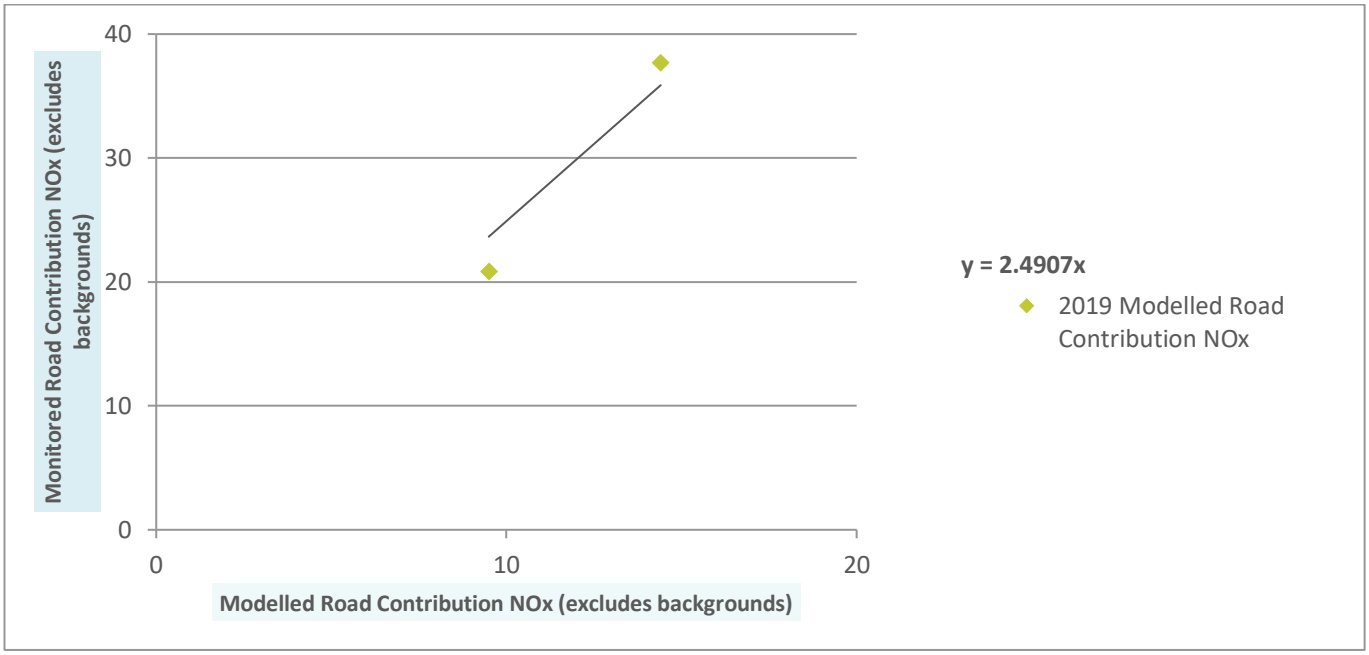

Figure B-1
Comparison of Modelled vs. Monitored Road NOx Contribution (2.4907)

APPENDIX B – Sensitivity Analysis Results

The results of the sensitivity analysis are presented in Table A-4. The sensitivity analysis assumes no improvement in 2019 baseline background NO_x / NO_2 concentrations, fleet composition or vehicle emission factors. No sensitivity analysis has been undertaken on PM_{10} or $PM_{2.5}$ concentrations / assessment inputs.

NO_2 Modelling Results

Table A-4 presents the annual mean NO_2 concentrations predicted at all assessed receptor locations for the 2024 DS scenario (sensitivity analysis). Any exceedences are displayed in bold text.

Table A-5
Predicted Annual Mean NO_2 Concentrations – 2024 Development Opening Year (Sensitivity Analysis)

Receptor	Modelled Height (m)	Predicted Annual Mean NO_2 Concentration (µg/m^3)	% of 2019 DS Sensitivity Relative to AQAL
		2019 DS Sensitivity	
PSR 1	0	**42.3**	105.6
	1.5	38.5	96.2
	4	26.6	66.5
	6.5	21.6	53.9
PSR 2	0	**42.3**	105.6
	1.5	38.4	96.1
	4	26.5	66.3
	6.5	21.5	53.8
PSR 3	0	**41.8**	104.6
	1.5	38.1	95.3
	4	26.4	66.1
	6.5	21.5	53.7
PSR 4	1.5	25.2	62.9
	20	17.9	44.6
PSR 5	1.5	24.8	61.9
	20	17.8	44.6
PSR 6	1.5	26.6	66.6
	20	17.8	44.5

The maximum predicted annual mean NO_2 concentration (2024 DS), at all receptors newly introduced by the Proposed Development, is at Receptor PSR 1 / PSR 2. The maximum predicted concentration is 42.3µg/m^3, which represents 106% of the AQAL. PSR 1 and PSR 2 are representative of the north-western façade of block A, immediately adjacent to the A3100 Portsmouth Road.

The empirical relationship given in LAQM.TG(16) states that exceedences of the 1-hour mean NO_2 AQAL are unlikely to occur where annual mean concentrations are <60µg/m^3. Annual mean NO_2 concentrations predicted at all receptor locations are well below this limit. Therefore, it is unlikely that an exceedence of the 1-hour AQAL will occur. Effects associated with likely 1-hour mean NO_2 concentrations at all assessed Site receptor locations are therefore considered to be 'not significant'.

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