Orchard Lane / East Molesey

Air Quality Assessment

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Orchard Lane,
East Molesey

Air Quality Assessment

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1 INTRODUCTION

1.1 Entran Limited has been commissioned to undertake an air quality assessment in relation to the redevelopment of the Site located at Orchard Lane, East Molesey. The location of the Site is presented in Figure 1.1.

1.2 The proposals are for the '*redevelopment of site by way of demolition (or partial demolition) of all existing buildings and the erection of 3 buildings comprising 74 residential units (15 x 1 bed, 48 x 2 bed and 11 x 3 bed) and ancillary facilities for residents, underground and surface level car and cycle parking, mechanical plant, soft and hard landscaping and associated diversion of existing Thames Water pipe'*.

1.3 The Proposed Development lies within the administrative area of Elmbridge Borough Council (EBC). EBC has declared seven Air Quality Management Areas (AQMAs) due to exceedences of the AQS objective levels for annual mean NO_2. The Proposed Development is not located within an AQMA; however the Walton Road, Molesey AQMA is located approximately 500m to the north of the Site.

1.4 This report presents the findings of an air quality assessment of the potential impacts associated with the Proposed Development on local air quality during both the construction and operational phases. For both phases the type, source and significance of potential impacts are identified and the measures that should be employed to minimise these impacts are described. Consideration is also given to the suitability of the Site for its proposed end-use with regards to air quality.

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

Figure 1.1: Site Location Plan

2 LEGISLATION, POLICY AND GUIDANCE

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

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

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

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

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

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

2.6 The AQS also contains a framework for considering the effects of a finer group of particles known as '$PM_{2.5}$'. Local Authorities are required to work towards reducing emissions /

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

concentrations of $PM_{2.5}$, but there is currently no statutory objective incorporated into UK law at this time.

2.7 Of the pollutants included in the AQS, NO_2, PM_{10} and $PM_{2.5}$ will be particularly relevant to this project as these are the primary pollutants associated with road traffic.

2.8 The current statutory standards and objectives for NO_2, PM_{10} and $PM_{2.5}$ are set out in the table presented in **Appendix B.**

Local Air Quality Management (LAQM)

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

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

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

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

National Planning Policy Framework

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

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

[3] Ministry of Housing, Communities and Local Government: *National Planning Policy Framework* (July 2021).

the principles and policies set out in the NPPF with the objective of contributing to the achievement of sustainable development.

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

2.15 Under Section 15: Conserving and Enhancing the Natural Environment, the NPPF (paragraph 174) requires that *'planning policies and decisions should contribute to and enhance the natural and local environment by …preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible help to improve local environmental conditions such as air and water quality'*

2.16 In dealing specifically with air quality the NPPF (paragraph 186) states that *'planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan'.*

2.17 Paragraph 188 states that *'the focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively.'*

Elmbridge Core Strategy

2.18 The Elmbridge Core Strategy Development Plan Document (DPD)[4] is the main document in the Council's Local Development Framework (LDF). It sets out a plan for the future development of the borough in the period 2011 to 2026

2.19 EBC do not have a specific air quality policy within this document. However, within the Core Strategy, Elmbridge has stated *"new development will be prioritised in the most accessible locations and will be supported by good quality local infrastructure. Measures will be put in place that could reduce the need to travel and offer attractive alternatives to driving. The accessibility of stations at Walton, Weybridge, Cobham and Esher will be improved. Areas with high levels of air pollution will be reduced to an acceptable level".*

Elmbridge Development Management Plan

2.20 The Development Management Plan[5] contains more detailed "every day" policies that all planning applications are assessed against. It contains the following policy relevant to air quality and the Proposed Development:

2.21 DM5 – Pollution, which states

'*[…] c. Air quality Within designated Air Quality Management Areas, the Council will promote measures to improve air quality and will expect development proposals to avoid introducing additional sources of air pollution. For proposals falling within an Air Quality Management Area and/or where the Council considers that air quality objectives are likely to be prejudiced, applicants will be expected to submit a detailed specialist report which sets out the impact that the proposed development would have upon air quality. Planning permission will not be granted for proposals where there is significant adverse impact upon the status of the Air Quality Management Area or where air quality may have a harmful effect on the health of future occupiers of the development, taking into account their sensitivity to pollutants, unless the harm can be suitably mitigated. […]*'

Control of dust and particulates associated with construction

2.22 Section 79 of the *Environmental Protection Act (1990*) provides the following definitions of statutory nuisance relevant to dust and particles:

[4] Elmbridge Borough Council. (2011). Elmbridge Core Strategy.

[5] Elmbridge Borough Council. (2015). Development Management Plan.

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

2.23 Following this, Section 80 states that where a statutory nuisance is shown to exist, the local authority mush serve an abatement notice. Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

2.24 In the context of the proposed development, the main potential for nuisance of this nature will arise during the construction phase – potential sources being the clearance, earthworks, construction and landscaping processes.

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

EPUK & IAQM Land Use Planning and Development Control

2.26 Environmental Protection UK (EPUK) & Institute of Air Quality Management (IAQM) published the Land Use Planning and Development Control Air Quality guidance in January 2017[6] to provide guidance on the assessment of air quality in relation to planning proposals and ensure that air quality is adequately considered within the planning control process.

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

2.28 This guidance has been used within this assessment.

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

Assessment of Dust from Demolition and Construction

2.29 The IAQM published guidance in 2014 on the assessment of emissions from demolition and construction activities[7]. The guidance sets out an approach to identifying the risk of impacts occurring at nearby sensitive receptors from dust generated during the construction process and sets out recommended mitigation measures based on the identified risk.

2.30 This guidance has been used within this assessment.

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

3 METHODOLOGY

Scope of Assessment

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

- Review of air quality data for the area surrounding the Site and background pollutant maps:
- Review of the traffic data; and
- Review of the proposals.

3.2 During construction of the Proposed Development there is the potential for impacts to occur as a result of dust and PM_{10} emissions. Guidance provided by the IAQM recommends that an assessment is undertaken where there are human receptors within 350m of the site boundary or within 50m of the routes used by construction vehicles up to 500m from the site entrance; and where there are dust sensitive ecological receptors within 50m of the site boundary or within 50m of the routes used by construction vehicles up to 500m from the site entrance. Human receptors are located within 350m of the Site, but there are no dust sensitive ecological habitats in the vicinity of the Site. An assessment of the impacts of the construction of the Proposed Development on human receptors has therefore been included in the assessment, assessment of the impacts on ecological receptors has not been considered further.

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

3.4 Traffic data provided by the transport consultants indicates that the Proposed Development, once operational, would result in an additional 124 vehicle trips per day on Orchard Lane. This traffic will distribute north and south onto Ember Lane resulting in 62 additional vehicle trips per day on any part of Ember Road. The impact of the operational scheme is therefore considered to be negligible on local air quality. Further assessment of the impact of the operational Proposed Development on local air quality has therefore been scoped out of this assessment. The assessment of the operational phase therefore comprises

consideration of exposure of future occupants to the existing pollutant concentrations and the suitability of the Site for its proposed end use.

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

Construction Phase Methodology

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

3.7 This approach divides construction activities into the following four categories:

- demolition;
- earthworks;
- construction; and
- trackout (the transport of dust and dirt from the construction site onto the public road network).

3.8 The assessment methodology then considers three separate dust effects:

- annoyance due to dust soiling;
- harm to ecological receptors; and
- the risk of health effects due to a significant increase in exposure to PM_{10}.

3.9 The assessment of the risk of dust effects is determined by:

- the scale and nature of the works, which determine the risk of dust arising; and
- the proximity of sensitive receptors.

3.10 Risks are described in terms of there being a low, medium or high risk of dust effects for each of the four separate potential activities. This assessment is based on both IAQM criteria and professional judgement.

3.11 Mitigation measures are identified where necessary and significance of dust effects determined following such mitigation. The significance of the dust effects is based on professional judgement, taking into account the sensitivity of the surrounding area and the existing air quality.

Dust Emission Magnitude

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

Table 3.1: Dust Emission Magnitude Criteria

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

Receptor Sensitivity

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

Table 3.2: Factors Defining the Sensitivity of a Receptor

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

(a) In the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day.

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

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

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

(e) Except commercially sensitive horticulture.

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

Area Sensitivity

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

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

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

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

Table 3.4: Sensitivity of the Area to Human Health Impacts

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

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

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

Risk of Dust Impacts

3.17 The risk of dust impacts prior to mitigation for each emission source is presented in Tables 3.5, 3.6 and 3.7.

Table 3.5: Risk of Dust Impacts – Demolition

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

Table 3.6: Risk of Dust Impacts – Earthworks and Construction

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

Table 3.7: Risk of Dust Impacts - Trackout

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

Mitigation and Significance

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

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

Construction Traffic

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

3.21 Based on the size and location of the Proposed Development, construction related traffic flows are not predicted to be significant in terms of total emissions or construction duration.

Operational Phase Methodology

3.22 As discussed in the scoping section, the impact of the traffic associated with the operation of the Proposed Development is considered to be negligible and therefore the assessment of operational phase considers only the likely exposure of future residents to existing pollutant levels and the suitability of the Site for its proposed end use. A qualitative assessment has been undertaken with reference to the EPUK & IAQM guidance.

4 BASELINE CONDITIONS

Elmbridge Borough Council Review and Assessment of Air Quality

4.1 EBC has carried out detailed assessments of air quality and as a result has declared seven AQMAs within the borough due to exceedences of the annual mean NO_2 objective. The Site is not located within an AQMA; the closest AQMA, Walton Road Molesey, is located approximately 500m to the north of the Site.

Automatic Local Monitoring Data

4.2 EBC operate two automatic monitors within the borough, located within the Weybridge and Hampton Court AQMAs, monitoring concentrations of NO_2. As there are monitoring sites located closer to Orchard Lane, these sites are not considered relevant to the baseline assessment.

4.3 There is no monitoring of PM_{10} or $PM_{2.5}$ carried out within the borough.

Non-Automatic Local Monitoring Data

4.4 EBC also monitors NO_2 concentrations across a network of diffusion tubes within the borough. The results of monitoring in recent years at the nearest diffusion tubes to the Site are presented in Table 4.1 below.

4.5 The data shows that annual mean NO_2 concentrations in the vicinity of the Site were below the 40 µg/m^3 objective between 2017 and 2021.

4.6 Large decreases in annual mean NO_2 concentrations were measured in 2020 when compared to the concentrations measured in 2019. It is considered that this is likely to be due to the travel restrictions associated with the COVID-19 pandemic.

4.7 Diffusion tubes cannot monitor short-term NO_2 concentrations, however, research has concluded that exceedences of the 1-hour mean objective are generally unlikely to occur where annual mean concentrations do not exceed 60 µg/m^3. Annual mean NO_2 concentrations were below 60 µg/m^3 at all monitoring sites between 2017 and 2021 therefore it is expected that the 1-hour objective is being met at these locations.

4.8 NO_2 concentrations are therefore expected to meet the annual mean and 1-hour NO_2 objectives at the Site.

Table 4.1: Diffusion Tube Monitoring Results (µg/m^3)

Site	Classifi-cation	Distance from Kerb (m)	Year				
			2017	2018	2019	2020	2021
Molesey 1	Kerbside	4.9	28.2	32.9	34.7	22.8	23.8
Molesey 8	Roadside	1.1	31.2	35.7	39.2	27.6	27.1
Molesey 9	Roadside	2.6	32.3	32.5	34.3	24.0	22.6
Molesey 10	Roadside	2.6	27.5	28.5	28.1	19.8	20.4

Defra Background Maps

4.9 Additional information on background concentrations in the vicinity of the Site has been obtained from the Defra background pollutant maps. Concentrations from the following grid square, 514500, 167500, which includes the Site and surrounding area, are provided below in Table 4.2.

4.10 The 2018 Defra background maps, which provide estimated background concentrations between 2018 and 2030, have been used to obtain concentrations for 2022.

Table 4.2: Estimated Annual Mean Background Concentrations from Defra Maps (µg/m^3)

Pollutant	Background Concentrations at Proposed Development	Air Quality Standard
NO_2	14.1	40
PM_{10}	14.9	40
$PM_{2.5}$	10.3	25

4.11 The data presented in Table 4.2 shows background concentrations of all three pollutants to be below the relevant annual mean objective.

5 ASSESSMENT OF IMPACT

Construction Phase

Area Sensitivity

5.1 The existing buildings at the Site are to be demolished prior to redevelopment.

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

Table 5.1: Sensitivity of Receptors and the Local Area to Dust Impacts

Receptor	Distance from Site Boundary (m)	Approx. Number of Receptors	Sensitivity to Health Impacts (a)		Sensitivity to Dust Soiling Impacts	
			Receptor	Area	Receptor	Area
Residential Properties	<20 m	1-10	High	Low	High	Medium
	<50 m	10-100	High	Low	High	Medium
Overall Sensitivity of the Area			**Low**		**Medium**	
(a) Estimated background PM_{10} concentration is 14.9 µg/m^3.						

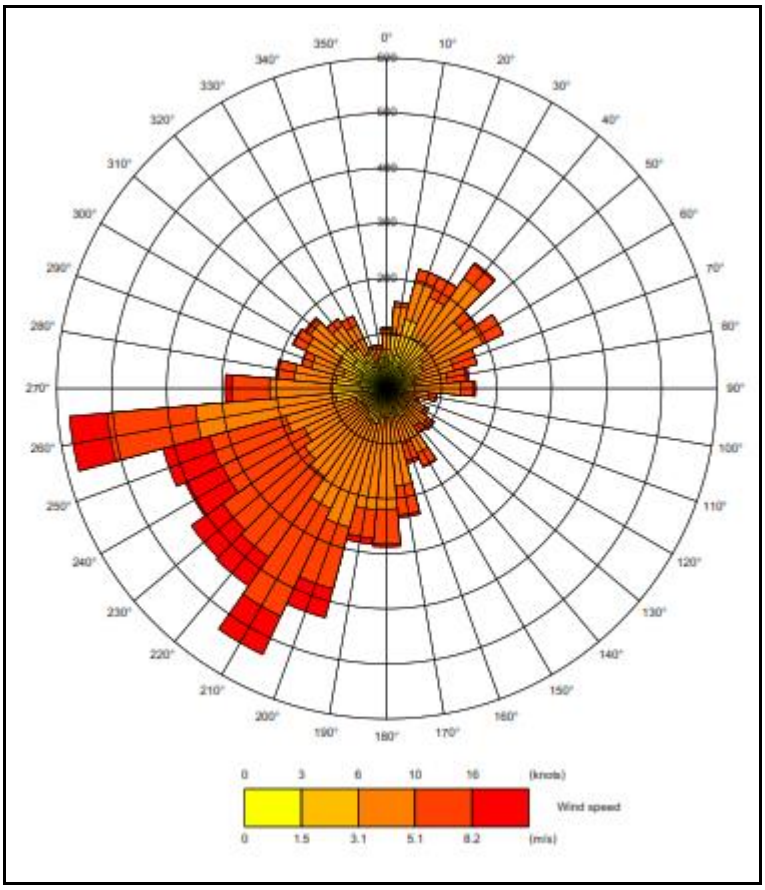
5.3 The route of the construction traffic is assumed to be Orchard Lane. As the Site is medium in size, the sensitivity of the area to impacts arising from track-out is considered within a distance of 200m from the site entrance. There are several sensitive receptors along the roads within this distance, therefore the sensitivity of the area to impacts from trackout is considered to be high for dust impacts and low for human health impacts.

5.4 The precise behaviour of the dust, its residence time in the atmosphere, and the distance it may travel before being deposited will depend upon a number of factors. These include wind direction and strength, local topography and the presence of intervening structures (buildings, etc.) that may intercept dust before it reaches sensitive locations. Furthermore, dust would be naturally suppressed by rainfall.

5.5 A wind rose from Heathrow Airport is provided in Figure 5.1, which shows that the prevailing wind is from the southwest, therefore receptors to the northeast of the Proposed

Development are the most likely to experience dust impacts from the Proposed Development. There are several residential receptors along Ember Farm Way to the northeast of the Proposed Development.

Figure 5.1: Wind Rose for Heathrow Airport Meteorological Station (2020)



Dust Emission Magnitude

5.6 Demolition works will involve the removal of the existing buildings at the Site. The building to be removed has a volume of less than 20,000m^3 and demolition activities will be at a height of less than 10m above ground. The magnitude of dust emission for the demolition phase is therefore considered to be *small*.

5.7 Earthworks will primarily involve excavating material, haulage, tipping and stockpiling. This may also involve levelling of the Site and landscaping. The area of the Site is between 2,500m^2 and 10,000m^2. During earthworks there is likely to be less than ten heavy duty vehicles at work on Site at any given time and materials are likely to be stored in bunds less than 8m in height. The magnitude of the dust emission for the earthworks phase is therefore considered to be *medium.*

5.8 Dust emissions during construction will depend on the scale of the works, method of construction, construction materials and duration of build. The completed development will have a volume of less than 100,000m^3 and the main construction materials are likely to be precast/in situ concrete, brick, SFS steelwork and slates. Based on the above, the dust emission magnitude for the construction phase is considered to be *medium*.

5.9 Factors influencing the degree of trackout and associated magnitude of effect include vehicle size, vehicle speed, vehicle numbers, geology and duration. Construction traffic will access the Site via Orchard Lane where there are a number of residential properties within 20m of the road. Based on the size of the Proposed Development, it is assumed the number of HGV movements (leaving the site) is likely to be between 2 and 20 per day, therefore dust emission magnitude due to trackout is considered to be *medium.*

Dust Risk Effects

5.10 A summary of the potential risk of dust impacts, is presented in Table 5.2.

Table 5.2: Risk of Dust Impacts Prior to Mitigation

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

Operational Phase

5.11 As indicated in Section 4 of this report, NO_2, PM_{10} and $PM_{2.5}$ concentrations are consistently below the AQS in the vicinity of the Site. The Defra background data outlined in Table 4.2, which are well below the relevant objectives, are considered to be representative of concentrations at the Site.

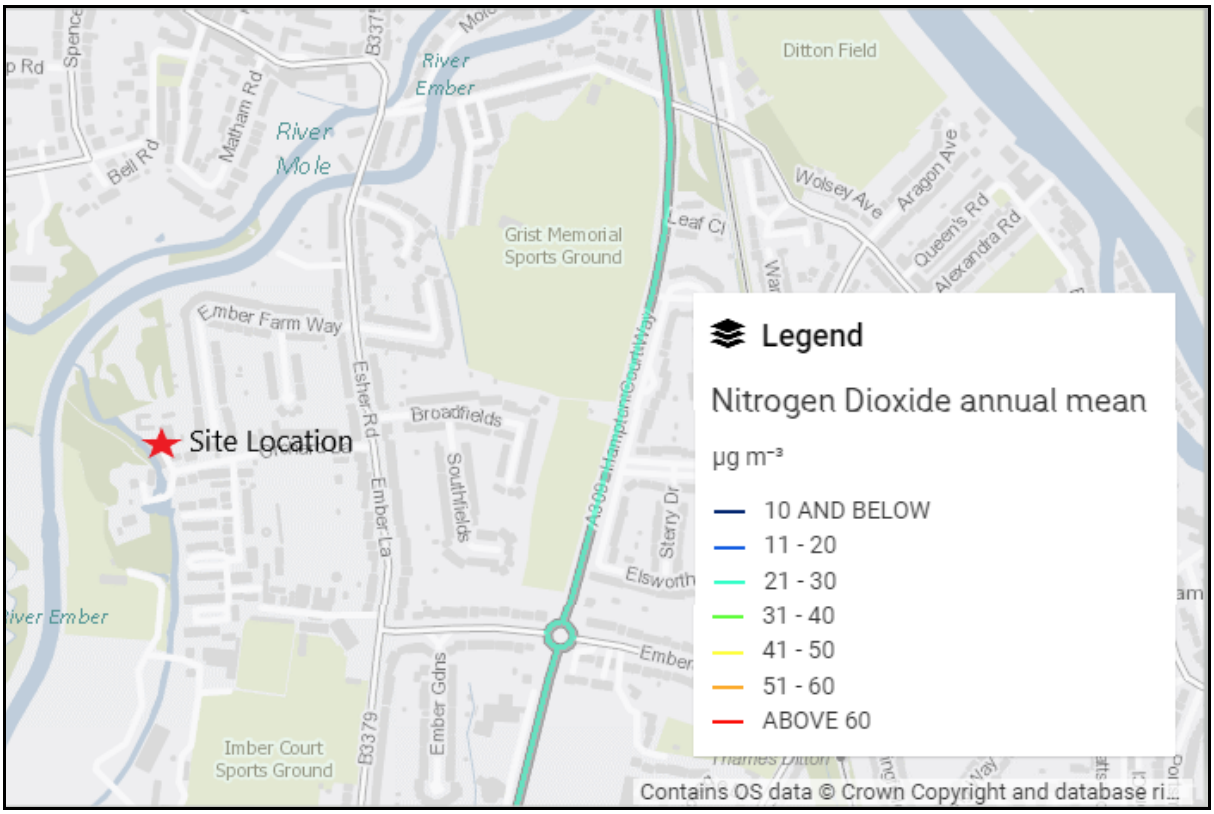
5.12 The Site is located in a predominately residential area. The main source of emissions to air in the area is from road traffic, however the roads immediately adjacent to the Site are relatively minor. The closest available traffic data is from a traffic count conducted by the DfT on Walton Road[8], which is located approximately 540m to the north of the Site. In 2019, the annual average daily total traffic (AADT) was 13,820 vehicles on Walton Road. This is considered a

[8] https://roadtraffic.dft.gov.uk/manualcountpoints/810976

'busy' road (10,000 – 30,000 vehicles a day) with reference to the AEA/Defra diffusion tube guidance[9]. With a separation distance of 540m, It is considered highly unlikely that emissions from this road will significantly impact residents of the Proposed Development..

5.13 Data from Defra's UK Ambient Air Quality Map[10] show that roadside annual mean NO_2 concentrations on the A309 are predicted to be well below the AQS. Therefore, concentrations at the façades of the Proposed Development would be expected to be further below the AQS. An excerpt from the Defra GIS Map is shown in Figure 5.2 below.

Figure 5.2: Roadside NO_2 concentrations in the vicinity of the Proposed Development from UK ambient air quality map, Defra, 2019



5.14 It is considered likely that the existing concentrations of NO_2, PM_{10} and $PM_{2.5}$ at the location of the Site are currently below the relevant AQS objective levels such that the impact on exposure will be negligible. It is not expected that proposed occupants will be exposed to unacceptable concentrations of pollutants. As such, the Proposed Development is considered to be suitable for its proposed end use.

[9] AEA Energy & Environment for Defra. (2008). Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance.

[10] https://uk-air.defra.gov.uk/data/gis-mapping/

MITIGATION

Construction Phase

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

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

5.17 The IAQM guidance recommends that where there is a medium/high risk of impacts at nearby residential receptors that monitoring of dust or PM_{10} is carried out throughout the construction period. The requirement for monitoring should be discussed and agreed with EBC, if required.

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

5.19 Following implementation of the ‘highly recommended’ measures outlined in the IAQM guidance and reproduced in **Appendix C**, the impact of emissions during construction of the Proposed Development would be negligible.

Operational Phase

5.20 The review has shown that the existing pollutant concentrations within the vicinity of the Site are likely to be below the relevant AQS objective levels. Therefore, it is considered that no mitigation measures will be required during the operational phase.

6 CONCLUSIONS

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

6.2 An assessment of the potential impacts during the construction phase has been carried out. This has shown that during this phase of the Proposed Development, releases of dust and PM_{10} are likely to occur during site activities. Through good site practice and the implementation of suitable mitigation measures, the impact of dust and PM_{10} releases may be effectively mitigated and the resultant impacts are considered to be negligible.

6.3 There is no significant traffic associated with the Proposed Development, therefore the impact of existing traffic has been considered with respect to the suitability of the Site for residential use only.

6.4 A review of baseline air quality monitoring data indicates that NO_2, PM_{10} and $PM_{2.5}$ concentrations in the vicinity of the Site are likely to be well below the relevant air quality objectives. The introduction of receptors to the area will not therefore increase exposure to poor air quality within the area.

6.5 It is concluded that air quality does not pose a constraint to the redevelopment of the Site as proposed, either during construction or once operational.

APPENDIX A - AIR QUALITY TERMINOLOGY

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

Term	Definition
	unusual measurements (see also ratification).
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.

APPENDIX B - AIR QUALITY STANDARDS AND OBJECTIVES

Table B1: Air Quality Strategy Objectives

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

(a) Air Quality Standards Regulations (2010)

(b) EU Directive Limit Value

APPENDIX C – CONSTRUCTION MITIGATION MEASURES

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

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- display the name and contact details of the person accountable for air quality and dust issues on the site boundary (i.e. the environment manager/engineer or site manager);
- display the head or regional office contact information on the site boundary;
- record all dust and air quality complaints, identify cause, take appropriate measures to reduce emissions in a timely manner and record the measures taken;
- make the complaints log available to the local authority when asked;
- record any exceptional incidents that cause dust and/or air emissions, either on- or off- site and the action taken to resolve the situation in the log book;
- carry out regular site inspections to monitor compliance with the DMP, record inspection results and make inspection log available to EBC when asked;
- increase frequency of site inspection by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged periods of dry or windy conditions;
- Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it is a large site, before work on a phase commences. Further guidance is provided by the IAQM on *monitoring during demolition, earthworks and construction*;
- plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- erect solid screens or barriers around dusty activities or the site boundary as necessary that are at least as high as any stockpiles;
- fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;
- avoid site runoff of water or mud;
- keep site fencing, barriers and scaffolding clean using wet methods;
- remove materials that have a potential to produce dust from site as soon as possible unless being re-used on site;
- cover, seed or fence stockpiles to prevent wind whipping;
- ensure all vehicles switch off engines when stationary - no idling vehicles;

- avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable;
- produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials;
- only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction e.g. suitable local exhaust ventilation systems;
- ensure an adequate water supply on site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- use enclosed chutes and conveyors and covered skips;
- minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate;
- ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods;
- avoid bonfires and burning of waste materials;
- ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;
- avoid dry sweeping of large areas;
- ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;
- record all inspections of haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned;
- implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);
- ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits; and
- access gates to be located at least 10m from receptors where possible.

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

- undertake daily on-site and off-site inspection, where receptors area nearby, to monitor, record inspection results and make the log available to the local authority when asked. This

should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of the site boundary;

- impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate);
- implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking and car-sharing);
- re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable;
- only remove the cover in small areas during work and not all at once;
- avoid scabbling (roughening of concrete surfaces);
- ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery; and
- for smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.