Senior Urban Living (Epsom) Ltd

Land at Epsom Hospital

Air Quality Assessment

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Contents

Appendices

Appendix A

Methodology of Construction Dust Assessment

1 Introduction

The air quality assessment has been prepared to accompany a planning application for a proposed development at Epsom Hospital, Epsom, Surrey (referred as the 'Proposed Development' to describe the proposals, or the 'site' to describe the site boundary).

Air quality studies are concerned with the presence of airborne pollutants in the atmosphere. This report outlines the relevant air quality policy and legislative context and presents the methodology used in the assessment. It assesses the existing air quality conditions in the vicinity of the Proposed Development and outlines the likely air quality impacts from the construction and operation of the development as well as future exposure at the Proposed Development. The effects have been assessed in the context of relevant national, regional and local air quality policies and guidance. Mitigation measures are proposed which would be implemented to reduce the effect of the Proposed Development on air quality as far as practicable.

The main pollutants of concern for local air quality are oxides of nitrogen (NOx), including nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$) and dust.

1.1 Existing Site

The site is located on Woodcote Green Road in Epsom and within the administrative boundary of Epsom & Ewell Borough Council (EEBC) (see Figure 1). It is to the south and west of Epsom General Hospital main buildings and the associated car park, and to the north of Woodcote Millennium Garden. The site currently consists of healthcare buildings and associated infrastructure including car parking, low-grade administrative space, temporary structures, a brick boiler house and chimney stack, a four-storey Rowan House and York House. Vehicular access to the site is provided on Woodcote Green Road.

1.2 Description of Development

The development proposals will demolish the existing hospital buildings, accommodation block and associated structures within the site to provide a new care community for older people. The Proposed Development will be arranged in two buildings comprising 307 care residences, ancillary communal and support services which includes a restaurant, café, shop, wellness centre, gym, library, craft room, therapy and treatment rooms (Use Class C2), 40 transitional care suites (Use Class C2), 24 key worker units (Use Class C3), children's nursery (Use Class D1), together with associated back of house and service areas, car and cycle parking, altered vehicular and pedestrian access, landscaping, private amenity space and public open space.

Figure 1: Location of the site

2 Air Quality Standards and Guidelines

2.1 European Air Quality Management

In 1996, the European Commission published the Air Quality Framework Directive on ambient air quality assessment and management (96/62/EC)[1]. This Directive defined the policy framework for 12 air pollutants known to have harmful effects on human health and the environment. Limit values (pollutant concentrations not to be exceeded by a certain date) for each specified pollutant were set through a series of Daughter Directives, including Directive 1999/30/EC (the 1st Daughter Directive)[2] which sets limit values for sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and oxides of nitrogen (NO_x), particulate matter (PM_{10}) and lead in ambient air.

In May 2008 the Directive 2008/50/EC[3] on ambient air quality and cleaner air for Europe came into force. This Directive consolidates the previous Directives (apart from the 4th Daughter Directive) and provides a new regulatory framework for $PM_{2.5}$ and makes provision for extended compliance deadlines for NO_2 and PM_{10}.

The Directives were transposed into national legislation in England by the Air Quality Standards Regulations 2010[4]. The Secretary of State for the Environment has the duty of ensuring compliance with the air quality limit values.

2.2 Environment Act 1995

Part IV of the Environment Act 1995 places a duty on the Secretary of State for the Environment to develop, implement and maintain an Air Quality Strategy with the aim of reducing atmospheric emissions and improving air quality[5]. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland[6] provides the framework for ensuring compliance with the air quality limit values based on a combination of international, national and local measures to reduce emissions and improve air quality. This includes the statutory duty, also under Part IV of the Environment Act 1995, for local authorities to undergo a process of local air quality management and declare Air Quality Management Areas (AQMA) where necessary.

2.3 Air Quality Objectives and Limit Values

Air quality limit values and objectives are quality standards for clean air. Some pollutants have standards expressed as annual average concentrations (long-term)

[1] Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management.
[2] Directive 1999/30/EC of 22 April 1999 relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air.
[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] The Air Quality Standards Regulations 2010, SI 2010/1001.
[5] Environment Act 1995, Chapter 25, Part IV Air Quality.
[6] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Volume 1, July 2007.

due to the chronic way in which they affect health or the natural environment (i.e. effects occur after a prolonged period of exposure to elevated concentrations) and others have standards expressed as 24-hour, 1-hour or 15-minute average concentrations (short-term) due to the acute way in which they affect health or the natural environment (i.e. after a relatively short period of exposure). Some pollutants have standards expressed in terms of both long-term and short-term concentrations. Table 1 sets out these EU air quality limit values and national air quality objectives for the pollutants relevant to this study (NO_2 and particulate matter).

In the majority of cases the air quality limit values and air quality objectives have the same pollutant concentration threshold and date for compliance. The key difference is that the Secretary of State for the Environment is required under European Law to ensure compliance with the air quality limit values whereas local authorities are only obliged under national legislation to undertake best efforts to comply with the air quality objectives. To assist local authorities in demonstrating best efforts, the Environment Act 1995 requires that when carrying out their local air quality management functions, local authorities shall have regard to guidance issued by the Secretary of State.

Table 1: Air quality standards

Pollutant	Averaging period	Limit value / objective
Nitrogen Dioxide (NO_2)	Annual mean	40µg/m^3
	1-hour mean	200µg/m^3 not to be exceeded more than 18 times a year (99.8th percentile)
Fine Particulate Matter (PM_{10})	Annual mean	40µg/m^3
	24-hour mean	50µg/m^3 not to be exceeded more than 35 times a year (90.4th percentile)
Very Fine Particulate Matter ($PM_{2.5}$)	Annual mean	25µg/m^3

2.4 Clean Air Strategy

Defra published an updated Clean Air Strategy in 2019[7], and this is aimed out tackling all sources of air pollution, making air healthier to breathe, protecting nature and boosting the economy. The strategy proposes new goals to cut public exposure to particulate matter pollution, as per the recommendation by the World Health Organisation. Comprehensive action is required from all parts of government and society to participate to meet these goals. In particular, the Clean Air Strategy states:

> *"New legislation will create a stronger and a more coherent framework for action to tackle air pollution. This will be underpinned by new*

[7] Defra (2019). Clean Air Strategy 2019.

England-wide powers to control major sources of air pollution, in line with the risk they pose to public health and the environment, plus new local powers to take action in areas with an air pollution problem. These will support the creation of Clean Air Zones to lower emissions from all sources of air pollution, backed up with clear enforcement mechanism."

2.5 Dust Nuisance

Dust is the Dust is the generic term used in the British Standard document BS 6069 (Part Two) to describe particulate matter in the size range 1–75µm in diameter. Dust nuisance is the result of the perception of the soiling of surfaces by excessive rates of dust deposition. Under provisions in the Environmental Protection Act 1990[8], dust nuisance is defined as a statutory nuisance.

There are currently no standards or guidelines for dust nuisance in the UK, nor are formal dust deposition standards specified. This reflects the uncertainties in dust monitoring technology and the highly subjective relationship between deposition events, surface soiling and the perception of such events as a nuisance. In law, complaints about excessive dust deposition would have to be investigated by the local authority and any complaint upheld for a statutory nuisance to occur. However, dust deposition is generally managed by suitable on-site practices and mitigation rather than by the determination of statutory nuisance and/or prosecution or enforcement notice(s).

[8] Environmental Protection Act 1990, Chapter 43, Part III Statutory Nuisances and Clean Air.

3 Planning Policy and Guidance

3.1 National Policy and Guidance

The land-use planning process is a key means of improving air quality, particularly in the long term, through the strategic location and design of new developments. Any air quality consideration that relates to land-use and its development can be material planning consideration in the determination of planning applications, dependent on the details of the Proposed Development.

3.1.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)[9] was published in February 2019 with the purpose of planning to achieve sustainable development. Paragraph 181 of the NPPF on air quality 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."*

In addition, paragraph 103 states that:

> *"The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making."*

Paragraph 170 discusses how planning policies and decisions should contribute to and enhance the natural and local environment. In relation to air quality, NPPF notes that this can be achieved by:

> *"e) 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.*

[9] Ministry of Housing, Communities & Local Government, National Planning Policy Framework, February 2019 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf

Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans".

3.1.2 Planning Practice Guidance

Planning Practice Guidance (PPG) on air quality to supplement the latest NPPF was updated in November 2019. The guidance refers to the significance of air quality assessments to determine the impacts of proposed developments in the area and describes the role of local and neighbourhood plans with regard to air quality. It also provides a flowchart method to assist local authorities to determine how considerations of air quality fit into the development management process.

3.2 Local Policy

3.2.1 Epsom and Ewell Local Plan

The EEBC Core Strategy 2007[10] is part of the Epsom and Ewell Local Plan adopted by the council in 2007. The Local Plan is part of their local development framework which sets out a strategy for EEBC over the period to 2022.

Policy CS 6 relates to environment and pollution. It states that:

"Proposals for development should result in a sustainable environment and reduce, or have a neutral impact upon, pollution and climate change…In order to conserve natural resources, minimise waste and encourage recycling, the Council will ensure that new development…minimises the emission of pollutants…".

3.2.2 Epsom and Ewell Sustainable Design Supplementary Planning Document

The Revised Epsom and Ewell Sustainable Design Supplementary Planning Document[11] published in 2016 provides details of relevant air quality documents required for submission alongside planning applications for developments. An Air Quality Impact Assessment is required for major development proposals where the location, proposed use, building design and number of vehicle trips generated has potential to impact air quality, and for all types of developments where the site is located within an AQMA.

[10] Epsom and Ewell Borough Council, Core Stategy 2007, https://www.epsom-ewell.gov.uk/sites/default/files/documents/residents/planning/planning-policy/Core%20Strategy%202007.pdf [Accessed December 2019]
[11] Epsom and Ewell Borough Council, Revised Sustainable Design Supplementary Planning Document, https://www.epsom-ewell.gov.uk/sites/default/files/documents/residents/planning/planning-policy/Revised%20Sustainable%20Design%20Guide%20Final%20Version%20February%202016.pdf [Accessed December 2019]

3.3 Other Relevant Policy and Guidance

3.3.1 Local Air Quality Management Policy Guidance and Technical Guidance

Policy guidance note LAQM.PG(16)[12] provides additional guidance on the links between transport and air quality. LAQM.PG(16) describes how road transport contributes to local air pollution and how transport measures may bring improvements in air quality. Key transport related Government initiatives are set out, including regulatory measures and standards to reduce vehicle emissions and improve fuels, tax-based measures and the development of an integrated transport strategy.

LAQM.PG(16) also provides guidance on the links between air quality and the land use planning system. The guidance advises that air quality considerations should be integrated in the planning process at the earliest stage and is intended to aid local authorities in developing action plans to deal with specific air quality problems and create strategies to improve air quality. It summarises the main ways in which the land use planning system can help deliver compliance with the air quality objectives.

LAQM.TG(16)[13] provides guidance to local authorities and air quality practitioners on all levels of air quality modelling and assessment. Where relevant this guidance has been considered.

3.3.2 Institute of Air Quality Management Dust Guidance

The latest Institute of Air Quality Management (IAQM) guidance[14] provides guidance to development consultants and environmental health officers on how to assess air quality impacts from construction. The IAQM guidance provides a method for classifying the significance of effect from construction activities based on the 'dust magnitude' (high, medium or low) and proximity of the site to the closest receptors. The guidance recommends that once the significance of effect from construction is identified, the appropriate mitigation measures are implemented. Experience has shown that once the appropriate mitigation measures are applied in most cases the resulting dust impacts can be reduced to negligible levels.

3.3.3 EPUK/IAQM Land-Use Planning & Development Control

The 2017 Land-Use Planning & Development Control guidance document[15] produced by Environmental Protection UK (EPUK) and the IAQM provides a framework for professionals operating in the planning system to provide a means

[12] Defra (2016) Local Air Quality Management Policy Guidance PG(16)
[13] Defra (2016) Local Air Quality Management Technical Guidance TG(16)
[14] IAQM (2016) Guidance on the Assessment of Dust from Demolition and Construction (Version 1.1)
[15] EPUK/IAQM (2017) Land-Use Planning & Development Control: Planning for Air Quality (Version 1.2).

of reaching sound decisions, having regard to the air quality implications of development proposals.

The document provides guidance on when air quality assessments are required by providing screening criteria regarding the size of a development, changes to traffic flows/composition energy facilities or combustion processes associated with the development.

4 Methodology of Assessment

The overall approach to the air quality assessment comprises:

- Consultation with the Environmental Health Officer (EHO) at the EEBC to agree the scope of the assessment and the methodology to be applied;
- A review of existing air quality conditions at, and in the vicinity of, the site;
- Review the traffic data provided by the Project Transport Consultant (Mayer Brown) and Project Quantity Surveyor (Morgan Sindall Construction);
- Desk study to confirm the location of nearby existing receptors that may be sensitive to changes in local air quality as a result of the construction and operation of the Proposed Development,
- An exposure study for the Proposed Development; and
- Formulation of mitigation measures, where appropriate, to ensure any adverse effects on air quality are minimised.

4.1 Methodology of Baseline Assessment

Existing or baseline ambient air quality refers to the concentrations of relevant substances that are already present in the environment. These are present from various sources, such as industrial processes, commercial and domestic activities, traffic and natural sources.

The following data sources have been used to determine the baseline and future conditions of air quality in the study area:

- EEBC Air Quality Annual Status Report (ASR)[16];
- The Defra Local Air Quality Management website[17]; and
- The Environment Agency (EA) website[18].

A desk-based review was undertaken using the data sources described above. The review identified the main sources of air pollution within a radius of 2km around the site, local air quality monitoring data for recent years and local background pollutant concentrations.

[16] Epsom and Ewell Borough Council, 2018 Air Quality Annual Status Report (ASR). Available at: https://www.epsom-ewell.gov.uk/sites/default/files/documents/residents/environmental-services/EEBC%20ASR%202018.pdf [Accessed November 2019]
[17] Defra, Local Air Quality Management website. Available at: http://laqm.defra.gov.uk/ [Accessed November 2019]
[18] Environment Agency website, https://environment.data.gov.uk/public-register/view/search-industrial-installations [Accessed November 2019]

4.2 Methodology of Construction Assessment

4.2.1 Construction Dust

The Proposed Development will include demolition and construction. The IAQM dust guidance[14] has been used to assess the impacts from dust on local sensitive receptors.

An 'impact' is described as a change in pollutant concentrations or dust deposition, while an 'effect' is described as the consequence of an impact. The main impacts that may arise during demolition and construction of the Proposed Development are:

- Dust deposition, resulting in the soiling of surfaces;
- Visible dust plumes;
- Elevated PM_{10} concentrations as a result of dust generating activities on site; and
- An increase in NO_2 and PM_{10} concentrations due to exhaust emissions from non-road mobile machinery (NRMM) and vehicles accessing the site.

The IAQM guidance[14] considers the potential for dust emissions from dust generating activities such as demolition of existing structures, earthworks, construction of new structures and trackout. Earthworks refer to the processes of soil stripping, ground levelling, excavation and land capping, while trackout is the transport of dust and dirt from the site onto the public road network where it may be deposited and then re-suspended by vehicles using the network. This arises when vehicles leave the site with dust materials, which may then spill onto the road, or when they travel over muddy ground on site and then transfer dust and dirt onto the road network.

For each of these dust-generating activities, the guidance considers three separate effects: annoyance due to dust soiling; harm to ecological receptors; and the risk of health effects due to a significant increase in PM_{10} exposure. The receptors can be human or ecological and are chosen based on their sensitivity to dust soiling and PM_{10} exposure.

The methodology takes into account the scale on which the above effects are likely to be generated (classed as small, medium or large), the levels of background PM_{10} concentrations and the distance to the closest receptor, in order to determine the sensitivity of the area. These factors are then taken into consideration when deriving the overall risk for the site. Suitable mitigation measures are suggested to reduce the risk of the Proposed Development.

There are five steps in the assessment process described in the IAQM guidance. These are summarised in Figure A.1, presented in Appendix A, and a further description is provided in the following paragraphs.

Step 1: Need for assessment

The first step is the initial screening for the need for a detailed assessment. According to the IAQM guidance, an assessment is required where there are

sensitive receptors within 350m of the redline boundary (for ecological receptors that is 50m) and/or within 50m of the route(s) used by the construction vehicles on the public highway and up to 500m from the site entrance(s).

Step 2: Assess the risk of dust impacts

This step is split into three sections as follows:

- 2A. Define the potential dust emission magnitude;
- 2B. Define the sensitivity of the area; and
- 2C. Define the risk of impacts.

Each of the dust-generating activities is given a dust emission magnitude depending on the scale and nature of the works (step 2A) based on the criteria shown in Table A1.1, Appendix A.

The sensitivity of the surrounding area is then determined (step 2B) for each dust effect from the above dust-generating activities, based on the proximity and number of receptors, their sensitivity to dust, the local PM_{10} background concentrations and any other site-specific factors. The criteria for defining the sensitivity of the area to different dust effects is shown in Table A1.2 to Table A1.4, Appendix A.

The overall risk of the impacts for each activity is then determined (step 2C) prior to the application of any mitigation measures using Table A1.5, Appendix Aand an overall risk for the site derived.

Step 3: Determine the site-specific mitigation

Once each of the activities is assigned a risk rating, appropriate mitigation measures are identified. Where the risk is negligible, no mitigation measures beyond those required by legislation are necessary.

Step 4: Determine any significant residual effects

Once the risk of dust impacts has been determined and the appropriate dust mitigation measures identified, the final step is to determine whether there are any residual significant effects. The IAQM guidance notes that it is anticipated that with the implementation of effective site-specific mitigation measures, the environmental effect will not be significant in most cases.

Step 5: Prepare a dust assessment report

The last step of the assessment is the preparation of a Dust Assessment Report. This forms part of this report.

4.2.2 Construction Traffic Data

Air quality impacts could arise during the construction phase because of traffic changes on the local road network. However, the Proposed Development will not generate more than 500 Annual Average Daily Traffic (AADT) and 100 AADT in light duty vehicles (LDV) and heavy-duty vehicles (HDV) respectively during the construction phase based on the information supplied by the Project Quantity

Surveyor (Morgan Sindall Construction). As such, the number of LDVs and HDVs will not breach the indicative criteria detailed in the EPUK/IAQM planning guidance[15]. On this basis it can be concluded that the construction traffic associated with the Proposed Development will not have a significant effect on air quality. Therefore, detailed assessment will not be required and has been scoped out of the assessment. This approach has been accepted by the EHO at EEBC.

4.3 Methodology of Operational Phase Assessment

4.3.1 Operational Traffic Data

Operational air quality impacts could arise because of traffic changes on the local road network. Information supplied by the Project Transport Consultant (Mayer Brown) indicates that Woodcote Green Road will be used as the main access road for the Proposed Development where the greatest change in traffic volume is anticipated. Table 2 presents the volume of operational traffic generated by the Proposed Development on Woodcote Green Road.

Table 2: Operational traffic data from the Proposed Development on Woodcote Green Road

Vehicle types	AADT
LDV	442
HDV	16
Total	458

From the traffic data presented above, the Proposed Development will not generate more than 500 AADT and 100 AADT in LDV and HDV respectively during the operational phase on Woodcote Green Road. The volume of operational traffic will disperse further once leaving Woodcote Green Road. As such, the number of LDVs and HDVs will not breach the indicative criteria detailed in the EPUK/IAQM planning guidance[15] on any one road. On this basis it can be concluded that the operational traffic associated with the Proposed Development will not have a significant effect on air quality. Therefore, detailed assessment will not be required and has been scoped out of the assessment. This approach has been accepted by the EHO at EEBC.

4.3.2 Combustion Emissions

The heating for the core elements of the Proposed Development will be supported by an air source heat pump (ASHP) system. The excess heat from the existing combined heat and power plant (CHP) at Epsom General Hospital will be used for the ancillary and wellbeing spaces at the Proposed Development. Therefore, no additional combustion plant will be installed within the Proposed Development, and there will be no change in the emissions from the existing CHP plant. Therefore, a further assessment will not be required. This approach has been accepted by the EHO at EEBC.

4.4 Sensitive Receptor Locations

The closest sensitive receptors are located at the immediate north of the site, the Epsom General Hospital. The closest residential receptors are located on Digdens Rose and Hylands Mews which are within 50m from the site.

The nearest designated ecological receptor is Epsom Common sites of Special Scientific Interest (SSSI), which is located 600m north-west from the site.

5 Baseline Assessment

5.1 Sources of Air Pollution

5.1.1 Industrial Processes

Industrial air pollution sources are regulated through a system of operating permits or authorisations, requiring stringent emission limits to be met and ensuring that any releases to the environment are minimised or rendered harmless. Regulated (or prescribed) industrial processes are classified as Part A or Part B processes, and are regulated through the Pollution Prevention and Control (PPC) system[19,20]. The larger more polluting processes are regulated by the Environment Agency (EA), and the smaller less polluting ones by the local authorities. Local authorities tend also to regulate only for emissions to air, whereas the EA regulates emissions to air, water and land.

There are no industrial Part A processes with relevant releases to air listed on the EA website within 2km of the site.

5.1.2 Road Traffic

In recent decades, atmospheric emissions from transport on a national basis have grown to match or exceed other sources in respect of many pollutants, particularly in urban areas. The local air quality of the Proposed Development is mainly influenced by vehicle emissions, notably the A24 Dorking Road and Woodcote Green Road.

5.2 Local Air Quality

The Environment Act 1995 requires local authorities to review and assess air quality with respect to the objectives for the pollutants specified in the National Air Quality Strategy. Where objectives are not predicted to be met, local authorities must declare the area as an AQMA and then produce an Air Quality Action Plan (AQAP) which includes measures to improve air quality in the AQMA. Local authorities are also required to prepare an Annual Status Report (ASR) to state the measures implemented to improve local air quality and report any progress achieved.

The Proposed Development is not within an AQMA and there are no AQMAs within 2km of the site.

[19] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control).
[20] The Environmental Permitting (England and Wales) (Amendment) Regulations 2013, SI 2013/390.

5.3 Local Monitoring

EEBC does not undertake any automatic monitoring site within the borough and only passive monitoring using diffusion tubes to measure NO_2 has been undertaken in recent years.

5.3.1 Diffusion Tube Monitoring

A review of existing local air quality conditions in the vicinity of the site has been undertaken. 12 of the diffusion tube monitoring locations are within 2km of the site. Details of these diffusion tubes are provided in Table 3. The locations of these monitoring sites are shown in Figure 2.

Table 4 shows the recent diffusion tube monitoring results for the annual mean NO_2 concentration from 2013 to 2017. The NO_2 annual mean objective was exceeded between 2013 and 2017 at three out of 12 diffusion tube sites which are all roadside locations. The highest annual NO_2 concentration recorded 48.6µg/m^3 in 2013 at High Street, Epsom (EE22), a roadside location approximately 1.2km north-east of the site.

The most representative diffusion tube location of the site is at 37 South Street (EE49), located approximately 800m north-east of the site. Monitoring location EE49 and the site both front onto the A24 Dorking Road/ South Street and located within a similar urban setting. The site is slightly set back from the A24 where the influence of road traffic emissions is lessened in comparison to EE49. The annual mean NO_2 concentrations at EE49 is 28.6µg/m^3 which is well below the objective.

The diffusion tube at 26 The Crescent (EE3) is the closest urban background monitoring site which is located approximately 1km north-west of the site. Between 2013 and 2017, the highest annual mean NO_2 concentration was 23.3µg/m^3 which is below the air quality objective. In 2017, the annual mean NO_2 decreased and recorded 16.9µg/m^3. It is considered likely that background NO_2 concentrations at the site would meet the annual mean objective.

Table 3: Details of the diffusion tube monitoring sites within 2km of the site

Site ID	Name	OS Grid Reference		Site type
		X	Y	
EE1	The Clock Tower	520732	160762	Roadside
EE3	26 The Crescent - Background	519293	160026	Urban Background
EE14	Hook Road Epsom	520885	161308	Roadside
EE22	High Street, Epsom	520965	160871	Roadside
EE36	Capitol Square, Church Street	521069	160817	Roadside
EE37	British Heart Foundation, High Street	520931	160833	Roadside
EE38	Station Approach	520726	160857	Roadside

Site ID	Name	OS Grid Reference		Site type
		X	Y	
EE39	The Parade	520844	160729	Roadside
EE42	High Street / East Street	521004	160901	Roadside
EE43	Kiln Lane	521478	161447	Roadside
EE46	Waterloo Road	520724	161027	Roadside
EE49	37 South Street	520580	160586	Roadside

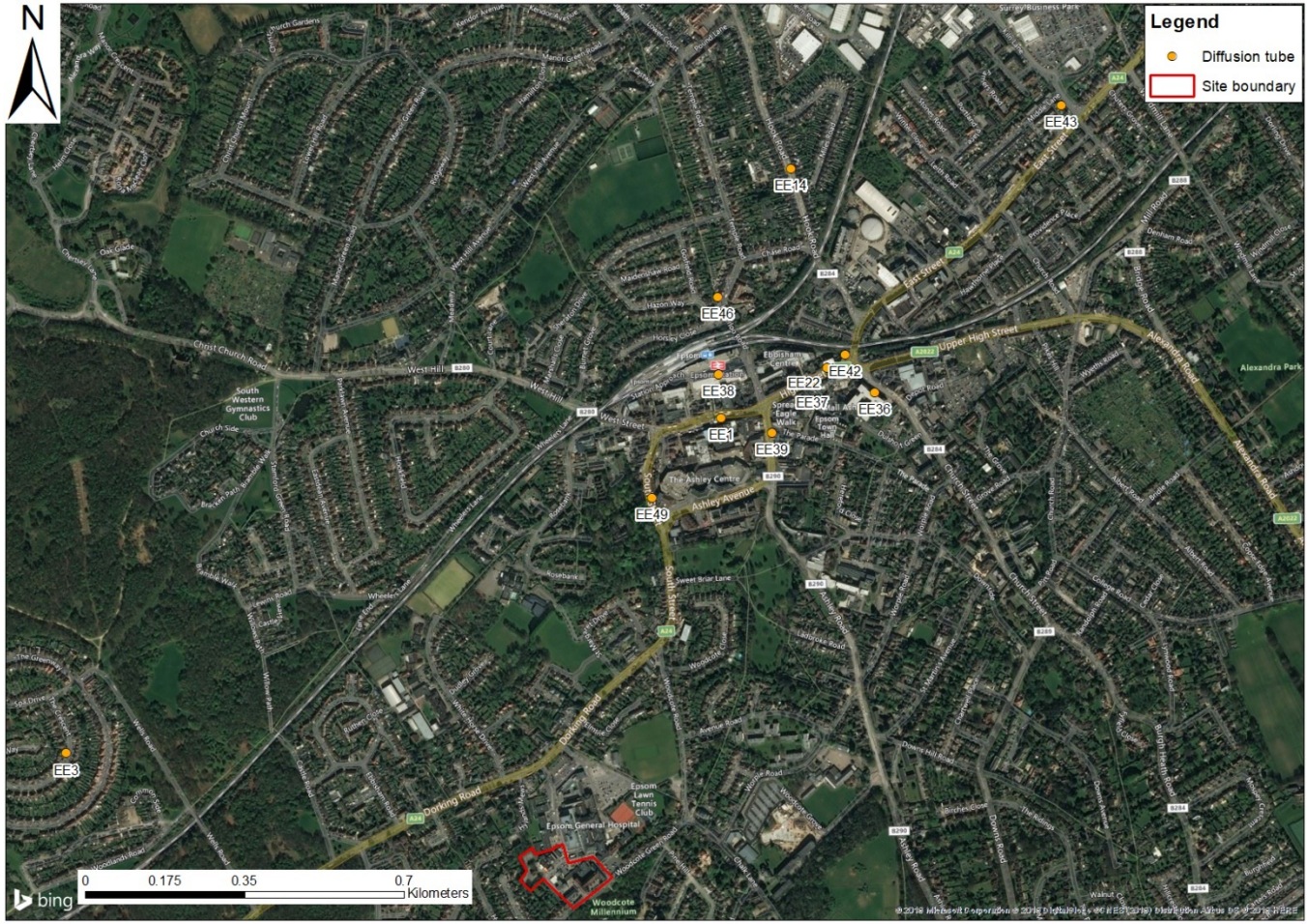
Table 4: Diffusion tube NO_2 results

Site ID	Name	NO_2 annual mean ($\mu g/m^3$)				
		2013	2014	2015	2016	2017
EE1	The Clock Tower	**44.8**	33.1	39.8	39.1	33.9
EE3	26 The Crescent	23.3	17.1	19.8	20.2	16.9
EE14	Hook Road Epsom	32.6	26.8	29.0	29.0	25.4
EE22	High Street, Epsom	**48.6**	**41.8**	**41.4**	**48.1**	39.3
EE36	Capitol Square, Church Street	31.1	25.8	29.6	29.1	26.3
EE37	British Heart Foundation, High Street	**40.5**	34.2	**43.6**	38.6	33.4
EE38	Station Approach	32.6	25.7	29.2	29.0	25.1
EE39	The Parade	36.8	32.0	33.6	35.6	27.6
EE42	High Street / East Street	35.0	30.3	34.5	32.9	28.8
EE43	Kiln Lane	36.0	29.9	35.0	34.4	28.5
EE46	Waterloo Road	24.8	19.2	25.5	23.0	24.6
EE49	37 South Street	n/a[1]	n/a[1]	n/a[1]	n/a[1]	28.6
Air quality objective		40 $\mu g/m^3$				

Note: Exceedances of the NO_2 annual mean objective of 40$\mu g/m^3$ are shown in **bold**. NO_2 annual means exceeding 60$\mu g/m^3$, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

[1]Diffusion tube monitoring site not yet in operation.

Figure 2: Location of diffusion tube monitoring sites within 2km of the site



5.4 Background Concentrations

5.4.1 Defra Background Maps

The Defra website includes estimated background concentrations for NO_2, NOx, PM_{10}, $PM_{2.5}$ for each 1km by 1km OS grid square. Table 5 shows the estimated 2017 Defra background concentrations for the OS grids square which the site is located in (520500,159500), and the OS grid square containing the closest urban background monitor at 26 The Crescent (EE3) (519500, 160500).

The estimated background concentrations are below the air quality objectives for annual mean NO_2 and PM_{10} (40µg/m^3) and below the 2020 air quality objective for $PM_{2.5}$ (25µg/m^3).

Table 6 shows the comparison between the measured concentration at diffusion tube monitoring site EE3 in 2017, and the estimated Defra background concentrations for the same OS grid square for NO_2. The NO_2 concentration measured at site EE3 is higher than the estimated Defra background concentration for the same grid square by 14%. The monitored background NO_2 concentration will be used throughout this assessment since it provides a more conservative approach.

Table 5: Defra's estimated 2017 background pollutant concentrations

Description	OS grid square		Annual mean concentrations (µg/m^3)			
	X	Y	NO_2	NOx	PM_{10}	$PM_{2.5}$
Site	520500	159500	14.8	20.9	15.1	10.6
26 The Crescent (EE3)	519500	160500	14.5	20.3	14.8	10.6

Table 6: Comparison between monitored NO_2 and Defra background concentrations

Pollutant	Defra background concentration (µg/m^3)	Monitored concentration at site EE3 (µg/m^3)	Difference (monitored – modelled) (µg/m^3)	Difference (monitored – modelled) (%)
NO_2	14.5	16.9	2.4	14

6 Construction Assessment

6.1 Construction Activities

The Proposed Development will require demolition and construction. As such, the effects of demolition, earthworks, construction and trackout activities on local air quality, are considered below.

6.1.1 Sensitive Receptors

Sensitive human receptors are defined as those residential properties/ schools/ hospitals/ places of work that are likely to experience a change in pollutant concentrations and/or dust nuisance due to the construction and operation of the Proposed Development. Further information for sensitive receptors are provided in Section 6.1.3.

There are no designated ecological receptors sensitive to dust within 50m of the redline boundary, and therefore the sensitivity of the area to ecological impacts is negligible.

6.1.2 Dust Emission Magnitude

Following the methodology outlined in Section 4.2, each dust-generating activity has been assigned a dust emission magnitude as shown in Table 7.

Table 7: Dust emission magnitude for construction activities

Activity	Dust emission magnitude	Reasoning
Demolition	Medium	Total building volume <40,000m^3 Demolition activities 10-20m above ground level Low potential for dust release as brick, dry lining, clay tiles and timber are the materials for the existing building
Earthworks	Large	Total site area >10,000m^2 <5 heavy vehicles operating at one time Moderately dust soil type, such as clay, sand and gravel <1,500 tonnes material to be moved No bunds will be created
Construction	Large	Total building volume >100,000m^3 Piling and concreate backing will be undertaken Potentially dusty construction material (e.g. concrete)
Trackout	Medium	10-50 HDV movements in any one day Moderately dusty surface No unpaved road on site

6.1.3 Sensitivity of the Area

There are 10 to 100 sensitive receptors within 20m of the redline boundary shown in Figure 3. The closest sensitive receptors are located at the Epsom General Hospital, which are considered 'high sensitivity receptors' by the IAQM guidance[14]. As such the areas sensitivity has been classified as high to dust soiling according to the IAQM guidance.

The annual mean background PM_{10} concentration is less than 24µg/m^3. As there are 10-100 receptors within 20m of the Proposed Development, the sensitivity of the area to human health impacts has been assigned as low. The overall sensitivity has been summarised as shown in Table 8.

Table 8: Sensitivity of the surrounding area to impacts on dust soiling and human health

Potential impact	Sensitivity of the surrounding area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	High
Human Health	Low	Low	Low	Low

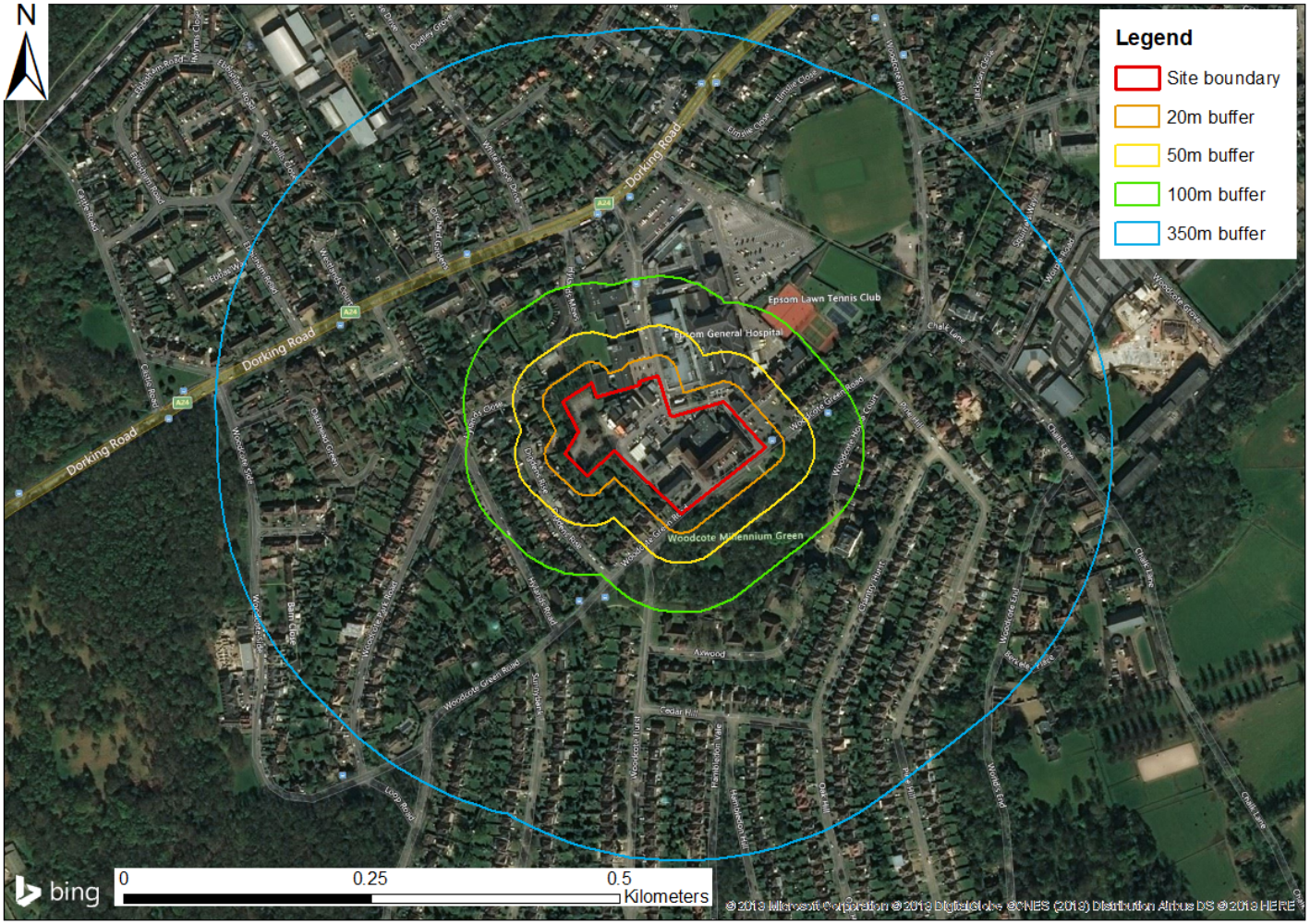
Using the criteria set out in the risk of dust impacts table (Table A1:5) the impacts on the area without mitigation are defined. Risk of impactsTaking into consideration the dust emission magnitude and the sensitivity of the area, the risk of impacts has been classified as high for earthworks and construction, and medium for demolition and trackout (Table 9).

With the appropriate best practice mitigation measures (outlined in Section 8.1) in place, there is likely to be a negligible effect from the dust-generating activities on site. The appropriate mitigation measures will be included in the Construction Environmental Management Plan (CEMP).

Table 9: Summary dust risk table prior to mitigation

Activity	Dust risk	Human health risk
Demolition	Medium	Low
Earthworks	High	Low
Construction	High	Low
Trackout	Medium	Low

Figure 3: Construction dust buffers



7 Exposure Assessment

An exposure assessment has been undertaken by taking into account the available air quality monitoring data and significant emission sources in the vicinity of the site.

7.1 Air quality at the site

A baseline assessment has been undertaken in Chapter 5, existing monitoring data results indicate the annual mean NO_2 concentrations within 2km of the site are generally below the objective of 40µg/m^3. Exceedances were only recorded at 3 monitoring locations in 2013 – 2016, and they are all locate on the A24 High Street, and they are also located over 1km away from the site.

The most representative monitoring location to the site is EE49 which is also fronting onto the A24 Dorking Road/ South Street and both locations are in a similar urban setting. The site is situated 150m away from the A24 where the influence of road traffic emissions is lessened in comparison to EE49, this indicates lower pollutant concentrations would be anticipated at the site.

Furthermore, traffic data provided by the Project Transport Consultant indicated traffic volume on the A24 near the hospital was lower than the section near monitoring location EE49 in 2018. Circa 20,000 AADT was recorded near the monitoring location EE49 and 17,000 AADT was recorded at the A24 section near the Epsom General Hospital.

Based on the above justification and referring to the latest annual mean NO_2 concentrations recorded at EE49, which is 28.6µg/m^3, this indicates exceedance is unlikely at the site.

EEBC does not undertake any PM_{10} or $PM_{2.5}$ monitoring within the borough. However, Defra estimated background mapping data indicate both PM_{10} and $PM_{2.5}$ concentrations are well below the relevant objectives, as such, exceedances are unlikely at the site.

7.2 Exposure Assessment at the Proposed Development

7.2.1 Road traffic

As discussed in section 4.3.1, the impact of the operational traffic is considered to be negligible as the greatest number of the additional vehicle movement is below the thresholds detailed in the EPUK & IAQM planning guidance[15]. In terms of the future exposure at the Proposed Development, as the contribution from the additional vehicle movement will be negligible to the NO_2, PM_{10} and $PM_{2.5}$ concentrations, the relevant pollutant concentrations are unlikely to be significantly changed due to operational road traffic emissions. Therefore, the baseline conditions detailed in Chapter 5 is considered to be representative at the Proposed Development when operational and no exceedances on site is

anticipated. Furthermore, road traffic emissions are likely to be reduced in future years considering the air quality improvement measures implemented by EEBC[21] and advances in vehicle technology.

7.2.2 Combustion plant

As stated in section 4.3.2, no new additional combustion plant will be installed at the Proposed Development.

With regards to existing/consented combustion plant in the area, it is understood that the nearest plant to the site is the consented energy centre at Epsom General Hospital (planning reference: 19/00865/FUL). As the Proposed Development is located approximately 70m southwest as well as downwind to the consented energy centre, a review of the air quality assessment[22] for the consented energy centre has been carried out to determine its potential impact on the Proposed Development.

The assessment included dispersion modelling to predict the annual and hourly mean NO_2 concentrations in the vicinity of the Epsom General Hospital, and the assessed receptor locations are considered to be representative to the Proposed Development due to their close proximity. As a worst-case approach, the highest predicted Process Contribution (PC) for annual mean NO_2 across the assessed receptors has been identified. The highest predicted PC in annual mean NO_2 concentration is at receptor 6 (detailed in the assessment for the consented energy centre), located at the northeast corner of the site. The predicted PC is 5.4µg/m^3 and the Process Environmental Concentration (PEC) is 36.1µg/m^3 [23] which is below the objective. In addition, no exceedances for hourly mean NO_2 were predicted in the assessment.

It is also noted that the predicted concentrations calculated in the air quality assessment[22] for the consented energy centre contains a high level of conservatism, where 100% of the emitted NOx has been assumed to convert into NO_2 and therefore the annual mean PEC at 36.1µg/m^3 is likely to be an over-prediction.

Taking into account the baseline conditions detailed in Chapter 5 and the predicted PEC based on the assessment carried out for the consented energy centre, exceedances of NO_2, PM_{10} and $PM_{2.5}$ concentrations are unlikely to occur when the Proposed Development is operational.

7.2.3 Car park

The proposed car park will operate under an Automatic Parking System (APS), where cars will be picked up and parked up by a centralised system as opposed to self-parking. There will not be any vehicles with engines running within the car park as they will be switched off before being picked up and dropped off, which

[21] EEBC (2010) Air Quality Action Plan and Further Assessment of Air Quality for Ewell High Street
[22] Environmental Visage (2019). Detailed air quality assessment for combustion plant associated with the energy centre at Epsom General Hospital.
[23] The background concentration applied across the site is 30.7µg/m^3.

will happen outside the car park. As a result, there will be no minimal emissions from the car park. Therefore, the air quality impacts associated with proposed carpark is considered to be negligible and is unlikely to cause exceedance of air quality objectives at the Proposed Development.

7.3 Summary

Based on above review, the air quality objectives are unlikely to be exceeded at the Proposed Development when it is operational.

8 Mitigation for Construction

8.1 Construction Dust

The dust emitting activities assessed can be greatly reduced or eliminated by applying the site-specific mitigation measures for the site according to the IAQM guidance. The guidance notes that it is anticipated that with the implementation of effective site-specific mitigation measures, the environmental effect is likely to be 'not significant' in most cases.

High risk mitigation measures for the general site and measures specific to the risks identified for demolition and construction activities, are identified following the assessment. The following measures from the guidance are relevant and should be included in the Construction Environmental Management Plan (CEMP) for the site.

8.1.1 General

- Develop and implement a stakeholder communications plan that include 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, which will include measures to control other emissions, approved by EEBC.

8.1.2 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 EEBC when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on-site or off-site and the action taken to resolve the situation in the log book.
- Hold regular liaison meetings with other high risk construction sites within 500m of the site boundary (if applicable), 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 strategic road network routes.

8.1.3 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 EEBC when asked. This should include regular dust soiling checks

of surfaces such as street furniture, cars and window wills within 100m of site boundary, with clean to be provided in necessary.

- Carry out regular site inspections to monitor compliance with the Dust Management Plan, record inspection results and make an inspection log available EEBC, 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.
- Liaise with EEBC regarding the need for air quality monitoring during construction. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.

8.1.4 Site Maintenance

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

8.1.5 Operating Vehicles/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.
- Ensure vehicles entering and leaving the site are covered to prevent escape of materials during transport.
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking and car-sharing).

8.1.6 Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques, such as water sprays or local extraction.
- 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 the fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean and dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet clean methods.

8.1.7 Waste management

- Avoid bonfires and burning of waste materials.

8.1.8 Measure Specific to Demolition

- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- Ensure effective water suppression is used during demolition operations.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

8.1.9 Measure Specific to Earthworks

- Use Hessian, mulches or trackifiers cover with topsoil, as soon as practicable.
- Only remove the cover in small areas during work and not all at once.

8.1.10 Measures Specific to Construction

- Avoiding scabbling (roughening of concrete surfaces).
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out.
- 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 final powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

8.1.11 Measures Specific to Trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving the site are covered to present escape of materials during transport;
- Access gates to be located at least 10m from receptors where possible.

9 Conclusion

A baseline assessment has been carried to review the air quality conditions in the vicinity of the site. The current EEBC monitoring indicates that annual NO_2 concentrations at both urban background and roadside locations within 2km the site are generally below the air quality objective.

An assessment of the potential impacts on local air quality arising from the operation of the Proposed Development has been undertaken. No significant impact is anticipated.

A qualitative assessment of the potential impacts on local air quality from construction activities for the Proposed Development has been carried out using the IAQM methodology. This identified medium to high risk for dust soiling and low risk for heath impact. However, with the appropriate best practice mitigation measures in place as defined in section 8, the residual effect from the dust-generating activities on site is likely to be 'not significant'.

An exposure assessment has been carried out to review the significant emission sources in the vicinity of the Proposed Development, which included road traffic, combustion plant and car park emissions. The review concluded that the air quality objectives are unlikely to be exceeded at the Proposed Development when it is operational.

Appendix A

Methodology of Construction Dust Assessment

A1 Methodology of Construction Dust Assessment

Figure A1.1: IAWM dust assessment methodology

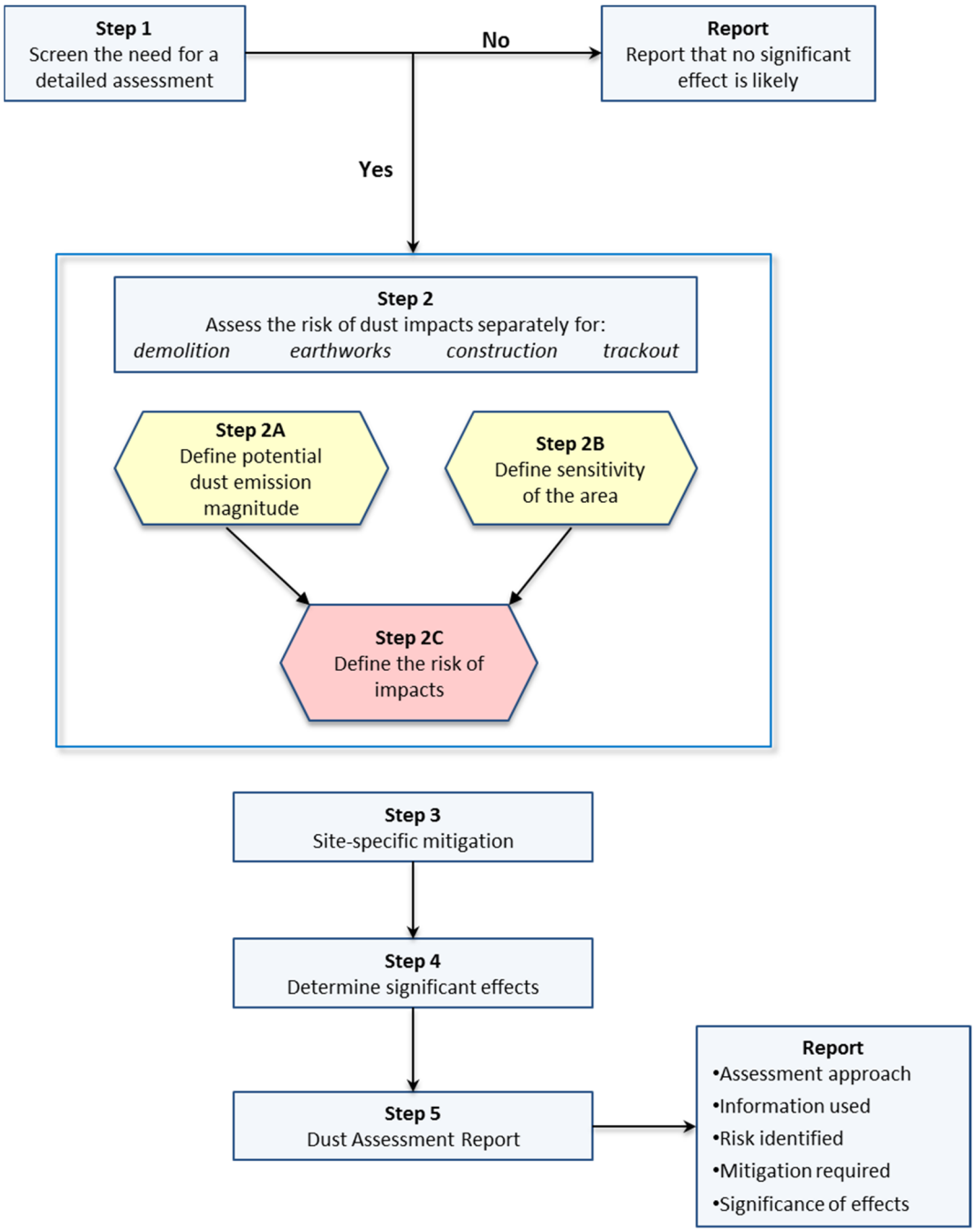


Table A1.1 Dust emission magnitude

Dust emission magnitude		
Small	**Medium**	**Large**
Demolition		
• total building volume <20,000m^3 • construction material with low potential for dust release (e.g. metal cladding or timber) • demolition activities <10m above ground • demolition during wetter months	• total building volume 20,000 - 50,000m^3 • potentially dusty construction material • demolition activities 10 - 20m above ground level	• total building volume >50,000m^3 • potentially dusty construction material (e.g. concrete) • on-site crushing and screening • demolition activities >20m above ground level
Earthworks		
• 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 <10,000 tonnes • earthworks during wetter months	• total site area 2,500m^2 - 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 >10,000m^2 • potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • >10 heavy earth moving vehicles active at any one time • formation of bunds >8m in height • total material moved >100,000 tonnes
Construction		
• total building volume <25,000 m^3 • construction material with low potential for dust release (e.g. metal cladding or timber)	• total building volume 25,000 - 100,000m^3 • potentially dusty construction material (e.g. concrete) • on-site concrete batching	• total building volume >100,000m^3 • on-site concrete batching • sandblasting

Dust emission magnitude		
Small	**Medium**	**Large**
Trackout		
• <10 HDV (>3.5t) outward movements in any one day • surface material with low potential for dust release • unpaved road length <50m	• 10 – 50 HDV (>3.5t) outward movements in any one day • moderately dusty surface material (e.g. high clay content) • unpaved road length 50 – 100m;	• >50 HDV (>3.5t) outward movements in any one day • potentially dusty surface material (e.g. high clay content) • unpaved road length >100m

Table A1.2 Sensitivity of the area to dust soiling effects

Receptor sensitivity	**Number of receptors**	**Distance from the source (m)**			
		< 20	**< 50**	**< 100**	**< 350**
High	> 100	High	High	Medium	Low
	10 – 100	High	Medium	Low	Low
	< 10	Medium	Low	Low	Low
Medium	> 1	Medium	Low	Low	Low
Low	> 1	Low	Low	Low	Low

Table A1.3 Sensitivity of the area to human health impacts

Receptor Sensitivity	**Annual Mean PM_{10} concentration**	**Number of receptors**	**Distance from the Source (m)**				
			<20	**<50**	**<100**	**<200**	**<350**
High	>32 µg/m^3	>100	High	High	High	Medium	Low
		10-100		High	Medium	Low	
		1-10		Medium	Low		
	28-32 µg/m^3	>100	High	High	Medium	Low	Low
		10-100		Medium	Low		
		1-10					
	24-28 µg/m^3	>100	High	Medium	Low	Low	Low

		10-100					
		1-10	Medium	Low			
	<24 µg/m^3	>100	Medium				
		10-100	Low	Low	Low	Low	Low
		1-10					
Medium	>32 µg/m^3	>10	High	Medium			
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m^3	>10	Medium				
		1-10	Low	Low	Low	Low	Low
	24-28µg/m^3	>10					
		1-10	Low	Low	Low	Low	Low
	<24µg/m^3	>10					
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table A1.4 Sensitivity of the area for ecological impacts

Receptor sensitivity	**Distance from the source (m)**	
	< 20	**< 50**
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Table A1.5 Risk of dust impacts

Sensitivity of area	**Dust emission magnitude**		
	Large	**Medium**	**Small**
Demolition			
High	High risk site	Medium risk site	Medium risk site
Medium	High risk site	Medium risk site	Low risk site
Low	Medium risk site	Low risk site	Negligible
Earthworks			

Sensitivity of area	Dust emission magnitude		
	Large	**Medium**	**Small**
High	High risk site	Medium risk site	Low risk site
Medium	Medium risk site	Medium risk site	Low risk site
Low	Low risk site	Low risk site	Negligible
Construction			
High	High risk site	Medium risk site	Low risk site
Medium	Medium risk site	Medium risk site	Low risk site
Low	Low risk site	Low risk site	Negligible
Trackout			
High	High risk site	Medium risk site	Low risk site
Medium	Medium risk site	Low risk site	Negligible
Low	Low risk site	Low risk site	Negligible