Chapter G
Air Quality

Milton Keynes East Environmental Statement

Chapter G: Air Quality

March 2021

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G1.0 Introduction

G1.1 This Chapter forms part of the Milton Keynes East Environmental Statement ('ES') which sets out the findings of an Environmental Impact Assessment ('EIA') of the proposed development of a sustainable urban extension to Milton Keynes. It relates to land to the east of the M1 motorway and to the south of Newport Pagnell. A description of the background to the proposal; the relationship of this chapter to the wider ES; and a description of the site and the development is provided at Chapters A to C of this ES.

G1.2 This chapter reports the findings of the assessment of potential air quality impacts and likely significant effects of the Proposed Development. The chapter also considers the potential odour impacts on the Proposed Development from the operations at the Anglian Water Cotton Valley Water Recycling Centre (WRC).

G1.3 The chapter should be read in conjunction with the following figures provided at Volume 2 to this ES:-

- Figure G1 - Baseline & Constraints
- Figure G2 - Construction Dust Assessment
- Figure G3 - 2031 Operational Study Area
- Figure G4 - 2048 Operational Study Area
- Figure G5 A - Human Receptors
- Figure G5 B - Human Receptors
- Figure G5 C - Human Receptors
- Figure G6 - Ecological Receptors

G1.4 It should also be read in conjunction with the following technical appendices (Volume 2 of the ES):-

- Appendix G1 – IAQM Construction Assessment Methodology
- Appendix G2 – Operational Traffic Data
- Appendix G3 – Model Inputs and Verification
- Appendix G4 – Receptors
- Appendix G5 – Results for Human Receptors
- Appendix G6 – Results for Ecological Receptors
- Appendix G7 – Anglian Water Odour Assessment

About the Author

G1.5 This chapter has been prepared by the Air Quality Team at WSP which has completed many assessments of this kind previously. This chapter was written and checked by competent professionals comprising members of the Institution of Environmental Sciences (IES) and the Institute of Air Quality Management (IAQM).

G2.0 Policy Context

Legislation

G2.1 The following legislation is relevant:

1 Section 79 of The Environmental Protection Act 1990[Ref 1] is national legislation which includes requirements under Part III of the Act for statutory nuisance and clean air. In the context of this assessment, statutory nuisance could result from emissions to air in the construction stage. The Act provides the following definitions of statutory nuisance relevant to dust and particles:

"Any dust, steam, smell or other effluvia arising from industrial, trade or business premises or smoke, fumes or gases emitted from premises so as to be prejudicial to health or a nuisance"; and

"Any accumulation or deposit which is prejudicial to health or a nuisance".

Statutory nuisance provisions are relevant to (amongst other things) the control of dust from construction sites and odour from wastewater treatment works. There are no statutory limit values for dust 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. The party responsible for the premises giving rise to the emissions is responsible for ensuring use of Best Practicable Means to avoid a statutory nuisance.

2 Under Part IV of the Environment Act 1995[Ref 2], local authorities must review and document local air quality within their area by way of staged appraisals and respond accordingly, with the aim of meeting the air quality objectives defined in the Regulations. Where the objectives are not likely to be achieved, an authority is required to designate an Air Quality Management Area (AQMA). For each AQMA the local authority is required to draw up an Air Quality Action Plan (AQAP) to secure improvements in air quality and show how it intends to work towards achieving air quality standards in the future.

3 The Air Quality (England) Regulations 2000 (as amended)[Refs 3,4] set objectives for ambient pollutant concentrations. The objective applies where there is relevant exposure: "*…at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present.*"

4 The Air Quality Standards Regulations 2010 (as amended)[Refs 5,6] set legally binding limit values for concentrations in outdoor air of major air pollutants that impact public health such as PM_{10}, $PM_{2.5}$ and NO_2. The limit values are numerically the same as the objectives. The air quality standards (AQS), in terms of objectives and limit values that are relevant to this assessment are given in Table G2.1.

Table G2.1 Relevant Air Quality Standards

Pollutant	Concentration in micrograms per cubic metre (µg/m³)	Measured as	Requirement
Nitrogen dioxide (NO_2)	40	Annual mean	Not to be exceeded as a national objective.
	200	1-hour mean	Not to be exceeded, more than 18 times a year as a national objective.
	40	Annual mean	Not to be exceeded as a national objective.

Pollutant	Concentration in micrograms per cubic metre (µg/m^3)	Measured as	Requirement
Particulate matter less than 10 micrometres in diameter (PM_{10})	50	24-hour mean	Not to be exceeded, more than 35 times a year as a national objective.
Particulate matter less than 2.5 micrometres in diameter ($PM_{2.5}$)	25	Annual mean	Not to be exceeded as a national objective.
Oxides of nitrogen (NO_x)	30	Annual mean	Critical level for the protection of vegetation.

Planning Policy

G2.2 The following policy is relevant:

1 The National Planning Policy Framework (NPPF)[Ref 7] encompasses the Government's overall planning policies for England and was adopted in 2019. The core underpinning principal of the framework is the presumption in favour of sustainable development. In relation to air quality, the following paragraphs in the document are relevant to the Proposed Development:

i. Paragraph 54: *"Local planning authorities should consider whether otherwise unacceptable development could be made acceptable through the use of conditions or planning obligations. Planning obligations should only be used where it is not possible to address unacceptable impacts through a planning condition.*"

ii. Paragraph 102, which relates to the need to consider transport related issues at the earliest stages of plan making and development proposals, so that *"…c) opportunities to promote walking, cycling and public transport use are identified and pursued; d) the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains…*".

iii. Paragraph 103: *"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."*

iv. Paragraph 170: *"Planning policies and decisions should contribute to and enhance the natural and local environment 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. 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."*

v. Paragraph 180: "*Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development."*

vi. Paragraph 181: *"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.

vii. Paragraph 183: *"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. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities."*

2 The Government's policy on air quality within the UK is set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007)[Refs 8,9]. The Air Quality Strategy provides a framework for reducing air pollution in the UK with the aim of meeting the AQS.

3 The Government's air quality plan for NO_2 in the UK (2017)[Ref 10]. This plan aims to bring NO_2 concentrations within the limit values in the shortest time possible. One measure to achieve this is to encourage the local acceleration of ultra-low emission vehicles (ULEV), by providing £35 million of funding for four cities, of which Milton Keynes is one.

4 The Department for Environment, Food and Rural Affairs (Defra) published the Government's Clean Air Strategy [Ref 11] in 2019. This sets out the measures, which aim to reduce emissions from all sources of air pollution, making air healthier to breathe, protecting nature and boosting the economy. The Strategy also provides goals to cut public exposure to airborne particulate matter, as per the recommendation made by the World Health Organisation.

Furthermore, the Strategy confirms that the Government will set new legislation to *"create a stronger and a more coherent framework for action to tackle air pollution. This will be underpinned by new 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."* New enforcement powers will also be given at a national and local level, across all sectors of society.

5 The 2006 Buckinghamshire and Milton Keynes Regional Air Quality Strategy [Ref 12] aims to set out the regional measures that will be undertaken to *"minimise the effects of air pollution on human health and the environment*". In addition, this document sets out the framework "*for planning future action, especially with regard to Air Quality Management Areas and local transport planning."* The aims of the Strategy are as follows:

viii. "Improve air quality in Milton Keynes and Buckinghamshire.

ix. Work towards reducing pollutants with an aim of achieving standards set under the National Air Quality Strategy.

x. Ensure a uniform approach towards air quality management across Buckinghamshire and Milton Keynes.

xi. Continue to inform and provide up to date information on air quality within the County.

xii. Ensure that all Council activities are considered with reference to their impact on air quality.

xiii. To support and push forward national initiatives that can improve air quality."

6 MKC adopted a new Local Plan in March 2019 known as 'Plan:MK' [Ref 13]. Of relevance to this assessment are the following policies:

i. Policy EH7 Promoting Healthy Communities: *"Milton Keynes is committed to reducing health inequalities, increasing life expectancy and improving quality of life in the Borough. Proposals should be designed to achieve the aspiration [whereby MKC seeks] to improve air quality and reduce noise by locating and designing pollution generating land uses and roads to avoid adverse impacts on sensitive land uses, and securing necessary mitigation measures to make development acceptable."*

ii. Policy NE6 Environmental Pollution - Air Quality: "*Prevailing air quality and potential impacts upon air quality arising from air borne emissions, dust and odour associated with the construction and operation of a proposal (including vehicular traffic) will be considered when determining planning applications. Proposals that would result in or be subject to unacceptable risk to human health and the natural environment from air pollution, or would prejudice compliance with national air quality objectives, will be refused.*

An Air Quality Assessment that demonstrates how prevailing air quality and potential impacts upon air quality have been considered, and how air quality will be kept to an acceptable standard though avoidance and mitigation, will be required for major and minor development proposals if any of the following apply:

- *The development is likely, due to the nature of the proposal, and through in-combination effects, to give rise to significant pollution;*
- *The site is within an Air Quality Management Area;*
- *The site is within 50 meters of a major road or heavily trafficked route;*
- *The site is within proximity to a source of air pollution which could present a significant risk to human health; and/or*
- *The type of development would mean its occupiers would be particularly sensitive to air pollution, such as schools, health care establishments or housing for older people.*

iii. The potential impact of proposals upon odour levels, or their sensitivity to prevailing sources and levels of odour, should be considered and addressed. Where appropriate, the Council will require an Odour Impact Assessment to be provided, including an Odour Management Plan where necessary."

7 The Sustainable Construction Draft Supplementary Planning Document [Ref 14] was prepared to support Plan:MK and sets out how Policy SC1 should be interpreted; including the type of electric vehicle charging infrastructure that new development should provide.

8 Anglian Water Asset Encroachment Policy[15] is relevant due to the proximity of the Cotton Valley WRC states that:

"Anglian Water will use a risk assessment process to consider any planning application within 400 metres of a sewage treatment works or within 15 metres of a sewage pumping station. We may decide to increase the size of this 'consultation zone' if the treatment works serves a population greater than 50,000 people. While the results of the assessment will not decide the outcome of a planning application, it will inform potential developers and provide planning officers and elected councillors with evidence-based findings to help inform their planning decisions."

Guidance

G2.3 The following guidance is relevant:

1 National Planning Practice Guidance (2014)[Ref 16] provides guiding principles on how the planning process can take into account the impact of new development on air quality, and explains how much detail air quality assessments need to include for proposed developments, and how impacts on air quality can be mitigated. It also provides information on how air quality is accounted for by Local Authorities in both the wider planning context of Local Plans and neighbourhood planning, and in individual cases where air quality is a consideration in a planning decision.

2 Defra's Local Air Quality Management Technical Guidance (2018)[Ref 17] (referred to hereafter as 'LAQM.TG(16)') has been used with respect to the methodology used in the assessment of operational stage effects.

3 IAQM's 'Guidance on the assessment of dust from demolition and construction' v1.1 (2016)[Ref 18] (referred to hereafter as 'IAQM Construction Dust Guidance') was produced to provide guidance to developers, consultants and environmental health officers on how to assess the impacts arising from construction activities. The emphasis of the methodology is on classifying sites according to the risk of impacts (in terms of dust nuisance, PM_{10} impacts on public exposure and impact upon sensitive ecological receptors) and to identify mitigation measures appropriate to the level of risk identified.

4 Environmental Protection United Kingdom (EPUK)/IAQM Land-Use Planning & Development Control: Planning for Air Quality v1.2 (2017)[Ref 19] guidance (referred to hereafter as 'EPUK/IAQM Guidance') offers comprehensive advice on: when an air quality assessment may be required; what should be included in an assessment; how to determine the significance of any air quality impacts associated with a development; and, the possible mitigation measures that may be implemented to minimise these impacts.

5 Published in June 2019, the IAQM 'A guide to the assessment of air quality impacts on designated nature conservation sites'[20] (referred to hereafter as 'IAQM Nature Impact Guidance') provides practical guidance on how to undertake assessment. It seeks to encourage greater communication and co-operation between air quality and ecology specialists. The advice provided in this document is not prescriptive and professional judgement on the part of an air quality specialist and ecology specialist is required due to *"the diverse range of projects and wide range of factors that influence the approach taken."*

6 Updated by Highways England in November 2019, the Design Manual for Roads and Bridges (DMRB) LA 105 Air Quality [Ref 21] (referred to hereafter as 'DMRB LA 105') provides a framework for assessing, mitigating and reporting the effects of motorway and all-purpose trunk road projects on air quality. Of relevance to this assessment is the direction it provides to consider designated habitat sites that are sensitive to changes in nitrogen deposition.

7 IAQM's 'Guidance on the assessment of odour for planning' v1.1 (2018)[Ref 22] (referred to hereafter as 'IAQM Odour Guidance') provides guidance on the content and general approach to odour assessment. The guidance also provides odour effect descriptors that can be used to assess the potential effect of different odour concentrations form the "most offensive" odour source on nearby receptors.

8 The Environment Agency's (EA) H4 Odour Management guidance [Ref 23] provides benchmarks against which predicted odour concentrations can be assessed and guidance for use in modelling emissions of odour from processes regulated by the EA.

G3.0 Assessment Methodology & Significance Criteria

Assessment Methodology

Scope of Assessment

G3.1 The scope of the air quality assessment has been established through the EIA scoping process – as described in Chapter B of the ES (Scope and Methodology), and through consultation with MKC and Anglian Water as discussed later in this chapter. Further information can be found in Chapter B of this ES (Scope and Methodology).

G3.2 In determining which elements can be scoped out and which need to be assessed - i.e. are scoped in, established scoping criteria have been applied.

G3.3 IAQM Construction Dust Guidance states that *"An assessment will normally be required where there is:*

1 *a 'human receptor' within:*
   - i *350 m of the boundary of the site;*
   - ii *Or 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).*

2 *An 'ecological receptor' within:*
   - i *50 m of the boundary of the site; or*
   - ii *50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s)."*

G3.4 EPUK/IAQM Guidance gives *"Indicative criteria for requiring an air quality assessment"*, which - in summary – are:

1 For road traffic:
   - i Change in light duty vehicles[1] (LDV) flows of more than 100 vehicles - expressed as annual average daily traffic (AADT) - within or adjacent to an AQMA, or more than 500 AADT elsewhere.
   - ii Change in heavy duty vehicles[2] (HDV) flows of more than 25 AADT within or adjacent to an AQMA, or more than 100 AADT elsewhere.
   - iii Where the road alignment changes by 5m or more.
   - iv Junction alterations adjacent to relevant receptors.
   - v An underground car park with ventilation extract within 20m of relevant receptors and more than 100 movements per day in and out.
   - vi Any combustion plant with a single or combined NO_X emission rate >5mg/s.

G3.5 IAQM Nature Impact Guidance refers to a screening threshold for road traffic of 1,000 AADT. This was used to identify designated habitat sites requiring detailed consideration.

[1] The LDV category includes all vehicle <3.5tonnes gross weight
[2] The HDV category includes lorries, buses and coaches >3.5tonnes gross weight

Elements scoped out

G3.6 The elements listed below are not considered to give rise to likely significant effects due to the Proposed Development and have therefore not been considered within the ES:

1 During construction, dust and particulate matter effects beyond 350m from the site boundary and 500m beyond the site entrance are expected to be insignificant.

2 Local air quality impacts during construction due to operation of non-road mobile machinery (NRMM) are unlikely to have a significant effect at nearby human receptors given the rural nature of the site and the phased nature of the works.

3 Vehicle emissions associated with the construction and operation of the Proposed Development will not have a significant effect on air quality at sensitive receptors beyond 200m from the modelled road network.

4 Local air quality impacts due to construction traffic. In the peak year, maximum AADT flows of 88 HDV and 397 LDV associated with construction activities are expected to be added to the local road network. These are below the IAQM/EPUK Guidance scoping thresholds outside of an AQMA. An analysis of the distribution of construction traffic on the road network determined that based on a route management strategy that utilises the M1, maximum AADT flows of 40 LDVs and 9 HDVs would travel along the A509 and through the Olney AQMA (further details are given in Volume 2 of this ES, Appendix D1 – Transport Assessment). These figures are below the IAQM/EPUK Guidance scoping thresholds for new development within or adjacent to an AQMA.

5 There is no underground car parking.

6 The Proposed Development includes premises with commercial kitchens. Air extraction systems from commercial kitchen areas will have appropriate odour control. A significant effect is highly unlikely.

7 Air quality impacts associated with emissions from space heating plant have been scoped out as unlikely to give rise to a significant effect. The Energy & Sustainability Pre-Application Strategy Summary states that "*the main heating strategy will be to have individual heating systems to each dwelling. This is likely to be a heat pump (either ground source or air source)".* The community and logistical hubs will have zero or low emissions heating systems. This is considered a reasonable and proportionate approach.

8 The potential exposure of future receptors to dust and particulate matter associated with mineral extraction activities on the land south of Caldecote Farm, Willen Road, Newport Pagnell. This site is subject to requirements to mitigate dust emissions and so any impact at new receptors is unlikely to result in a significant effect.

Elements scoped in

G3.7 The following elements meet the relevant scoping criteria and are considered to have the potential to give rise to significant effects during construction and operation of the Proposed Development and have therefore been considered within the ES:

1 Increases in dust deposition and airborne particulate matter concentrations from activities during construction.

2 Local air quality impacts due to exhaust emissions arising from operational road traffic generated by the Proposed Development.

3 The potential exposure of future residents of the Proposed Development to poor air quality.

4 The potential exposure of future receptors to odorous emissions associated with the Cotton Valley WRC.

Extent of The Study Area

G3.8 The following study areas have been defined for the air quality assessment:

1 350 metres from the site boundary and 500 metres beyond the site entrance during construction (see Figure G2 at Volume 2 to this ES); and

2 200 metres from the roads that will be affected by changes in traffic, according to EPUK/IAQM Guidance indicative criteria for air quality assessment, during operation (see Figure G3 and Figure G4 at Volume 2 to this ES).

Baseline Data Collation

G3.9 A desk-based review of information and data in the public domain has been undertaken to determine baseline (existing) air quality conditions in the vicinity of the Development Site. This includes the consideration of data and reports published by the Defra [Ref 24] and MKC.

G3.10 In addition, in 2019 WSP undertook a NO_2 diffusion tube survey to establish baseline conditions in the vicinity of the Development Site and help identify any potential constraints to its development. Baseline information is illustrated in Figure G1 (Volume 2 to this ES).

During Construction

Construction Dust

G3.11 Dust comprises particles typically in the size range 1-75 micrometres (μm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials. The larger dust particles fall out of the atmosphere quickly after initial release and therefore tend to be deposited near to the source of emission. Dust therefore, is unlikely to cause long-term or widespread changes to local air quality; however, its deposition on property and cars can cause 'soiling' and discolouration. This may result in complaints of nuisance through amenity loss or perceived damage caused, which is usually temporary.

G3.12 The smaller size fractions of dust include PM_{10} and $PM_{2.5}$. These remain suspended in the atmosphere for longer duration than the larger dust particles and can therefore be transported by wind over a wider area. These pollutants are harmful to human health as they are small enough to enter the body and lungs through breathing and, in the case of $PM_{2.5}$, can enter the bloodstream and harm other organs. In the case of $PM_{2.5}$, the main source during construction will be from the exhausts of operational NRMM.

G3.13 An assessment of construction dust impacts has been undertaken with reference to IAQM Construction Dust Guidance, with required information concerning demolition and construction activities provided by the Project Team.

G3.14 The IAQM Construction Dust Guidance methodology assesses the risk of potential dust and PM_{10} impacts from the following four sources: demolition; earthworks; general construction activities and track-out. It accounts for the nature and scale of the activities undertaken for each source and the sensitivity of the area to an increase in dust and particulate levels to assign a level of risk. Risks are described in terms of there being a low, medium or high risk of dust impacts. Once the level of risk has been ascertained, then site specific mitigation proportionate to the level of risk is identified, and the significance of residual effects determined. Additional details of the methodology are provided in Appendix G1 (Volume 2 to this ES).

During Operation

Traffic Emissions

G3.15 In the UK, the local air pollutants of concern in relation to road traffic are NO_x (designated habitat impacts[3]), NO_2, PM_{10} and $PM_{2.5}$ (human health impacts). Vehicle emissions of other local air pollutants such as sulphur dioxide and hydrocarbons are no longer found to be problematic in the UK. The emissions from any road will have a noticeable impact on local air quality within only 200m of the road centreline, with a rapid decline in contributed pollutant concentrations as one moves away from the road edge. At around 200m the impact from any road will be imperceptible or **negligible**. This is due to the rapid dilution and dispersion of the emissions in ambient air.

G3.16 For the prediction of impacts due to emissions arising from road traffic, the dispersion model ADMS-Roads (version 5.0.0.1)[Ref 25] has been used. Emissions data representing road traffic activity on the modelled road network and local meteorological conditions are input to ADMS-Roads to predict pollutant concentrations at specified receptor locations.

G3.17 Details of the traffic data used in the assessment can be found in Appendix G2 (Volume 2 to this ES). Five traffic scenarios were modelled:

- 2019 – model verification and baseline;
- 2031 – interim year without Proposed Development;
- 2031 – interim year with Proposed Development;
- 2048 – opening year without Proposed Development; and
- 2048 – opening year with Proposed Development.

G3.18 2019 is the most recent year for which monitoring data and meteorological data are available to enable verification of the model results, and so this year has been used as the baseline year for this assessment.

G3.19 2031 is an interim year assessed to account for the phased occupation of the Proposed Development and is the year when the first phase of the Proposed Development is expected to be complete. The traffic data accounts for development growth up to 2031 plus committed developments.

G3.20 2048 is the anticipated final opening year of the Proposed Development and represents the full build out of the Proposed Development as well as additional growth built upon the 2031 reference case and committed development.

G3.21 Vehicle emissions factors for use in the assessment have been obtained using Defra's Emissions Factors Toolkit (EFT) version 10.1[Ref 26]. The EFT allows for the calculation of emissions from road traffic for all years between 2018 and 2030. The EFT accounts for advances in vehicle technology and changes in vehicle fleet composition, such that vehicle emissions are assumed to reduce over time. In assessing the impacts for 2031 and 2048, and due to the unavailability of future year vehicle emissions and background concentrations beyond 2030, it has been necessary to assume the same emissions factors as for 2030. This limiting assumption is likely to be conservative.

G3.22 Meteorological data, such as wind speed and direction, is used by the model to determine pollutant transportation and levels of dilution by the wind. Meteorological data used in the model was obtained from the Met Office observing station at Bedford for 2019. This station provides representative data for the assessment since it is approximately 22km to the north east

[3] Also see Chapter F: Ecology for further assessment of ecological effects

of the Development Site and has better data capture than the nearer Cranfield meteorological station.

G3.23 Defra's forecasts for background pollutant concentrations have been used in the assessment [Ref 23]. As with the EFT, the forecast background concentrations account for measures to bring about improvements in air quality and do not extend beyond 2030. In assessing the impacts for 2031 and 2048 it has been necessary to assume the same background levels as for 2030. This limiting assumption is likely to be conservative.

G3.24 Further details on the background concentrations are provided in Section G4.0 of this Chapter.

Model Verification and Processing of Results

G3.25 The ADMS-Roads dispersion model has been widely validated for this type of assessment and is fit for purpose. Model validation undertaken by the software developer will not have included validation in the vicinity of the Development.

G3.26 To determine the performance of the model at a local level, a comparison of modelled results with the results of monitoring carried out within the study area was undertaken. This process of verification aims to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results. Verification was carried out following the methodology specified in LAQM.TG(16).

G3.27 As is common in air quality modelling of road traffic sources, the 2019 baseline model was found to systematically underestimate concentrations at roadside monitoring sites. This systematic error has been minimised by model adjustment; further details are given in Appendix G3 (Volume 2 to this ES).

G3.28 To determine total annual mean NO_2 concentrations at human health receptors in each scenario, it was necessary to convert the adjusted modelled road contributions of NO_x to NO_2 and combine with the relevant background concentration. This was undertaken using Defra's NO_x to NO_2 calculator (version 8.1)[Ref 27]. The resulting total annual mean NO_2 concentration is comparable with the AQS of 40µg/m^3 (Table G2.1).

G3.29 LAQM.TG(16) indicates that non-compliance with the 1 hour mean NO_2 AQS is unlikely to occur where annual mean concentrations are below 60µg/m^3. This approach has been applied in this assessment when considering the impact on 1 hour mean NO_2 at receptors.

G3.30 As local roadside monitoring data are not available for PM_{10} or $PM_{2.5}$, the modelled road-PM_{10} and road-$PM_{2.5}$ components have been adjusted by the same factor as obtained for NO_x. The adjusted modelled road contributions were then simply added to the 2019 background concentrations. The resulting total annual mean PM_{10} and $PM_{2.5}$ concentrations are comparable with the AQS of 40µg/m^3 and 25µg/m^3 respectively (Table G2.1).

G3.31 The number of days with PM_{10} concentrations greater than 50µg/m^3 was then estimated using the following empirical relationship with the annual mean concentration, as described in LAQM.TG(16):

Number of 24-hour mean PM_{10} exceedances of 50µg/m^3 = -18.5 + 0.00145 x annual mean^3 + (206 ÷ annual mean)

Note: where the annual mean PM_{10} concentration is less than 16.6µg/m^3 then the number of exceedances of the 24-hour mean level of 50µg/m^3 can be assumed to be zero.

G3.32 With regard to ecological receptors, the adjusted road source annual mean NO_x contributions were combined with background NO_x data to generate total concentrations at transect receptor points.

G3.33 Nitrogen deposition rates were derived for each designated habitat site in accordance with DMRB LA 105 Guidance and conversion factors were obtained from the Air Quality Advisory Group AQTAG06 Technical Guidance [Ref 28]. The predicted nitrogen deposition rates were then compared to the lower critical load obtained from the Air Pollution Information System (APIS) website [Ref 29], which gives ranges of critical loads for different habitat types that are sensitive to changes in nitrogen deposition. Exceedance of the lower critical load indicates potential harm to the habitat.

Odour Assessment

G3.34 To assess the impacts of odour emissions associated with the Cotton Valley WRC to the south of the Development Site, atmospheric dispersion modelling was undertaken by Anglian Water using the latest version of the United States Environmental Protection Agency's dispersion model AERMOD (version 9.9.0)[30]. This model software is regularly used in the UK for this purpose.

G3.35 The odour modelling methodology was agreed with the Lead Process Modeller at Anglian Water and the Senior Practitioner at MKC prior to beginning the work. Full details of the methodology and assessment are given in Appendix G7 (Volume 2 to this ES).

Selection of Sensitive Receptors

G3.36 Sensitive receptor locations are places where the public or sensitive ecological habitats may be exposed to pollutants resulting from activities associated with the Proposed Development. These include locations sensitive to an increase in dust deposition and PM_{10} exposure as a result of on-site construction activities, and locations sensitive to exposure to local air pollutants resulting from road traffic associated with the Proposed Development.

During Construction

G3.37 The IAQM construction dust assessment (see Appendix G1, Volume 2 to this ES) is undertaken where there are:

1 human receptors within 350 metres of the Proposed Development site boundary;

2 human receptors within 50 metres of the route(s) used by construction vehicles on the public highway;

3 human receptors up to 500 metres from the site entrance(s);

4 'ecological receptors' within 50 metres of the site boundary;

5 ecological receptors within 50 metres of the route(s) used by construction vehicles on the public highway; or

6 ecological receptors up to 500 metres from the site entrance(s).

G3.38 It is within these distances that the impacts of dust soiling and increased particulate matter in the ambient air will have the greatest impact on local air quality at sensitive receptors. There are no designated ecological receptors within 350m of the Development Site boundary. Neither are there any nearby roads used for construction traffic. Ecological receptors are therefore scoped out and not considered further within the IAQM construction dust assessment.

During Operation

G3.39 In terms of locations that are sensitive to pollutants emitted from engine exhausts, these include places where members of the public are likely to be regularly present over the period of time prescribed in the relevant Regulations. For instance, on a footpath where exposure will be

transient (for the duration of passage along that path) comparison with a short-term standard (i.e. 1-hour mean) may be relevant. At a school or adjacent to a private dwelling, where exposure may be for longer periods, comparison with a long-term standard (such as 24-hour mean or annual mean) may be more appropriate. Box 1.1 of LAQM.TG(16) provides examples of the locations where the air quality objectives should and should not apply.

G3.40 To complete the assessment of operational phase impacts, a number of 'receptors' representative of locations of relevant public exposure were identified at which pollution concentrations were predicted. Receptors have been located adjacent to the roads that are likely to experience the greatest impacts as a result of the Proposed Development.

G3.41 To complete the exposure assessment, pollution concentrations were also predicted at locations within the Development Site. The locations of the assessed human health receptors are shown on Figure G5 A, Figure G5 B and Figure G5 C and listed in Appendix G4 (all at Volume 2 to this ES).

G3.42 Ecological receptors were selected to determine the air quality impacts of the Proposed Development at designated habitat sites within the operational study areas. Paragraph 2.25 in DMRB LA 105 defines the type of designated habitats that require consideration and when. The assessment should be limited to those sites for which the designated features are sensitive to air pollution, either directly or indirectly, and which could be adversely affected by the effect of local air pollution on vegetation. DMRB LA 105 specifies that designated habitat sites need only to be considered if they are within 200m of the affected road network (ARN). For designated habitats that may be sensitive to changes in air pollution, a threshold of 1,000 AADT, as referred to in IAQM Nature Impact Guidance was applied.

G3.43 Designated habitat sites that were not within 200m of the ARN were excluded from assessment on the basis that any impacts will be imperceptible and not significant.

G3.44 In the 2031 scenario, there are eight designated sites (shown in Figure G1 and Figure G6, Volume 2 to this ES), with features that are potentially sensitive to air quality impacts, within 200m of a link that experiences a change in traffic flow of 1,000 AADT or more:

1 Lower Wood Ancient Woodland (transect points 1-1 to 1-21);

2 Moulsoe Wood Ancient Woodland (transect points 2-1 to 2-13);

3 Linford Wood Ancient Woodland (north transect points 5-1 to 5-15, and south transect points 20-1 to 20-15);

4 Mouthslade Spinney Ancient Woodland (transect points 6-1 to 6-5);

5 Bedlam Spinney Ancient Woodland (east transect points 7-1 to 7-7, and west transect points 8-1 to 8-4);

6 Brandon's Wood Ancient Woodland (transect points 9-1 and 9-9);

7 Stanton Wood Ancient Woodland (transect points 21-1 to 21-17); and

8 Unnamed woodland ID: 1503134 (transect points 19-1 to 19-12).

G3.45 In the 2048 scenario there are seven designated sites (shown in Figure G1 and Figure G6, Volume 2 to this ES), with features that are potentially sensitive to air quality impacts, within 200m of a link that experiences a change in traffic flow of 1,000 AADT or more:

1 Lower Wood Ancient Woodland (transect points 1-1 to 1-21);

2 Moulsoe Wood Ancient Woodland (transect points 2-1 to 2-13);

3 Down's Barn Ancient Woodland (transect points 4-1 to 4-7);

4 Mouthslade Spinney Ancient Woodland (transect points 6-1 to 6-5);

5 Bedlam Spinney Ancient Woodland (east transect points 7-1 to 7-7, and west transect points 8-1 to 8-4);

6 Brandon's Wood Ancient Woodland (transect points 9-1 and 9-9); and

7 Bunsty Wood Ancient Woodland.

Significance Criteria

During Construction

G3.46 The IAQM Construction Dust Guidance assessment methodology recommends that significance criteria are only assigned to the identified risk of dust impacts occurring from a construction activity with appropriate mitigation measures in place.

During Operation

Human Receptors

G3.47 The approach provided in the EPUK/IAQM Guidance has been used within this assessment to assist in describing the air quality effects of additional emissions from traffic generated by the Proposed Development.

G3.48 This guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change in pollution concentration as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion, as summarised in Table G3.1.

Table G3.1 Impact Descriptors for Individual Receptors

Long term average concentration at receptors in assessment year	% Change in concentration relative to the AQS			
	1	2 - 5	6 - 10	>10
75% or less of AQS	Negligible	Negligible	Minor	Moderate
76 - 94% AQS	Negligible	Minor	Moderate	Moderate
95 - 102% of AQS	Minor	Moderate	Moderate	Substantial
103 - 109% of AQS	Moderate	Moderate	Substantial	Substantial
110% or more of AQS	Moderate	Substantial	Substantial	Substantial

Notes: Where the percentage change in concentrations is <0.5%, the change is described as 'Negligible' regardless of the concentration.
When defining the concentration as a percentage of the AQS, 'without scheme' concentration should be used where there is a decrease in pollutant concentration and the 'with scheme;' concentration where there is an increase.
Where concentrations increase, the impact is described as adverse, and where it decreases as beneficial.
The impact descriptors within this table have been adjusted from the EPUK/IAQM Guidance to be consistent with the standard terminology is used across all technical chapters within the ES.

G3.49 The EPUK/IAQM Guidance notes that the criteria in Table G3.1 should be used to describe impacts at individual receptors and should be considered as a starting point to make a judgement on significance of effects, as other influences may need to be accounted for. The EPUK/IAQM Guidance advises that the assessment of overall significance should be based on professional judgement including consideration of the following factors:

1 The existing and future air quality in the absence of the development;

2 The extent of current and future population exposure to the impacts; and

3 The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

G3.50 The EPUK/IAQM Guidance states that for most road transport related emissions, long-term average concentrations are the most useful for evaluating the impacts. The guidance does not include criteria for determining the significance of the effect on 1-hour mean NO_2 concentrations or 24-hour mean PM_{10} concentrations. The significance of effects of 1-hour mean NO_2 and 24-hour mean PM_{10} concentrations arising from the operation of the Proposed Development have therefore been determined qualitatively using professional judgement and the principles described above.

Ecological Receptors

G3.51 In regard to designated habitats, DMRB LA 105 was used to assess the impacts on nitrogen deposition. Unlike previous DMRB guidance (HA 207/07)[Ref 31], there is no requirement to review the impacts on annual mean NO_x to determine if assessment of nitrogen deposition impacts is necessary, although these impacts have been considered in this report.

G3.52 Following DMRB LA 105, if the with Proposed Development scenarios do not result in exceedance of the lower critical load for nitrogen deposition of the most sensitive feature, then it is considered that the impact will not give rise to a significant effect. The same is true if the change in nitrogen deposition is less than 1% of the lower critical load. If the change in nitrogen deposition is greater than 1% of the lower critical load, then the impact cannot simply be discounted as not significant and must be given further consideration by an ecologist. If the change in nitrogen deposition is greater than 0.4kg N/ha/yr then the implication of the guidance is that there is some potential for species richness to be reduced which should be considered by an ecologist in determining if a significant air quality effect is triggered.

G3.53 DMRB LA 105 contains a flow chart process which is intended to aid the competent expert in biodiversity in concluding whether the changes in nitrogen deposition are likely to trigger a significant air quality effect.

Consultation

G3.54 MKC's EIA Scoping Opinion (see Appendix B2 of the ES) was received on 30th November 2020, with the following comment on air quality:

"The approach to air quality, odour and noise assessments are supported, both for operational and construction phases of the development."

G3.55 Further consultation was undertaken with the MKC Environmental Health Officer (EHO) and Anglian Water and has been summarised in Table G3.2 below. All the comments provided by the consultees were taken into account as part of the air quality assessment presented in this ES Chapter.

Table G3.2 Summary of the Consultation Undertaken

Consultee	Date and form of consultation	Summary of outcome of discussions
David Parrish Senior Practitioner – Environmental Health Environment & Property Regulatory Services Milton Keynes Council	14th August to 23rd October 2020, via email correspondence.	Agreement of approach to air quality assessment.
	22nd September 2020 Pre-planning application	The EHO commented that he anticipates odour, associated with the Cotton Valley WRC, may be detectable at the Development

Consultee	Date and form of consultation	Summary of outcome of discussions
	meeting via Microsoft Teams.	Site with a westerly and south westerly prevailing wind direction and therefore it is "*prudent to undertake an odour assessment*".
	20th January 2021, via email correspondence.	The EHO confirmed that the proposed methodology of detailed odour assessment was as he would recommend i.e. following the IAQM "Guidance on the assessment of odour for planning" version 1.1 July 2018 update.
	2nd February 2021, via email correspondence.	It was proposed that the air quality study area would be confined to the transport model simulation network as the model area with the greatest amount of detail and accuracy. No objection to this proposal was received.
Elizabeth Verdegem Team Leader – West Team Development Management Milton Keynes Council	30th November 2020 EIA Scoping Opinion.	The approach to air quality and odour assessments are supported by MKC, both during operation and construction of the development.
Omid Shafibeik Lead Process Modeller - Anglian Water	17th December 2020 to 13th January 2021, via phone, Microsoft Teams and email correspondence.	Agreement of approach to detailed odour assessment.

Assumptions and Limitations

G3.56 There are uncertainties associated with both measured and predicted concentrations. The model (ADMS-Roads) used in this assessment relies on input data (including predicted traffic flows), which also have uncertainties associated with them. The model itself simplifies complex physical systems into a range of algorithms. In addition, local micro-climatic conditions may affect the concentrations of pollutants that the ADMS-Roads model will not take into account.

G3.57 In order to reduce the uncertainty associated with predicted concentrations, model verification has been carried out following guidance set out in LAQM.TG(16). As the model has been verified against local monitoring data and adjusted accordingly, there can be reasonable confidence in the predicted concentrations.

G3.58 Due to the unavailability of future year vehicle emissions and background concentrations beyond 2030, it has been necessary to assume that in assessment years 2031 and 2048 there has been no improvement and to restrict vehicle emissions or background concentrations to 2030. This approach provides a conservative assessment.

G3.59 The ADMS-Roads models assume that height differences between modelled roads and receptors are minimal. This is a model limitation. For human receptors, heights of 1.5 and 4.5 m were assigned corresponding to breathing zones at ground and first floor levels respectively. For ecological receptors, a height of 0m was assumed. This may result in concentrations being over-estimated in some locations where the teal world position of the receptor is at a lower or higher level relative to the road level.

G3.60 Habitats present in designated habitat sites were identified using desk-study sources alone and are not based on field surveys. Use of field survey data would provide detailed information on the vegetation communities present (e.g. it is not possible to determine whether acid grassland or neutral grassland is present from interpretation of aerial imagery alone). This is not

considered to be a major weakness in the approach taken as critical thresholds are only available on APIS for a subset of the range of habitats present in the field. In all instances, the closest matching habitat was chosen. Furthermore, where there was uncertainty over which habitat was present, a lower critical threshold was selected to ensure that a precautionary approach was adopted.

G3.61 This assessment does not consider the impacts on veteran trees where they occur outside of designated habitat sites. DMRB LA 105 indicates that veteran trees should be assessment for possible air quality impacts. However, there is no comprehensive source of data for this ecological feature category and publicly available data sources (e.g. the Woodland Trust's Ancient Tree Inventory database) contain both accurate and unverified data entries. Furthermore, APIS does not proposed critical levels or loads for this ecological feature type. It was not considered practical to undertake an evidence-based assessment of veteran trees which would be sufficiently robust to inform this assessment.

G3.62 The qualitative construction assessment was carried out based upon information provided prior to the appointment of the main contractor. It is understood that more detailed information will become available at a later stage.

G4.0 Baseline Conditions

Existing Conditions

Milton Keynes Council's Review and Assessment of Air Quality

G4.1 MKC reviews and assesses air quality within its administrative area in fulfilment of the requirements of the LAQM regime. In 2008, MKC declared an AQMA due to exceedances of the objective for annual mean NO_2 concentrations [Ref 32]. The Olney AQMA is located approximately 7.6km north of the Development Site at Bridge Street/High Street, Olney. No other locations requiring an AQMA have been identified by MKC, which indicates that air quality within the rest of the district is likely to be relatively good. Furthermore, the Annual Status Report for 2020[Ref 33] states that *"the Olney AQMA is likely to be revoked in early 2021…"*

G4.2 MKC's Olney Quality Action Plan [Ref 34] was published in October 2012 to address the legal requirement to work towards compliance with AQS within its administrative area. The Action Plan attributes the source of pollution within the Olney AQMA almost entirely to road traffic on the A509. Borough-wide measures set out within the Action Plan to "*assist in improving air quality throughout the Borough including Olney*" include:

1 Promotion of car share schemes;

2 Promotion of sustainable journeys to school with School travel plans;

3 Increase the up-take of bus travel through Public Transport Provisions;

4 Promotion of Redways and other sustainable modes of transport;

5 Introduction of measures to increase the uptake of low emissions vehicles such as public charging points; and

6 Promotion of more sustainable freight movement.

Local Emission Sources

G4.3 The Development Site is located in an area where air quality is mainly influenced by emissions from road transport using the M1, A509, A422 and other local minor roads.

G4.4 There are 70 small installations that are regulated by MKC including but not limited to 33 service stations, 16 dry cleaners, 5 car respraying facilities and a crematorium. None of these small installations are notable emitters of NO_x or particulate matter and therefore they will not affect local air quality in the vicinity of the Development Site.

G4.5 According to the EA's public register for installation permits[35] there are also eleven large industrial installations regulated by the EA within the administrative area of MKC. Four of these large installations are within 2km of the Development Site.

G4.6 Further information on the nature of the process and activities undertaken at the above four large installations, which could generate emission to air, was requested and received from the EA. Details of these activities are summarised in Table G4.1.

Table G4.1 Large installations within 2km of the Development Site

Local Emissions Source	Activities undertaken
Anglian Water (including Alpheus Environmental Ltd), Cotton Valley Waste Treatment Centre,	According to Permit PP3434ML, the Cotton Valley WRC has no point source emissions to air[36]. An odour assessment report provided by Anglian Water for this ES (Appendix G7, Volume 2 to this ES) indicates that in 2019 odorous emissions are unlikely to be

Local Emissions Source	Activities undertaken
Pineham, Buckinghamshire, MK15 9PA.	detectable beyond approximately 740m from the centre of the Cotton Valley WRC (this is marked by the 3 odour unit (OU_E) per cubic metre contour shown in Appendix G7). This distance coincides with the location of historical odour complaints received by MKC and Anglian Water. In 2013 more than 100 complaints were received regarding odorous emissions. Since then the number of complaints has decreased substantially to only three received in 2019 and none received in 2020. Between 2013 and 2019 the majority of complaints were received from the Willen, Broughton and Brooklands areas.
Refresco Drinks UK Ltd, 7, Northfield, Milton Keynes, Buckinghamshire, MK15 0DD.	According to Permits EPR/BN5327IH[37] and EPR/YP3200BH[38], emission points to air from Refresco Drinks UK Ltd include three boilers via flues, two refrigeration circuits, 'Canning Carbonation System' from the tank and filling area and from the 'Nitrogen System' from the nitrogen tank.
The Indium Corporation of America, 7, Newmarket Court, Kingston, Milton Keynes, Buckinghamshire, MK10 0AG.	The Indium Corporation of America *"manufactures solder paste containing metal alloys that may contain lead and distributes a variety of related products such as performs, wire and ribbon to the electronics and automotive industries."* According to Permit EP3039SP there is one emission point to air in the form of a HEPA filter exhaust vent [Ref 39].
Wafer Technology Ltd, 34, Maryland Road, Tongwell, Buckinghamshire, MK15 8HJ.	Under Permit YP3435SD Wafer Technology Ltd "undertakes substrate wafer production used for the fabrication electronic devices for use in consumer and telecommunications products." There are seven emission points to air identified within this permit[40].

G4.7 Due to their proximity it is possible that the emissions sources listed in Table G4.1 have some small influence air quality at the Development Site.

G4.8 There is also a quarry located adjacent to the north-west boundary of the Development Site. In April 2013, minerals permission (MKC Ref: 12/01284/MIN) was granted for the land south of Caldecote Farm, Willen Road for the *"extraction of sand and gravel, temporary siting of plant and machinery and restoration to agriculture using imported material (inert infill) and in situ overburden and soils."* [Ref 41] According to IAQM Mineral Planning Guidance [Ref 42], adverse dust impacts may occur within 250m of a sand and gravel quarry. Adverse impacts beyond 250m are uncommon.

G4.9 Condition 26 of this permit required that a Dust Management Scheme, for the control and mitigation of dust, was submitted and approved prior to any development taking place. The Dust Management Scheme is required to be sufficient to *"protect the amenities of the locality from the effects of any dust arising from the development."*

G4.10 The Dust Management Scheme specifies that the screening plant to be operated is a Finlay Logwasher which is further described as wet plant. Extracted stone will be cleaned and the sand will hold at least 5% moisture regardless of the meteorological conditions. These circumstances, the presence of lagoons on-site, along with application of the measures detailed within the Dust Management Scheme, make it unlikely that fugitive dust impacts, as a result of the operation of the quarry, will be anything other than **negligible** in the surrounding area; including the Development Site.

Local Authority Air Quality Monitoring Data

G4.11 MKC undertakes extensive air quality monitoring across its borough using a combination of passive diffusion tube sites and continuous monitoring sites (CMS) to measure ambient NO_2 and PM_{10} concentrations.

Continuous Monitoring Data

G4.12 MKC operates three CMS, the nearest of which is the roadside site Roadbox 1 located approximately 2.1km north west of the Development Site.

G4.13 Table G4.2 shows that from 2015 to 2019 inclusive, all three CMS sites consistently recorded annual mean NO_2 concentrations that are compliant with the relevant AQS (Table G2.1).

G4.14 For 1-hour mean NO_2 concentrations, Defra's Technical Guidance LAQM.TG(16) suggests that if annual mean NO_2 concentrations do not exceed 60µg/m3 then it is unlikely that the 1-hour mean AQS will be exceeded. Consequently, it is unlikely that there were any exceedances of the 1-hour mean AQS in the locality of the any of the CMS operated by MKC.

Table G4.2 CMS annual mean NO_2 concentrations (µg/m^3)

Site ID	Site Type	X, Y	Approx. distance from Development Site boundary	Annual mean NO_2 concentrations (µg/m^3)					
				2015	2016	2017	2018	2019	2020
Fixed	Urban centre	485070, 239131	3.4km south west	18.8	18.1	17	16.2	23.5	N/A
Roadbox 1	Roadside	486290, 243344	2.1km north west	27.0	32.8	30.5	25.6	27.1	N/A
Roadbox 2	Roadside	488922, 251157	7.8km north	22.3	22.8	22.4	19.9	23.9	N/A

Notes: Data was obtained from the MKC 2020 Air Quality Annual Status Report [Ref 33].
N/A indicates that data were not available at the time that this report was written.

G4.15 PM_{10} concentrations recorded at two CMS were well below the annual mean and 24-hour mean AQS, as summarised in Table G4.3 below.

Table G4.3 CMS annual mean and 24-hour mean PM_{10} concentrations (µg/m^3)

Site ID	Site Type	X, Y	Objective	Annual mean PM_{10} concentrations (µg/m^3)					
				2015	2016	2017	2018	2019	2020
Fixed	Urban centre	485070, 239131	Annual mean	14.8	14.2	14.5	14.7	16.1	N/A
			No. exceedances of the 24-hour mean	1	1	2	1	10	N/A
Roadbox 2	Roadside	488922, 251157	Annual mean	16.7	17.4	16.5	-	-	-
			No. exceedances of the 24-hour mean	0	1	2	-	-	-

Notes: Data was obtained from the MKC 2020 Air Quality Annual Status Report [Ref 33].
-indicates that PM10 monitoring was discontinued at this site.
N/A indicates that data were not available at the time that this report was written.

G4.16 MKC began monitoring annual mean $PM_{2.5}$ concentrations in 2019 at the 'Fixed' CMS only. Table G4.4 below shows that the 2019 annual mean $PM_{2.5}$ concentration recorded at this site was well below the AQS of 25µg/m3.

Table G4.4 CMS annual mean $PM_{2.5}$ concentrations (µg/m³)

Site ID	Site Type	X, Y	Approx. distance from Development Site boundary	Annual mean $PM_{2.5}$ concentrations (µg/m³)					
				2015	2016	2017	2018	2019	2020
Fixed	Urban centre	485070, 239131	3.4km south west	-	-	-	-	11.2	N/A

Notes: -indicates that $PM_{2.5}$ monitoring did not occur at this time.
Data was obtained from the MKC 2020 Air Quality Annual Status Report [Ref 33].

Passive Monitoring Data

G4.17 MKC also operates a network of 40 diffusion tubes sites for monitoring annual mean NO_2; eleven of which are within 2km of the Development Site. Diffusion tube sites identified within 2km of the Development Site are summarised in Table G4.5 below and Figure G1 (Volume 2 to this ES).

Table G4.5 Annual mean NO_2 concentrations (µg/m³) at diffusion tube sites within 2km of the Development Site

Site ID	Site Type	X, Y	Approx. distance from Development Site boundary	Annual mean NO_2 concentrations (µg/m³)					
				2015	2016	2017	2018	2019	2020
H1 H2	Roadside	487514, 243901	1.5km north west	22.8	25.5	26.6	23.8	23.1	N/A
I1 I2	Kerbside	487588, 243912	1.4km north west	27.7	30.6	29.5	26.7	28.6	N/A
J1 J2	Kerbside	487620, 243922	1.5km north west	30.1	31.4	31.1	30.0	30.3	N/A
K1 K2	Suburban	486296, 243208	2km north west	25.6	23.4	24.8	22.2	22.3	N/A
L1 L2	Suburban	486345, 243230	1.9km north west	22.3	21.8	24.4	20.7	22.0	N/A
M1 M2	Suburban	486495, 243345	1.9km north west	18.0	18.1	19.2	16.9	16.4	N/A
O1 O2	Urban background	486039, 241484	1.7km west	15.1	17.4	17.1	15.2	16.6	N/A
AA1 AA2	Suburban	489237, 239016	1.5km south	13.3	15.9	14.9	14.4	14.3	N/A
TT1 TT2	Roadside	487589, 243923	1.4km north west	27.6	27.1	27.5	26.8	26.5	N/A
AAA1 AAA2	Suburban	489835, 240351	0.2km south	-	-	-	19.4	18.5	N/A
BBB1 BBB2	Roadside	490299, 239695	0.9km south	-	-	-	19.7	22.5	N/A

Notes: Data was obtained from the MKC 2020 Air Quality Annual Status Report [Ref 33].
-indicates that monitoring did not occur at this time.
N/A indicates that data were not available at the time that this report was written.

G4.18 During the five-year period from 2015 to 2019 inclusive, all diffusion tube monitoring sites within 2km of the Development Site recorded annual mean NO_2 concentrations that were consistently below the AQS of 40µg/m³. The maximum annual mean NO_2 concentration

recorded in 2019 was 30.3µg/m3. This concentration was recorded at the kerbside site J1 J2 located approximately 1.5km to the north west of the Development Site.

Site-specific Air Quality Monitoring Data

G4.19 In 2019, WSP undertook a NO_2 diffusion tube survey to establish baseline conditions in the vicinity of the Development Site and identify any potential development constraints. Prior to the survey, in April 2019, WSP consulted MKC's Environmental Health Department regarding the locations of monitoring sites, which are shown in Figure G1 (Volume 2 to this ES).

G4.20 Diffusion tube monitoring was carried out at seven locations in and around the Development Site boundary for six months for the period between the 14th May to the 29th October 2019. Details are given in Table G4.6.

Table G4.6 WSP NO_2 Diffusion Tube Survey Results

Site ID	X	Y	Location relative to Development Site	Estimated 2019 Annual Mean NO_2 Concentration (µg/m³)
MK1	488072	241428	35m south of M1 at Carteret Close	20.8
MK2	487986	241715	At the Development Site boundary adjacent to M1 southbound	38.4
MK3	488152	241600	At the Development Site boundary adjacent to M1 southbound	38.0
MK4	489459	243653	0.3km north, at roadside on A509 southbound	38.0
MK5	487989	242659	0.7km west, at the Development Site boundary at roadside on the A422	27.6
MK6	489082	242101	Within Development Site boundary, near A509 London Road	26.5
MK7	491458	241934	0.9km north east on Cranfield Road, Moulsoe	14.4

G4.21 The results in Table G4.6 show that the annual mean NO_2 concentrations at all locations were below the annual mean AQS of 40µg/m3. With reference to LAQM.TG(16), based on the annual mean concentrations it is unlikely that 1-hour mean concentrations will be in breach of the 1-hour mean NO_2 AQS.

Defra's Pollution Climate Mapping (PCM) Model

Background

G4.22 Table G4.7 gives the ranges of background pollutant concentrations as published by Defra for annual mean NO_2, PM_{10} and $PM_{2.5}$ across the study area. All annual mean background concentrations are well below the relevant AQS (Table G2.1).

Table G4.7 Defra annual mean background concentrations (µg/m³)

Pollutant	2019	2030
NO_2 (µg/m³)	8.1 – 21.3	6.0 – 12.6
PM_{10} (µg/m³)	13.8 – 18.9	12.6 – 17.7
$PM_{2.5}$ (µg/m³)	9.0 – 11.7	8.1 - 10.8

Roadside

G4.23 Defra's PCM model [Ref 42] is used in combination with monitoring data, for the UK's annual assessment of compliance with AQS. The PCM model provides estimates of roadside

concentrations of annual mean NO_2. Approximately 18,000 links in 406 local authorities are included in the PCM model, of which 203 are within the administrative area of MKC; these are shown in Figure G1 (Volume 2 to this ES).

G4.24 The PCM model provides projected roadside concentrations of pollutants for the years 2018 to 2030 inclusive, based on a 2018 reference year; after which year on year reductions in concentrations are generally predicted. Within the administrative area of MKC the highest 2019 and 2030 estimated roadside concentrations, of 28.8µg/m^3 and 16.9µg/m^3 respectively, were on the A421 Standing Way between Rhoscolyn Drive and Grafton Street.

G4.25 Defra PCM mapping indicates that the annual mean roadside NO_2 concentrations were below the annual mean AQS of 40µg/m^3 in the baseline year (2019) and opening years (2031 and 2048) on all PCM links within the administrative area of MKC.

Future Baseline

Human Health Receptors

G4.26 All 2019 base year results are provided in Appendix G5 (Volume 2 to this ES). The results of the assessment show that in the 2019 baseline year, pollutant concentrations at selected human receptors were compliant with the AQS for all pollutants annual mean. The highest predicted annual mean NO_2 concentration is 37.8µg/m^3 at receptor R1 (18 High Street South, Olney).

Ecological Receptors

G4.27 All 2019 base year results for ecological receptors are provided in Appendix G6 (Volume 2 to this ES). The predicted annual mean NO_x concentrations do not exceed the critical level of 30µg/m^3 at any of the transect points with only one exception: a concentration of 32.1µg/m^3 was modelled at transect point 7-1 in Bedlam Spinney East AW.

G4.28 Nitrogen deposition is predicted to exceed the lower critical load for all designated habitats in the base year.

G5.0 Potential Effects

During Construction

Construction Dust

G5.1 Construction activities that have the potential to generate and/or resuspend dust and PM_{10} include:

1 Site clearance and preparation including demolition activities;

2 Preparation of temporary access/egress to the Development Site and haulage routes;

3 Earthworks;

4 Materials handling, storage, stockpiling, spillage and disposal;

5 Movement of vehicles and construction traffic within the Development Site;

6 Use of crushing and screening equipment/plant;

7 Exhaust emissions from site plant, especially when used at the extremes of their capacity and during mechanical breakdown;

8 Construction of buildings, roads and areas of hardstanding alongside fabrication processes;

9 Internal and external finishing and refurbishment; and

10 Site landscaping after completion.

G5.2 Construction activities will take approximately 26 years beginning in 2022 and concluding by 2048. All construction activities will occur during normal working hours which are 08:00 to 17:30 Monday to Saturday. Exceptions to this include the installation of the M1 bridge which will require 24-hour working; including short-term closures of the main motorway carriage.

G5.3 The majority of the releases are likely to occur during the 'working week'. However, for some potential release sources (e.g. exposed soil produced from significant earthwork activities) in the absence of dust control mitigation measures, dust generation has the potential to occur 24 hours per day over the period during which such activities are to take place.

Potential Dust Emission Magnitude

G5.4 The IAQM Construction Dust Guidance methodology has been used to determine the potential dust emission magnitude for the following four different dust and PM_{10} sources: demolition, earthworks, construction, and, trackout. The findings of the assessment are presented below.

Demolition

G5.5 To enable to the Proposed Development, demolition works are planned for all existing buildings at the Hermitage Farm, Newport Road, Moulsoe Farm, London Road and all existing buildings at 27/29 London Road (i.e. house, adjacent farm sheds and the farm shed on the opposite side of the road. In addition, the existing furniture warehouse premises on Newport Road may also be demolished if they are not retained.

G5.6 The total volume of buildings to be demolished on site is between 20,000 and 50,000 m^3, with potentially dusty construction material, on-site crushing and screening and demolition activities occurring below 10m above ground level. Therefore, the potential dust emission magnitude is considered to be large for demolition activities.

G5.7 The total volume of buildings to be demolished that are associated with Housing Infrastructure Fund (HIF) funded works only are expected to be less than 20,000m^3 with potentially dusty

construction material and on-site crushing and screening. Demolition activities will also occur below 10m above ground level. Therefore, the potential dust emission magnitude is large for HIF works demolition activities.

Earthworks

G5.8 The total area of the Development Site is more than 10,000m^2, the soil type is loamy and clayey with impeded drainage and therefore moderately dusty, and the total material that will be moved is estimated to be more than 100,000 tonnes. It is also estimated that more than 10 heavy earth moving vehicles will be active at any one time for Proposed Development works and HIF Funded Infrastructure works. Therefore, the potential dust emission magnitude is considered to be large for earthwork activities.

Construction

G5.9 The total volume of buildings to be constructed on the Development Site will be more than 100,000m^3 with site concrete batching activities being undertaken. Therefore, the potential dust emission magnitude is considered to be large for construction activities.

G5.10 HIF Funded Infrastructure works comprise road infrastructure only but will include the use of potentially dusty construction material such as concrete for laying kerbs and surrounding manhole covers for example. Therefore, the potential dust emission magnitude is considered to be medium for HIF Funded Infrastructure construction activities.

Trackout

G5.11 For both the built development component of MKE (excluding HIF Funded Infrastructure works) and HIF Funded Infrastructure works there will be between 10 and 50 HDV outward movements in any one day travelling on moderately dusty surface materials. Due to the size of the site, it is also assumed that the length of unpaved roads within Development Site will be more than 100m. Therefore, the potential dust emission magnitude is considered to be large for trackout.

Table G5.1 Potential Dust Emission Magnitude

Activity	Dust Emission Magnitude	
	Built Development	HIF Funded Infrastructure
Demolition	Large	Large
Earthworks	Large	Large
Construction Activities	Large	Medium
Trackout	Large	Large

Sensitivity of the Study Area

G5.12 A wind rose generated using the meteorological data used for the dispersion modelling of operational phase impacts is provided in Appendix G3 (Volume 2 to this ES). This shows that the prevailing wind direction is from the south west. Therefore, receptors located to the north east of the Development Site are most likely to be affected by dust and particulate matter emitted and re-suspended during the construction phase. Receptors introduced as part of the phased occupation of the Proposed Development will similarly be most likely to be affected when located north east of ongoing construction activities.

G5.13 Under low wind speed conditions, it is likely that most dust would be deposited in the area immediately surrounding the source. The land use to the north and east of the Development Site is primarily agricultural. There are, however, sensitive residential receptors along and off North

Crawley Road and Newport Road to the north and east of the Development Site respectively, as displayed in Figure G2 (Volume 2 to this ES).

G5.14 To the west of the Development Site is the Interchange Park Business Park beyond which is a residential property off North Crawley Road. Also to the west are residential properties in the east of Newport Pagnell including those along and off the B526 London Road, Hopton Grove, Samuel Close and Downs Field. In addition, isolated residential properties on Caldecote Lane and Glen Fields, including Caldecote Farm and Glen Fields, as well as the Tongwell Industrial Estate are within 350m of the Development Site western boundary.

G5.15 To the south of the Development Site are residential properties in Willen, Willen Hospice, Cotton Valley WRC, residential properties at the northern end of Broughton and Northfield Industrial Estate.

G5.16 The screening assessment showed that there are more than 100 human health receptors and no ecological sites within 350m of the Development Site boundary.

G5.17 Within 50m of construction haul routes are residential properties along the B520 London Road, Dansteed Road and Newport Road.

G5.18 Taking the above into account, including the maximum background annual mean PM_{10} concentration of 18.9µg/m^3 (see Table G4.7), and following the IAQM assessment methodology, the sensitivity of the area to changes in dust and PM_{10} has been derived for each of the construction activities considered. The results are shown in Table G5.2.

Table G5.2 Sensitivity of the Study Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	High
Human Health	Low	Low	Low	Low
Ecological	N/A	N/A	N/A	N/A

Risk of Impacts

G5.19 The predicted dust emission magnitude has been combined with the defined sensitivity of the area to determine the risk of impacts during the construction phase, prior to mitigation. Table G5.3 and Table G5.4 below provides a summary of the risk of dust impacts for the Proposed Development and HIF Funded Infrastructure works. The risk category identified for each construction activity has been used to determine the level of mitigation required.

Table G5.3 Summary Dust Risk Table to Define Site Specific Mitigation for the Proposed Development (excluding HIF Funded Infrastructure works)

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High Risk	High Risk	High Risk	High Risk
Human Health	Medium Risk	Low Risk	Low Risk	Low Risk
Ecological	N/A	N/A	N/A	N/A

Table G5.4 Summary Dust Risk Table to Define Site Specific Mitigation for HIF Funded Infrastructure works

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High Risk	High Risk	Medium Risk	High Risk
Human Health	Medium Risk	Low Risk	Low Risk	Low Risk
Ecological	N/A	N/A	N/A	N/A

During Operation

Traffic Emissions

Human Receptors

G5.20 Full assessment results for human receptors are provided in Appendix G5 (Volume 2 to this ES).

Impacts on annual mean NO_2 concentrations

G5.21 For 2031, the anticipated completion year of Phase 1 of the Proposed Development, the predicted annual mean NO_2 concentrations are complaint with the AQS of 40µg/m^3 (Table G2.1) at all human receptors. The highest concentrations are at R1 (18 High Street South, Olney) where the annual mean is expected to be 18.2µg/m^3 without the Proposed Development and 19.0µg/m^3 with the Proposed Development. The greatest increase in concentrations with the Proposed Development is 0.8µg/m^3 at existing receptors R1 (18 High Street South, Olney) and R5 (12 Bridge Street, Olney). The predicted changes in annual mean NO_2 at all receptors are 2% of the relevant AQS or less therefore, in accordance with the EPUK/IAQM Guidance, the impact of increased emissions associated with the Proposed Development on annual mean NO_2 concentrations is **negligible** in 2031.

G5.22 By 2048, the predicted completion year of the Proposed Development, the predicted annual mean NO_2 concentrations are complaint with the AQS at all human receptors. The highest concentrations are at R1 (18 High Street South, Olney) where the annual mean is expected to be 21.5µg/m^3 without the Proposed Development and 21.6µg/m^3 with the Proposed Development. The greatest increase in concentrations with the Proposed Development is 0.5µg/m^3 at existing receptor R6 (Newport Road, Moulsoe). The predicted changes in annual mean NO_2 at all receptors are 1% of the relevant AQS or less therefore, in accordance with the EPUK/IAQM Guidance, the impact of increased emissions associated with the Proposed Development on annual mean NO_2 concentrations is **negligible** in 2048.

Impacts on 1-hour mean NO_2 concentrations

G5.23 The annual mean NO_2 concentrations predicted by the models in all scenarios were all below 60µg/m^3, and therefore 1-hour mean NO_2 concentrations are unlikely to cause a breach of the 1-hour mean AQS (Table G2.1). The impact of the Proposed Development on 1-hour mean NO_2 concentrations at all human receptors is **negligible** in both 2031 and 2048.

Impacts on annual mean PM_{10} concentrations

G5.24 The results of the assessment show that predicted annual mean concentrations of PM_{10} at all receptors in all modelled future year scenarios are well below the annual mean AQS of 40µg/m^3 (Table G2.1).

G5.25 The highest concentration in 2031 is predicted at receptor R1 (18 High Street South, Olney) with a concentration of 20.7µg/m^3 with the Proposed Development. The greatest increase in concentrations with the Proposed Development is 0.5µg/m^3 at existing receptor R1 (18 High

Street South, Olney). The predicted changes in annual mean PM_{10} at all receptors are 1% of the AQS or less therefore, in accordance with the EPUK/IAQM Guidance, the impact of increased emissions associated with the Proposed Development on annual mean PM_{10} concentrations is **negligible** in 2031.

G5.26 The highest concentration in 2048 is predicted at receptor R1 (18 High Street South, Olney) with a concentration of 21.9µg/m^3 in the with Proposed Development scenario. The greatest increase in concentrations with the Proposed Development is 0.1µg/m^3. The predicted changes in annual mean NO_2 at all receptors are 1% of the relevant AQS or less therefore, in accordance with the EPUK/IAQM Guidance, the impact of increased emissions associated with the Proposed Development on annual mean PM_{10} concentrations is **negligible** in 2048.

Impacts on 24-hour mean PM_{10} concentrations

G5.27 The AQS for 24-hour mean PM_{10} concentrations is 50µg/m^3 to be exceeded no more than 35 times a year. For 2031, the results of the dispersion modelling indicate that with the implementation of the Proposed Development there will be a maximum of four exceedances of the 24-hour mean PM_{10} AQS in 2031; well below the permitted threshold of 35. These are predicted to occur at receptors R1 (18 High Street South, Olney) and R5 (12 Bridge Street, Olney). The maximum change in daily exceedances of 1 is expected to occur at receptors R3 (19 London Road, Newport Pagnell) and R5 (12 Bridge Street, Olney).

G5.28 Similarly, by 2048 it is expected that there will be a maximum of six exceedances of the 24-hour mean PM_{10} AQS at receptor R1 (18 High Street South, Olney); well below the permitted threshold of 35. The maximum change in daily exceedances of 1 is expected to occur at receptors R3 (19 London Road, Newport Pagnell) and R56 (16 Windrush Close, Downhead Park).

G5.29 Impacts on 24-hour mean PM_{10} concentrations at all modelled human receptors are therefore **negligible** in 2031 and 2048.

Impacts on annual mean $PM_{2.5}$ concentrations

G5.30 Predicted concentrations of annual mean $PM_{2.5}$ are all well below the AQS of 25µg/m^3 (Table G2.1) in all modelled scenarios. The highest predicted concentration is 13.3µg/m^3 at receptor R1 (18 high Street South, Olney) with the Proposed Development in 2048. All changes in $PM_{2.5}$ are 1% or less of the relevant AQS and therefore, based on the EPUK/IAQM Guidance, the Proposed Development has a **negligible** impact on $PM_{2.5}$ concentrations in 2031 and 2048.

Ecological Receptors

G5.31 Bunsty Wood Ancient Woodland is adjacent to modelled road links representative of the M1 between junction 14 and junction 15. With the Proposed Development it is expected that traffic flows in 2048 on these links will decrease by -1,365 AADT.

G5.32 With the expected reductions of traffic on the ARN within 200m of this designated site there will be an associated reduction in pollutant emissions and therefore concentrations in their locality. It can therefore be inferred that there will likely be a modest improvement to local air quality in its vicinity with the introduction of the Proposed Development.

G5.33 In 2031 Linford Wood North, Linford Wood South, Lower Wood, Moulsoe Wood, Bedlam Spinney East, Bedlam Spinney West, Brandon's Wood, Mouthslade Spinney, Stanton Wood and unnamed woodland ID:1503134 Ancient Woodlands are all within 200m of modelled traffic links predicted to experience an increase in traffic flow of 1,000 AADT.

G5.34 In 2048 Lower Wood, Moulsoe Wood, Mouthslade Spinney, Bedlam Spinney East, Bedlam Spinney West, Brandon's Wood and Down's Barn Ancient Woodlands are all within 200m of modelled traffic links predicted to experience an increase in traffic flow of 1,000 AADT.

G5.35 It is predicted that in all future year scenarios there will be no exceedances of the annual mean NO_x critical level of 30µg/m^3 (Table G2.1) on any of the transect points modelled. The maximum predicted annual mean NO_x concentrations of 16.5 and 17.4 µg/m^3 were modelled in 2031 and 2048 respectively at transect point 7-1 in Bedlam Spinney approximately 4.9m east of the nearest modelled road link.

G5.36 The majority of sites in all future year scenarios are also predicted to experience a magnitude of change that is imperceptible (i.e. more than 0.4µg/m^3). In 2031 the only exceptions are at transect points 7-1 and 8-1 located in Bedlam Spinney AW. A magnitude of change of 0.8µg/m^3 and 0.6µg/m^3 respectively is predicted.

G5.37 In 2048 the only exceptions are at transect points 1-1 and 7-1 located in Lower Wood AW and Bedlam Spinney AW respectively. A magnitude of change of 0.5µg/m^3 is predicted at both points.

G5.38 Whilst all transect points assessed are expected to experience nitrogen deposition levels that are in exceedance of the lower critical load, none are predicted to experience more than a 1% change in nitrogen deposition relative to the lower critical load. A maximum predicted increase of 0.6% was modelled in 2031 at transect point 7-1 in Bedlam Spinney AW. A maximum predicted decrease of -0.7% was modelled in 2031 at transect point 5-1 in Linford Wood AW. In addition, none of the points register an increase in nitrogen deposition greater than 0.4kg N/ha/yr – the indicative threshold at which a change in the species-richness of the vegetation at these sites may occur.

G5.39 In order to determine the significance of effect, consultation with the ecology specialist was carried out. The following narrative was provided for inclusion within this assessment:

"The project ecologists have considered the findings for the air quality modelling on the off-site ecological receptors located in the vicinity of roads receiving potentially meaningful increases in traffic from the proposed development. As the proposed development will not result in an increase in nitrogen deposition greater than 1% of the relevant critical load for the ecological receptors in the vicinity of any of the affected roads, it has been concluded that adverse effects as a result of the proposed development is highly unlikely.

Furthermore, it should be noted that the actual deposition resulting from the proposed development and any associated effect is expected to be lower than that modelled, for reasons including:

1 *Improvements to vehicular engines resulting in reduced nitrogen emissions, together with increased uptake of hybrid and electric cars;*

2 *Policy and legislation leading to reduce vehicular nitrogen emissions, including banning sales of new petrol and diesel engines from 2030, encouraging sales of electric vehicles;*

3 *Trends in decreasing background nitrogen levels; and*

4 *It is expected that a comprehensive Travel Plan will be adopted to further reduce traffic arising from the proposed development."*[4]

[4] Further information on embedded mitigation considered as part of this ES are provided in Chapter C (Site and Development Description) and Chapter Q (Mitigation and Monitoring Measures)

G5.40 Therefore, it has been determined by the ecology specialist that the proposal will have no significant effect in regard to designated habitats, in consideration of DMRB LA105.

Odour

G5.41 In line with IAQM Odour Guidance, odour concentrations of $3OU_E/m^3$ and $5OU_E/m^3$ are the criteria at which nuisance and potential loss of amenity would be experienced by high and medium sensitivity receptors respectively. A Zone of Influence (ZoI) was derived by Anglian Water for each concentration.

G5.42 The ZoI for high sensitivity receptors (e.g. residential dwellings and schools) was determined by appointing the distance between the centre of the Cotton Valley WRC to the most distant point on the $3OU_E/m^3$ isopleth as the radius of a circle. This is illustrated by the blue circle on Figure 17 within Appendix G7 (Volume 2 to this ES). As advised by Anglian Water, no encroachment of high sensitivity receptors should occur within this ZoI.

G5.43 The ZoI for medium sensitivity receptors (e.g. commercial uses) was determined by appointing the distance between the centre of the Cotton Valley WRC to the most distant point on the $5OU_E/m^3$ isopleth as the radius of a circle. This is illustrated by the red circle on Figure 17 within Appendix G7 (Volume 2 to this ES). As advised by Anglian Water, no encroachment of any receptors, regardless of their sensitivity, should occur within this ZoI.

G5.44 The results of the dispersion modelling assessment show that on completion of Phase 1 of the Proposed Development (scenario 2 in Appendix G7, Volume 2 to this ES), the ZoI for high sensitivity receptors extends 747m from the centre of the Cotton Valley WRC and into the Development Site (see Figure 14 in Appendix G7, Volume 2 to this ES). Consequently, any odorous emissions from the Cotton Valley WRC will have a **negligible** impact on sensitive receptors in Phase 1 of the Proposed Development as these are more than 500m further north.

G5.45 On completion of Phase 2 of the Proposed Development (scenario 2 in Appendix G7, Volume 2 to this ES), the ZoI for high sensitivity receptors extends 652m from the centre of the Cotton Valley WRC and approximately 194m into the Development Site (see Figure 15 in Appendix G7, Volume 2 to this ES). Consequently, any odorous emissions from the Cotton Valley WRC will have a **negligible** impact on highly sensitive receptors in Phase 1 and 2 of the Proposed Development approximately 180m further north.

G5.46 On completion of Phase 3 of the Proposed Development (scenario 3 in Appendix G7, Volume 2 to this ES) where the entirety of the MKE development is in place, the ZoI for high sensitivity receptors extends 620m from the centre of the Cotton Valley WRC and approximately 165m into the Development Site. Figure 16 in Appendix G7 (Volume 2 to this ES) shows that on completion of the MKE development there will be no high sensitivity receptors within the ZoI derived from the $3OU_E/m^3$ isopleth and no new receptors of any sensitivity within the ZoI derived from the $5OU_E/m^3$ isopleth. Consequently, any odorous emissions from the Cotton Valley WRC will have **negligible** impact within the Development Site. All new receptors introduced by the Proposed Development should not be subject to unacceptable odours on a routine basis.

G6.0 Mitigation and Monitoring

During Construction

G6.1 Based on the assessment results, mitigation will be required. Recommended mitigation measures for a high-risk site are given below. In any event, Best Practicable Means should be used by the contractor to avoid causing statutory nuisance.

General Communication

- A stakeholder communications plan that includes community engagement before work commences on site should be developed and implemented.
- The name and contact details of person(s) accountable for air quality and dust issues should be displayed on the site boundary. This may be the environment manager/engineer or the site manager. The head or regional office contact information should also be displayed.

General Dust Management

- A Dust Management Plan (DMP), which may include measures to control other emissions, in addition to the dust and PM_{10} mitigation measures given in this report, should be developed and implemented, and approved by the Local Authority. The DMP may include a requirement for monitoring of dust deposition, dust flux, real-time PM10 continuous monitoring and/or visual inspections.

Site Management

- All dust and air quality complaints should be recorded and causes identified. Appropriate remedial action should be taken in a timely manner with a record kept of actions taken including of any additional measures put in-place to avoid reoccurrence. (highly recommended for all sites). The complaints log should be made available to the local authority on request.
- Any exceptional incidents that cause dust and/or air emissions, either on- or offsite should be recorded, and then the action taken to resolve the situation recorded in the log book.
- Regular liaison meetings with other high-risk construction sites within 500m of the site boundary should be held, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.

Monitoring

- Daily (in accordance with IAQM guidance) on-site and off-site inspections should be undertaken, where receptors (including roads) are nearby to monitor dust. The inspection results should be recorded and made 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 100m of site boundary, with cleaning to be provided if necessary.
- Regular site inspections to monitor compliance with the DMP should be carried out, inspection results recorded, and an inspection log made available to the local authority when asked.
- The frequency of site inspections should be increased when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

- Dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations should be agreed with the Local Authority. Where possible baseline monitoring should start at least three months before work commences on site or, if it a large site, before work on a phase commences.

Preparing and maintaining the site

- Plan the site layout so that machinery and dust causing activities are located away from receptors, as far as is practicable.
- Where practicable, erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Where practicable, fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover appropriately.
- Where practicable, cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

- Ensure all vehicle operators 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.
- A maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas should be imposed (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).
- A Construction Logistics Plan should be produced to manage the sustainable delivery of goods and materials.
- A Travel Plan (included as part of a Construction Logistics Plan) that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing) should be provided [5].

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

[5] Further information on the Construction Logistics Plan at Chapter C (Site and Development Description); Chapter D (Transport); and Chapter Q (Mitigation and Monitoring) of this ES

Waste management

- Avoid bonfires and burning of waste materials.

Measures specific to demolition

- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- Ensure effective water suppression is used during demolition operations. Hand-held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

Measures specific to earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Where practicable, only remove the cover in small areas during work and not all at once.
- Stockpile surface areas should be minimised (subject to health and safety and visual constraints regarding slope gradients and visual intrusion) to reduce area of surfaces exposed to wind pick-up.
- Where practicable, windbreak netting/screening should be positioned around material stockpiles and vehicle loading/unloading areas, as well as exposed excavation and material handling operations, to provide a physical barrier between the Development Site and the surroundings.
- Where practicable, stockpiles of soils and materials should be located as far as possible from sensitive properties, taking account of the prevailing wind direction.
- During dry or windy weather, material stockpiles and exposed surfaces should be dampened down using a water spray to minimise the potential for wind pick-up.

Measures specific to construction

- Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
- For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.
- All construction plant and equipment should be maintained in good working order and not left running when not in use.

Measures specific to trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being in frequent use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Where practicable, hard surfaced haul routes should be installed, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10m from receptors where possible

G6.2 Detailed mitigation measures to control construction traffic should be discussed with MKBC to establish the most suitable access and haul routes for the site traffic. The most effective mitigation could be achieved by ensuring that construction traffic does not pass along sensitive roads (residential roads, congested roads, via unsuitable junctions, etc.) where possible, and that vehicles are kept clean (through the use of wheel washers, etc.) and sheeted when on public highways. Timing of large-scale vehicle movements to avoid peak hours on the local road network will also be beneficial.

During Operation

G6.3 The assessment has demonstrated that all impacts on human and ecological receptors are likely to be **negligible**. There would be no exceedances of the air quality standards. Therefore, no specific operational mitigation beyond that embedded into the Proposed Development[6] should be required.

G6.4 The odour dispersion modelling assessment has also demonstrated that, during routine operation, odorous emissions from the Cotton Valley WRC will have a **negligible** impact on future receptors. Therefore, no specific operational mitigation should be required.

[6] Further information on embedded mitigation provided at Chapter C (Site and Development Description) and Chapter Q (Mitigation and Monitoring) of this ES

G7.0 Residual Effects

During Construction

G7.1 Construction activities will at times occur simultaneous to operational activities following the phased occupation of the Proposed Development. Regardless, the residual effects of dust and PM_{10} generated by construction activities following the application of the mitigation measures described above and good site practice are **negligible** (not significant) for all existing and future receptors.

G7.2 The residual effects of emissions to air from construction vehicles and plant on local air quality are **negligible** (not significant).

During Operation

G7.3 The residual effects due to operational emissions are not significant.

G8.0 Summary & Conclusions

G8.1 An air quality assessment has been carried out for the Proposed Development that has considered relevant legislation, policy and guidance in assessing the potential impacts during construction and operation of the project.

G8.2 The assessment of construction impacts found there to be a high risk of dust soiling impacts in the surrounding area as well as a medium risk of human health impacts due to emissions of PM_{10}. Given the high sensitivity of the surrounding area mitigation will be required to minimise emissions. With diligent implementation of best practice mitigation measures to minimised emissions of dust and PM_{10}, the residual effects due to construction emissions are not significant.

G8.3 The assessment of operational impacts due to traffic emissions demonstrated that all impacts on human health receptors are likely to be **negligible**. There would be no exceedances of AQS. Therefore, no specific operational mitigation should be required. The residual effects due to operational emissions are not significant.

G8.4 Pollutant concentrations at new receptors are predicted to be well below relevant AQS.

G8.5 For ecological receptors, the assessment demonstrates that there would be no significant effects on designated habitat sites.

G8.6 The results of the odour dispersion modelling assessment show that odorous emissions from routine operation of the Cotton Valley WRC would not cause significant effects on future receptors of any sensitivity at the Proposed Development.

G8.7 It is considered that the Proposed Development will comply with national and local policy for air quality.

G8.8 A summary of the likely significance of effects of the Proposed Development on Air Quality is provided in Table G8.1.

Table G8.1 Summary of Effects

Receptor	Potential Effect	Mitigation	Residual Effect
During Construction			
Dust and particulate matter emissions due to onsite construction activities.	Negligible	As presented in Section G6.0, mitigation measures include but are not limited to: Development and implementation of a stakeholder communications plan, development and implementation of a DMP, site management, monitoring, preparing and maintaining the site, waste management, measures specific to demolition, measures specific to earthworks and measures specific to construction.	Negligible
Plant.	Negligible	As presented in Section G6.0, mitigation measures include but are not limited to: Measures for operating vehicle/machinery, only use cutting, grinding or sawing equipment fitted with suitable dust suppression techniques, ensure an adequate water supply on the site for effective/particulate matter	Negligible

Receptor	Potential Effect	Mitigation	Residual Effect
		suppression/mitigation, use enclosed chutes and conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	
During Operation			
Emissions from development generated traffic on NO_2 concentrations.	Negligible	-	Negligible
Emissions from development generated traffic on PM_{10} and $PM_{2.5}$ concentrations.	Negligible	-	Negligible
Odour emissions from Cotton Valley WRC.	Negligible	-	Negligible

G9.0 Abbreviations & Definitions

- AADT – Annual Average Daily Traffic
- ADMS – Air Dispersion Modelling Software
- APIS – Air Pollution Information System
- AQAL – Air Quality Assessment Level
- AQAP – Air Quality Action Plan
- AQMA – Air Quality Management Area
- AQS – Air Quality Standard
- ARN – Affected Road Network
- AW – Ancient Woodland
- CMS – Continuous Monitoring Site
- Defra – Department for the Environment, Food and Rural Affairs
- DMP – Dust Management Plan
- DMRB – Design Manual for Roads and Bridges
- EA – Environment Agency
- EFT – Emissions Factors Toolkit
- EHO – Environmental Health Officer
- EIA – Environmental Impact Assessment
- EPUK – Environmental Protection United Kingdom
- ES – Environmental Statement
- HDV – Heavy Duty Vehicle
- HIF – Housing Infrastructure Fund
- IAQM – Institute of Air Quality Management
- IES – Institute of Environmental Science
- LAQM – Local Air Quality Management
- LAQM.TG – Local Air Quality Management Technical Guidance
- LDV – Light Duty Vehicle
- $\mu g/m^3$ – micrograms per cubic metre
- MKC – Milton Keynes Council
- NPPF – National Planning Policy Framework
- NRMM – Non-road Mobile Machinery
- OU_E – Odour Units
- PCM – Pollution Climate Model
- US EPA – United States Environmental Protection Agency
- ULEV – Ultra-low Emission Vehicle
- WRC – Water Recycling Centre

- ZoI – Zone of Influence

G10.0 References

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