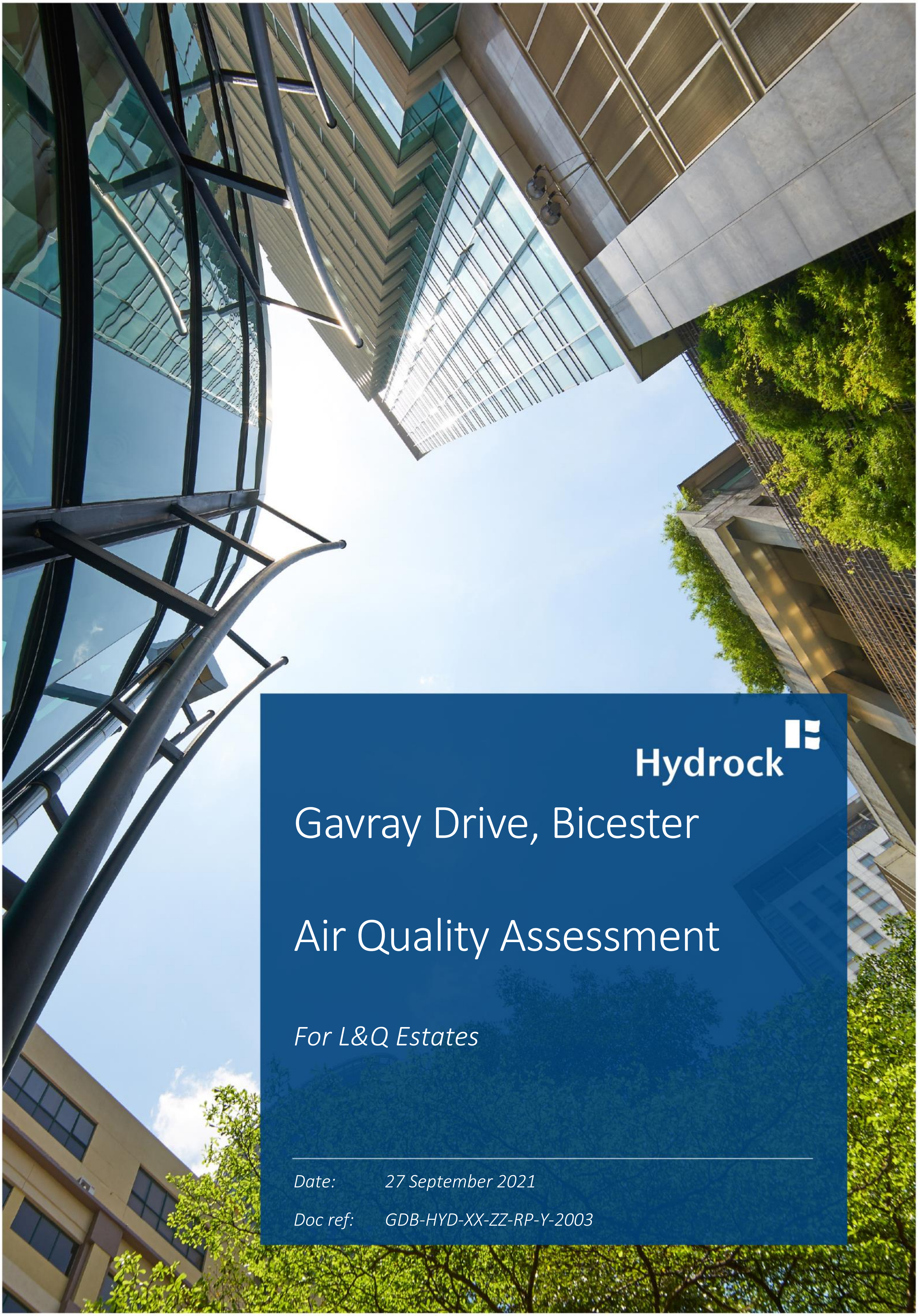

Hydrock

Gavray Drive, Bicester

Air Quality Assessment

For L&Q Estates

Date: *27 September 2021*

Doc ref: *GDB-HYD-XX-ZZ-RP-Y-2003*

DOCUMENT CONTROL SHEET

Issued by	Hydrock Consultants Limited 5th Floor Merchants House Wapping Road Bristol	Tel: 0117 945 9225 www.hydrock.com
Client	L&Q Estates	
Project name	Gavray Drive, Bicester	
Title	Air Quality Assessment	
Doc ref	GDB-HYD-XX-ZZ-RP-Y-2003	
Project no.	C-15114-C	
Status	Submission	
Date	27/09/2021	

Document Production Record		
Issue Number	03	Name
Prepared by		SM
Checked by		PH/MN
Approved by		MN

Document Revision Record			
Issue Number	Status	Date	Revision Details
P01	Draft	02/06/2021	Draft Issue
P02	Submission	09/07/2021	Following client review
P03	Submission	27/09/2021	Minor updates

Hydrock Consultants Limited has prepared this report in accordance with the instructions of the above-named client for their sole and specific use. Any third parties who may use the information contained herein do so at their own risk.

CONTENTS

Tables

Figures

Appendices

1. INTRODUCTION

Hydrock have been commissioned by L&Q Estates to prepare an Air Quality Assessment (AQA) to support the Outline Planning Application (OPA) at Gavray Drive, Bicester. This AQA has been produced on behalf of L&Q Estates, Charles Brown & Simon Digby and London & Metropolitan International Developments. The application site lies within the administrative boundary of Cherwell District Council (CDC). The grid reference for the centre of the application site is 459674, 222332. The location of the application site is shown below in Figure 1:

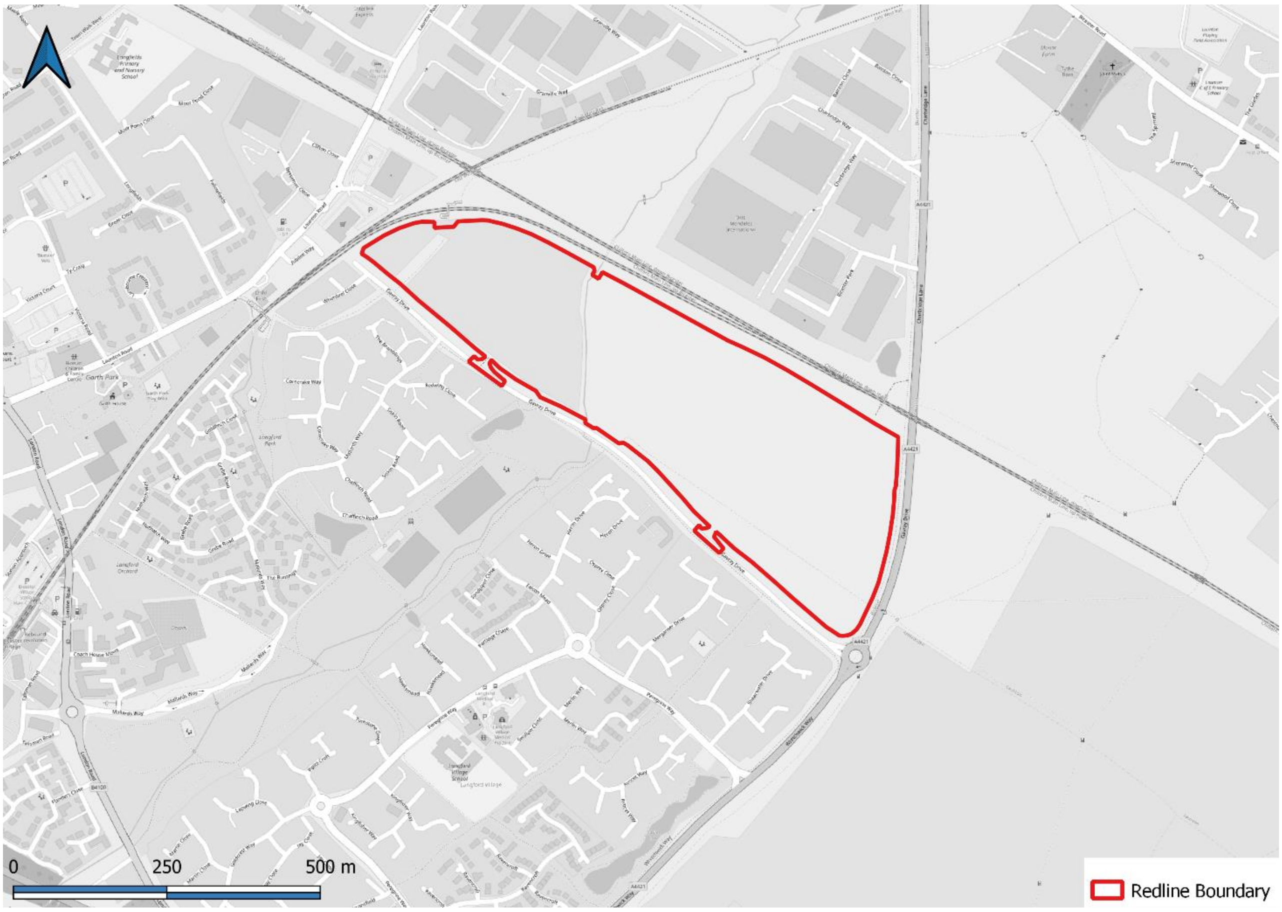

Figure 1 - Application site Location

The application site is located in the south eastern quarter of Bicester, bounded by Gavray Drive to the south, beyond which lies the residential area of Langford Village, the Birmingham to Marylebone railway line (Chiltern Line) to the north, the Oxford to Bletchley railway line to the west (East-West Rail) and Bicester's eastern bypass to the east (Charbridge Lane, A4421). North of the application site is Bicester Distribution Park, with Bicester town centre located approximately 1.3km to the west of the application site offering a full range of retail, commercial, employment and residential uses.

Tailpipe emissions from vehicles travelling along local roads are considered to be the main pollution source in the study area. There are no significant point sources in close proximity to the area, according to data from the National Atmospheric Emissions Inventory (NAEI).

1.1 Proposed Development

The Proposed Development seeks planning permission for:

"Residential development for up to 250 dwellings including affordable housing and ancillary uses including retained Local Wildlife Site, public open space, play areas, localised land remodelling, compensatory flood storage, structural planting and access."

1.2 Purpose of Air Quality Assessment

This report provides a review of baseline air quality in the study area to assess the risk of exceedance of National Air Quality Objectives (NAQOs) at the application site and surrounding area.

The potential impacts of scheme generated traffic on sensitive receptors in the local area has been assessed via an ADMS-Urban modelling exercise to determine the potential for significant impacts on ambient air quality (NO_2, PM_{10} and $PM_{2.5}$). Significance has been determined in line with IAQM guidance and mitigation measures suggested accordingly. The findings of the assessment have also been used to determine the potential exposure to poor air quality across the application site and its suitability for the proposed use.

The potential impact of construction dust has also been addressed to conclude on the requirements for mitigation to reduce the significance of impacts to negligible during this phase.

2. RELEVANT LEGISLATION

2.1 UK

The targets and limit values set within the 2008/50/EC[1] directive were transposed into UK law through the Air Quality Standards Regulations 2010, as amended. These set out how the government has interpreted the EU directives noted above. One of the main additions is the regulatory framework for $PM_{2.5}$.

The Air Quality Strategy 2007 Volume 1[2] outlines the National Air Quality Standard (AQS) concentrations and National Air Quality Objectives (NAQOs) that should be achieved. A summary of the AQS concentrations and NAQOs of relevance to this assessment is provided below, in Table 1:

Table 1 - UK Air Quality Standards

Pollutant	units	Averaging Period	Air Quality Standard (AQS)	National Air Quality Objectives (NAQO)
Nitrogen dioxide (NO_2)	µg/m^3	1 Hour Mean	200 µg/m^3	Not to be exceeded more than 18 times in a year.
		Annual Mean	40 µg/m^3	
Particulate matter (PM_{10})	µg/m^3	24 Hour Mean	50 µg/m^3	Not to be exceeded more than 35 times in a year.
		Annual Mean	40 µg/m^3	
Particulate matter ($PM_{2.5}$)	µg/m^3	Annual Mean	25 µg/m^3	25 µg/m^3

Defra's Local Air Quality Management Technical Guidance 2016 (LAQM.TG (16))[3] provides guidance on where the above NAQO's should apply. This is summarised below, in Table 2:

Table 2 - Summary of where NAQOs should apply:

Averaging Period	Objectives should apply at:	Objectives should generally NOT apply at:
Annual mean	All locations where members of the public might be regularly exposed. Building facades of residential properties, schools, hospitals, care homes etc.	Building facades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to other locations at the building façade) or any other location where public exposure is expected to be short term.
24-hour mean and 8-hour mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties	Kerbside sites (as opposed to other locations at the building façade) or any other location where public exposure is expected to be short term.

[1] EC, "Directive 2008/50/EC of the European Parliament and of the Council," May 21, 2008, 44.
[2] Defra, "The Air Quality Strategy for England, Scotland, Wales and Northern Ireland - Volume 1" (Department for Food, Environment and Rural Affairs (Defra), July 2007), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69336/pb12654-air-quality-strategy-vol1-070712.pdf.
[3] Defra, "LAQM Technical Guidance LAQM.TG16" (Department for Food, Environment and Rural Affairs (Defra), February 2018), https://laqm.defra.gov.uk/documents/LAQM-TG16-February-18-v1.pdf.

1-hour mean	All locations where the annual Mean and: 24 and 8-hour mean objectives apply. Kerbside site (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railways stations etc. which are not fully enclosed, where members of the public might be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably expect to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15-min mean	All locations where member of the public might reasonably be exposed for a period of 15 minutes	

From the above it can be concluded that both the short term and annual mean NAQOs apply at the application site in the context of the Proposed Development. They also apply at existing high sensitivity receptors in the local area, such as residential dwellings, schools and hospitals when considering the potential impact of the Proposed Development on air quality.

2.2 Local Air Quality Management

Obligations under the Environment Act 1995[4] require local authorities to declare an Air Quality Management Area (AQMA) at sensitive receptor locations where an objective concentration has been predicted to be exceeded. In setting an AQMA, the local authority must then formulate an Air Quality Action Plan (AQAP) to seek to reduce pollution concentrations to values below NAQOs.

CDC have four AQMAs declared in the district. The closest of these is the Air Quality Management Area No.4, located in the centre of Bicester, which was declared in 2015 for exceedances of the annual mean NAQO for NO_2. The AQMA is located approximately 900m west of the application site boundary. The location of AQMA No.4 is shown below:

[4] Environment Agency, "Environment Act 1995" (The Environment Agency, 2002), http://www.legislation.gov.uk/ukpga/1995/25/contents.

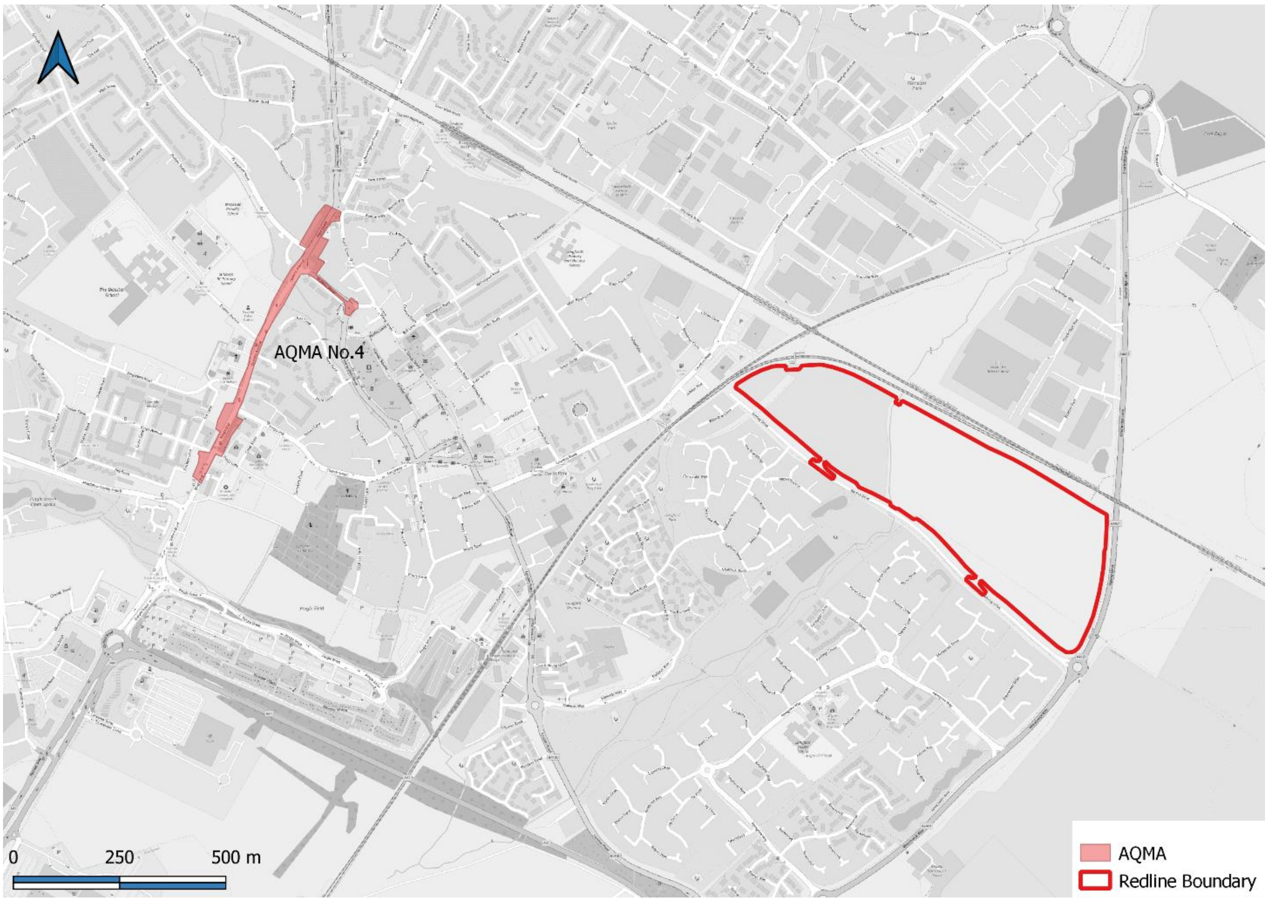

Figure 2 - Cherwell AQMA No.4

CDC's AQAP (2017)[5] details the priority measures taken by the council to improve air quality in the AQMAs. These measures include:

- Priority 1 – Strengthening local policy to improve air quality and its role in protecting health;
- Priority 2 – Reducing NO_x emissions from cars in all AQMAs;
- **Priority 3 – Ensuring new developments encourage and facilitate low emission and alternative transport;**
- Priority 4 – Ensuring transport infrastructure delivery takes account of air quality improvement potential within AQMAs, and;
- Priority 5 – Raising awareness of poor air quality and encouraging improvement actions by vehicle users and fleet managers.

2.3 National Planning Policy Framework

The National Planning Policy Framework (NPPF)[6] sets out the Government's planning policy for England. It requires planning decisions for any new development to prevent new and existing development from contributing to, or being put at risk from, unacceptable levels of air pollution (paragraph 174). It also states that planning decisions should sustain and contribute towards compliance with relevant limit values or national

[5] Cherwell District Council, "Cherwell District Council Air Quality Action Plan -2017," March 1, 2017.
[6] Ministry of Housing, Communities and Local Government, "National Planning Policy Framework," July 2021, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1004408/NPPF_JULY_2021.pdf.

objectives for air pollutants, taking into account the presence of AQMAs and Clean Air Zones (CAZ)s (paragraph 186), and the cumulative impacts from other sites (paragraph 185).

Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. Furthermore, planning decisions should ensure that any new development in AQMAs and CAZs is consistent with the local air quality action plan.

Also, to help reduce congestion and emissions, to improve air quality and public health, significant development should be focused on locations which are / can be made sustainable through limiting the need to travel (paragraph 105).

2.4 Planning Practice Guidance

Reference ID 32 (Air Quality) of the National Planning Practice Guidance (nPPG)[7], which was updated in November 2019, provides guiding principles on how planning can take account of the impact of new development on air quality. The PPG summarises the importance of air quality in planning and the key legislation relating to it.

2.5 Local planning policy

Cherwell District Council's (CDCs) Adopted Local Plan addresses air quality in both the saved policies from the Cherwell Local Plan 1996[8] and the Cherwell Local Plan 2011-2031 Part 1 (incorporating Policy Bicester 13 re-adopted on 19 December 2016)[9].

Policy ENV1 from the Cherwell Local Plan 1996 states that:

> *"Development which is likely to cause materially detrimental levels of noise, vibration, smell, smoke, fumes or other type of environmental pollution will not normally be permitted."*

Policy ESD 10: Protection and Enhancement of Biodiversity and the Natural Environment in The Cherwell Local Plan 2011-2031 Part 1 states that:

> *"Protection and enhancement of biodiversity and the natural environment will be achieved by the following: …Air quality assessments will also be required for development proposals that would be likely to have a significantly adverse impact on biodiversity by generating an increase in air pollution."*

Strategic Objective SO 15 in The Cherwell Local Plan 2011-2031 Part 1 is:

> *"To protect and enhance the historic and natural environment and Cherwell's core assets, including protecting and enhancing cultural heritage assets and archaeology, maximising opportunities for improving biodiversity and minimising pollution in urban and rural areas."*

Policy Bicester 13: Gavray Drive (re-adopted) includes specific considerations in regards to the application site, but does not contain any specific considerations relevant to air quality.

---

[7] Ministry of Housing, Communities & Local Government, "Reference ID (32) Air Quality" (Ministry of Housing, Communities & Local Government, 2019), https://www.gov.uk/guidance/air-quality--3.

[8] Cherwell District Council, "Cherwell Local Plan 1996," November 1996, https://www.cherwell.gov.uk/info/83/local-plans/373/adopted-local-plan-1996-november-1996.

[9] "The Cherwell Local Plan 2011-2031 (Incorporating Policy Bicester 13 Re-Adoption December 2016)," July 2015, https://www.cherwell.gov.uk/downloads/download/45/adopted-cherwell-local-plan-2011-2031-part-1-incorporating-policy-bicester-13-re-adopted-on-19-december-2016.

3. METHODOLOGY

3.1 Consultation

A consultation was carried out with CDC's Environmental Health Officer (EHO) in January 2021. Full details of the air quality assessment approach were agreed with CDC EHO prior to undertaking the assessment. The only comment of consequence was:

> *"...you should look at the possible impacts of the activities on the nearby industrial estates as part of the assessment."*

The activities from the nearby industrial estates are dealt with accordingly within this assessment.

In addition, CDC's Environmental Health Officer (EHO), in their formal response to the EIA Scoping Report, requested the inclusion of a Damage Cost appraisal and emissions mitigation assessment within the AQA. This is at provided at section 7.

The agreed methodology is described below.

3.2 Guidance

Defra's LAQM.TG (16)[3] and the EPUK & IAQM Land-use Planning & Development Control: Planning for Air Quality[10] have been followed as guidance to produce this assessment. The IAQM's guidance on assessing impacts from construction[11] has also been followed.

For the consideration of designated ecological sites in the area the IAQM's Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites has been referred to[12]. Finally, the IAQM guidance on the Assessment of Mineral Dust Impacts for Planning[13] has been referred to consider the risk of impacts from nearby dust sources.

3.3 Baseline Air Quality

The baseline air quality conditions in the vicinity of the application site have been established through the compilation and review of appropriately sourced background concentration predictions and local monitoring data. This is provided in section 4, and includes:

- Data from the National Atmospheric Emissions Inventory;
- Defra's modelled background concentrations of AQS pollutants (UK-AIR)[14]. These estimates are produced using detailed modelling tools and are available as concentrations at central 1km^2 National Grid square locations across the UK, and;

[10] IAQM, "Land-Use Planning & Development Control: Planning for Air Quality" (Institute for Air Quality Management (IAQM), January 2017), http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf.
[11] IAQM, "Guidance on the Assessment of Dust from Demolition and Construction" (Institute of Air Quality Management (IAQM)), February 2014), http://www.iaqm.co.uk/text/guidance/construction-dust-2014.pdf.
[12] IAQM, "A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites" (Institute for Air Quality Management (IAQM), June 2019), https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2019.pdf.
[13] IAQM, "Guidance on the Assessment of Mineral Dust Impacts for Planning," May 2016, http://www.iaqm.co.uk/text/guidance/mineralsguidance_2016.pdf.
[14] UK-AIR, "Background Mapping Data for Local Authorities - 2018," n.d., https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018.

- CDC's latest available air quality monitoring data, derived from the latest available air quality annual status report published in 2020[15]. At the time of writing, these data were from 2019 (which provides a robust assessment, as data do not include reductions due to changes in travel behaviour as a result of the COVID-19 pandemic).

3.4 Construction Dust Risk Assessment

A construction dust risk assessment is provided in section 5, which has been undertaken in line with IAQM guidance. This considers the risk of impacts during the construction phase in terms of nuisance dust, human health (PM_{10} exposure) and ecological impacts.

With regard to ecological receptors, risk assessment should be taken where high-sensitivity receptors are located within 50m of a site boundary. The Multi Agency Geographic Information for the Countryside (MAGIC) website, which incorporates Natural England's interactive maps[16], has been reviewed to identify whether any statutory ecological sensitive receptors are situated within 50m of the application site boundary or within 50m of any routes used by construction vehicles on the public highway, up to 200m from the application site entrance. Whilst there are no statutory ecological receptors in proximity of the Proposed Development, Gavray Drive Meadows Local Wildlife Site (LWS) is located within 20m of the construction phase works. This receptor will be considered accordingly.

Within distances of 20m of the application site boundary there is a high risk of dust impacts. Up to 100m from the construction site, there may still be a high risk, particularly if the receptor is downwind of the prevailing wind direction in relation to the dust source. It is considered that for receptors more than 350m from the application site boundary, the risk is negligible. Sensitive receptors were identified within 350m of the application site boundary. Based on the IAQM guidance residential dwellings are considered as high sensitivity receptors in relation to both dust soiling and health effects of PM_{10}. Indicative examples of medium sensitivity receptors include places of work, such as offices.

The IAQM guidance states that the potential dust emission magnitude from Demolition, Earthworks, Construction and Trackout should all be assessed individually. In addition, the sensitivity of the area to adverse dust impacts should also be defined.

The overall significance of the risk of adverse impacts during the construction phase can then be defined using the 'risk of impacts matrix' for each stage of the construction phase described above.

3.5 Impact Assessment

3.5.1 Scope of Impact Assessment

The scope of assessment has been determined against the IAQM's checklist criteria. The IAQM guidance includes numerous criteria which are not directly relevant to the Proposed Development, such as those related to the realignment of roads within an AQMA, introduction of a new bus station, new road junctions and underground car parks. These have been excluded from this assessment and only relevant screening criteria have been included. The purpose of the checklist criteria shown in Table 3 is to establish whether a detailed assessment of potential impacts is required.

[15] Cherwell District Council, "2020 Air Quality Annual Status Report (ASR)," June 2020.
[16] Natural England and MAGIC partnership organisations., "Multi Agency Geographic Information for the Countryside.," 2020, https://magic.defra.gov.uk/MagicMap.aspx.

Table 3 - IAQM detailed assessment criteria

Criteria	The development will:	Indicative criteria to proceed to a detailed AQA:
1	Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors. (LDV - cars and small vans <3.5t gross vehicle weight)	A change of LDV flows of: - more than 100 AADT within or adjacent to an AQMA -more than 500 AADT elsewhere.
2	Cause a significant change in Heavy Duty (HDV) flows on local roads with relevant receptors (HDV = goods vehicles + buses >3.5t gross vehicle weight).	A change of HDV flows of: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere.
7	Have one of more substantial combustion processes, where there is a risk of impacts at relevant receptors. NB. This includes combustion plant associated with standby emergency generators (typically associated with centralised energy centres) and shipping.	Typically, any combustion plant where the single or combined NO_x emission rate is less than 5mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent stack in a location and at a height that provides adequate dispersion. In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situation where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emissions rates. Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable.

With regard to screening criteria 1 and 2, the application site and immediately surrounding area are not within an AQMA and as such, the less stringent criteria apply. The transport consultants working on the scheme are Markides Associates who have confirmed that the development is expected to cause an increase in traffic flows above the defined threshold levels for detailed assessment.

However, Markides Associates confirmed that the traffic impact through the Bicester AQMA no.4 is not expected to be exceed criteria 1 and 2:

> *"The SATURN model distribution is showing 237 two-way daily flow on London Road at the A41 / A4421 roundabout. Of this somewhere between 56% and 75% is going to / from the site via Mallards Way and therefore wouldn't be travelling through the AQMA. This leaves between 59 and 104 vehicles travelling along London Road beyond Mallards Way. There are a range of alternative destinations and routes before you get to the AQMA (the station, various employment opportunities, Launton Road and the majority of the town centre). I would therefore anticipate that substantially less than 100 vehicles per day would pass through the AQMA as a result of the development."*

Therefore, no further assessment has been undertaken through this AQMA and the study area is confined to the immediate surrounding area around the application site, as potential impacts in the AQMA can be considered as Negligible, which is insignificant, in accordance with IAQM guidance.

With regard to screening criteria 7, the application is currently at outline stage and no further details are available to consider any building related emissions. If the future proposed energy strategy includes any significant combustion sources, these may need further assessment. If any gas fired boilers are proposed for heating / hot water, these should have a NO_x emission rate of less than 5 mg/s. This is equivalent to meeting the ultra-low NO_x emission rating of <40mg/kWh, in accordance with EPUK/IAQM guidance.

Based on the above, a detailed assessment of air quality impacts has been undertaken, in accordance with IAQM guidance. The methodology of this is described below.

3.5.2 ADMS-Urban Dispersion Model

The emissions generated from traffic travelling along the local road network have been assessed for exceedances of the NAQOs for NO_2, PM_{10} and $PM_{2.5}$ at sensitive receptor locations using the latest version of ADMS-Urban (version 5.1), which was released in April 2020 by Cambridge Environmental Research Consultants (CERC). The model has been validated and approved by Defra for use as an assessment tool for calculating the dispersion of pollutants from traffic on UK roads.

ADMS-Urban is able to provide an estimate of air quality at receptor locations at the Proposed Development, considering important input data such as background pollutant concentrations, meteorological data, and traffic flows.

3.5.3 Emission Sources

For the purposes of this assessment, the main emission sources are considered to be from vehicles travelling on local roads.

No significant point sources or other non-roads sources of air pollution were found to be in the area after a review of the NAEI. The roads modelled included in the impact assessment are shown in Figure 3 below:

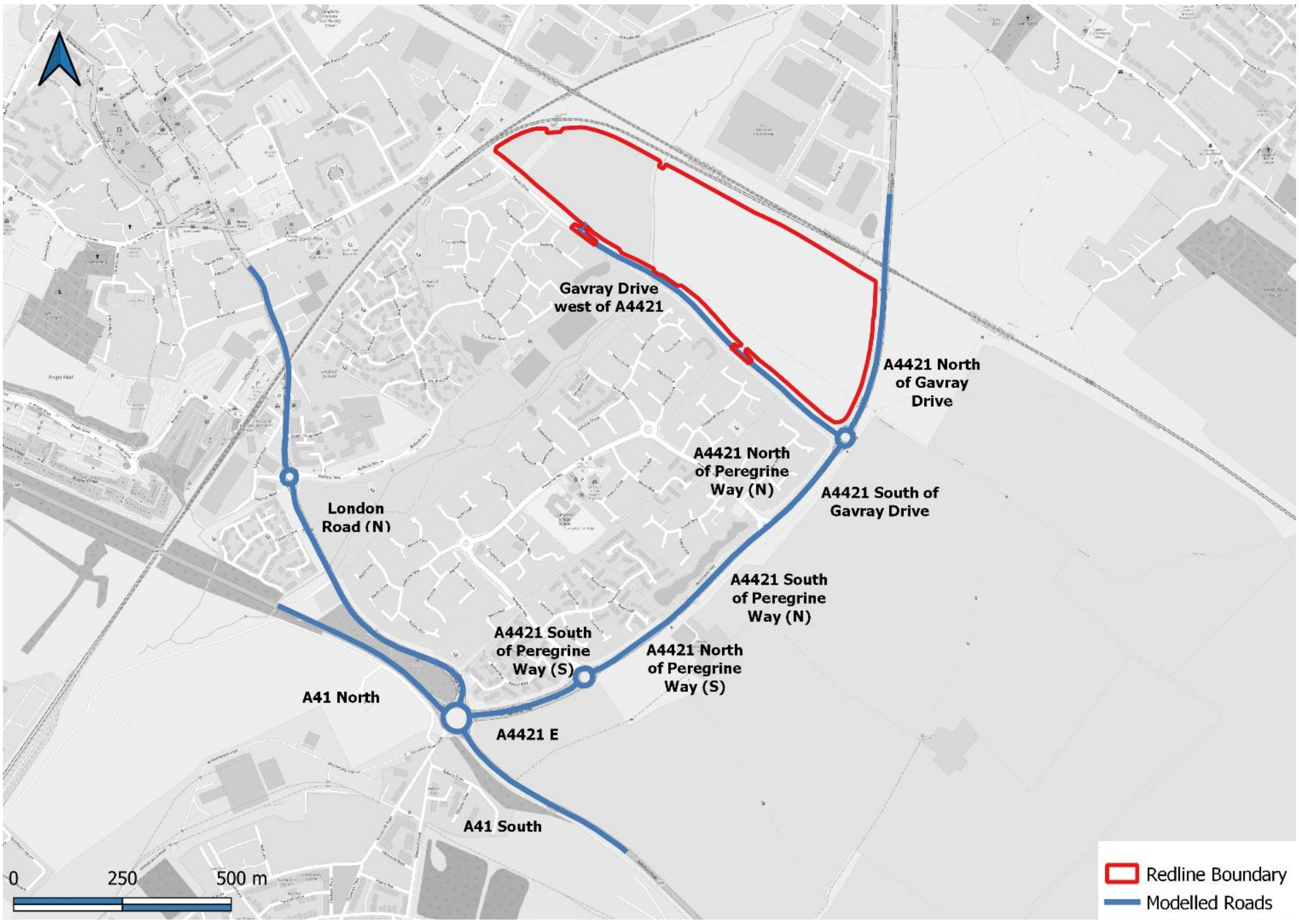

Figure 3 - Modelled Roads

3.5.4 Human Receptors

Discrete model receptors, R1 to R20, were positioned at breathing height (1.5m) to represent ground floor level at the façades of existing high sensitivity receptors in the study area to assess the potential impact at these locations. Worst case receptor locations were selected, whereby receptors were placed at the closest relevant location to roads and junctions as modelled emissions are higher here, ensuring the results capture the worst-case exposure.

Concentrations were also modelled at receptor points at the boundary of the application site at a height of 1.5m to represent the potential exposure of new receptors to existing poor air quality, represented by S1 to S6. A table of all modelled receptors is shown in Appendix A. The modelled receptors are shown in Figure 4 below:

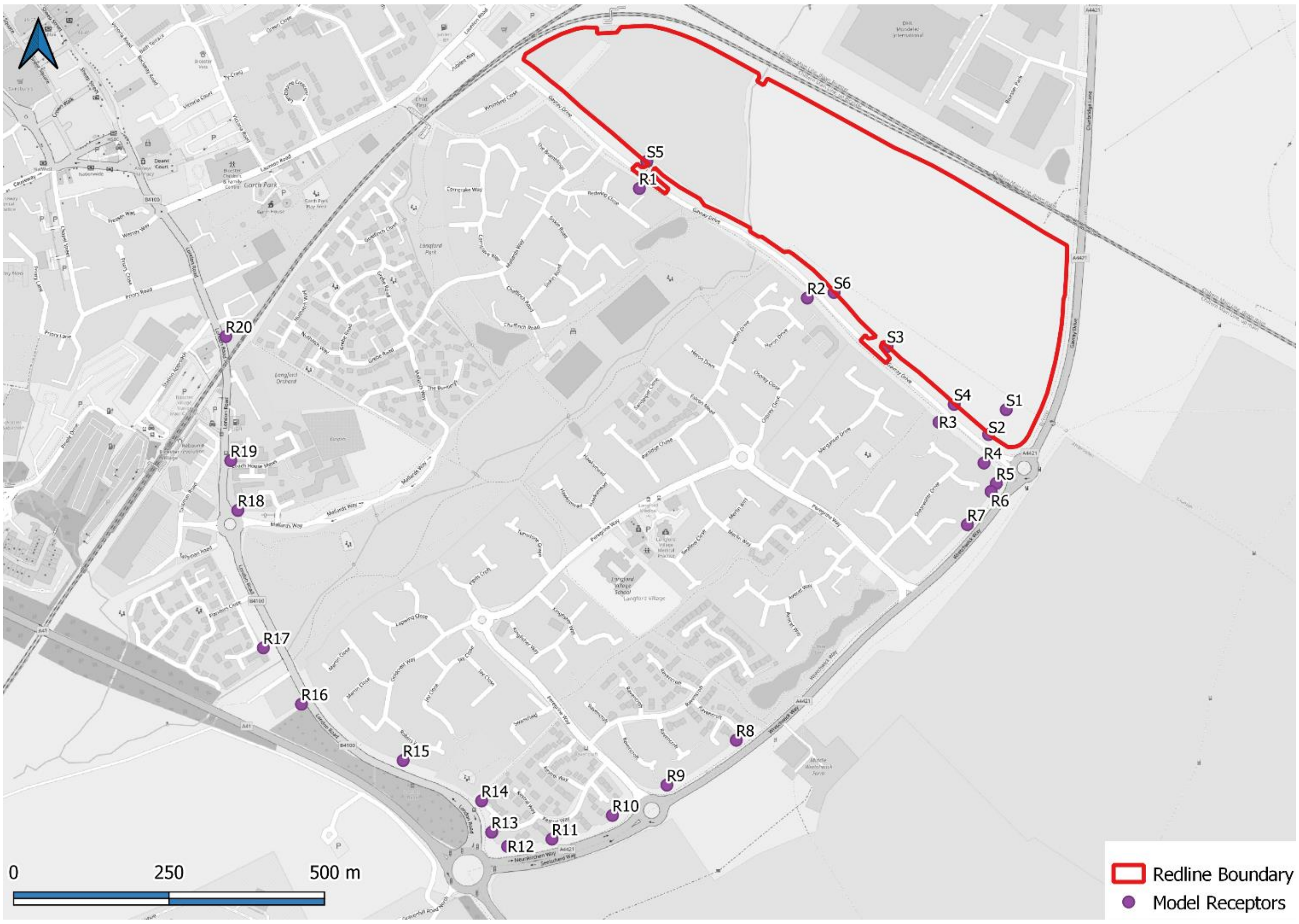

Figure 4 - Modelled Receptors

3.5.5 Ecological Receptors

No statutory designated ecological sites have been identified within the 200m of the local road network within the study area and therefore no further assessment has been undertaken.

Gavray Drive Meadows Local Wildlife Site (LWS) is located within and adjacent to the application site boundary. Consultation with the project ecologist, edp, determined that this LWS is not sensitive to the effects of changes in ambient NO_x concentration. Therefore, any impacts from an increase in emissions are not likely to lead to a significant effect on the habitat / ecological function of the LWS.

Furthermore, any operational phase mitigation measures included to reduce emissions at human health receptors will further reduce any potential residual risk posed to the LWS. Therefore, no further operational phase assessment of the LWS has been undertaken. The LWS is considered further within the construction phase assessment.

3.5.6 Assessment Scenarios

The following assessment scenarios have been considered in this assessment:

- Baseline / Model Verification 2019;
- 2026 Do Minimum (DM): Baseline 2026 + Committed Development; and
- 2026 Do Something (DS): Baseline 2026 + Committed Development + Proposed Development.

The above scenarios are consistent with IAQM guidance which states:

> *"Where these developments have been granted planning consent and are therefore 'committed' developments, their impacts should be assessed cumulatively with those of the application site. The contribution of these committed developments should be accounted for in the 'future baseline', provided that their contributions can be quantified."*

A sensitivity study has also been performed, whereby the above scenarios DM and DS were repeated using 2019 emissions factors and background concentrations from 2019. Therefore, accounting for the worst-case scenario where vehicle emissions and background concentrations do not improve in line with Defra predictions.

3.5.7 Model Inputs

3.5.7.1 Traffic Data

Traffic flows were provided by Markides Associates for the 2019 baseline scenario based on 2014 ATC Survey Data uplifted to 2019 flows by applying TEMPro growth factors. The future years flows for 2026 were provided from the Bicester SATURN model. The future year traffic data therefore includes the in-combination effect of all other developments accounted for in the Bicester SATURN transport model.

Vehicle speeds were also provided. For each link, vehicle speeds were derived from speed limit for each road. Vehicle speeds were reduced by 10kph within approximately 50m of junctions relative to the speed limit to account for queuing and congestion in the average speed profile, in accordance with LAQM.TG (16). For busy junctions vehicles speeds were reduced further in line with LAQM.TG (16) guidance.

The traffic data used in the model are provided in Appendix B.

3.5.7.2 Emission Factors

Emission rates used for the dispersion modelling assessment were calculated from the latest Emissions Factor Toolkit (v.10.1) which was released in August 2020.

Most modern vehicles on the road in the UK meet a particular Euro emissions standard from 1 – 6, with 6 being the newest. Different parts of the country have newer or older vehicles than others. This is defined as the "fleet". The EFT estimates this primarily based on whether the location is within or outside London or in England, Wales or Scotland. In the case of this model the vehicle fleet was taken as "England (urban)".

For model verification, 2019 factors were applied to the traffic data. For future year scenarios DM and DS, 2026 factors were applied. The sensitivity study performed used 2019 factors for the future year scenarios DM and DS. This accounts for the uncertainty in the predicted decrease in emissions from vehicles.

3.5.7.3 Meteorological Parameters

Detailed, hourly sequential meteorological data are used by the model to determine pollutant transportation and levels of dilution by the wind and vertical air movements.

Wind direction, wind speed, temperature, humidity and cloud cover data for the period 01/01/2019 to 31/12/2019 were obtained from the Brize Norton meteorological measurement station, using the WorldMet R package[17]. The surface roughness applied to the model was 0.75 for the dispersion sites, and 0.2 for the meteorological measurement site. The minimum Monin-Obukhov length was set to 10m, the default setting for small-towns.

3.5.7.4 Background Concentrations

With regard to background data used in the assessment, it is important that the choice of background site captures all pollutant sources that are not being modelled, but does not capture any sources being modelled, which could result in double-counting emissions from road sources in the study area.

UK-AIR modelled background concentrations for the relevant grid square were considered to be the appropriate source of background concentrations in the dispersion model. NO_2, PM_{10} and $PM_{2.5}$ backgrounds were derived from this data. 2019 background concentrations were used for the Model Verification scenario. 2026 backgrounds concentration were used for the future scenarios DM and DS. Background values applied to the model are shown in Appendix C.

3.5.8 Model Verification and Uncertainty

A verification study has been undertaken using CDC's air quality monitoring data from 2019 using diffusion tubes on London Road and Aylesbury Road. The locations of these diffusion tubes were adjusted in the ADMS-Urban model to accurately represent their locations and distances from the road following review of Google Street view. Full details of the model verification exercise are included in Appendix D. The model was found to be under-predicting concentrations of NO_x and NO_2. Therefore, an adjustment factor of 1.587 was applied to the model results.

The Root Mean Square Error (RMSE) is used to define the average error or uncertainty of the model. According to LAQM.TG (16), the RMSE should preferably be within 10% of the relevant NAQO, but is acceptable where it is within 25%. The model verification process, calculated post-adjusted RMSE value of the model to be 0.2µg/m^3, which equates to 0.6% of the annual mean NAQO for NO_2.

This RMSE value is well within the preferable range of uncertainty in accordance with LAQM.TG (16). As such, the factor was considered appropriate for model adjustment.

3.6 Significance Criteria

The significance of modelled impacts has been determined against the following threshold criteria, derived from the EPUK and IAQM guidance, as shown below in Table 4.

[17] David Carslaw, *Worldmet: Import Surface Meteorological Data from NOAA Integrated Surface Database (ISD)*, version 0.9.2, 2020, https://CRAN.R-project.org/package=worldmet.

Table 4 - EPUK and IAQM Significance Criteria

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	<1*	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76 - 94% of AQAL	Negligible	Slight	Moderate	Moderate
95 - 102% of AQAL	Slight	Moderate	Moderate	Substantial
103 - 109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

**Changes of 0%, i.e., < 0.5%, will be described as Negligible.*

3.7 Non-road sources

The impacts of the adjacent railway on the Proposed Development are not considered to require further assessment in line with Defra's LAQM.TG (16). The railway tracks in questions are not listed as a relevant line with heavy traffic of diesel passenger trains in the LAQM.TG (16) guidance.

Additionally, the background annual mean NO_2 concentration is not above 25µg/m^3. Therefore, consideration of moving diesel locomotives can be scoped out. With regards to potential stationary diesel locomotives a review of the line characteristics indicates it is unlikely that regular stationary periods of 15-minutes or more will occur. Also, the Land Use Parameter Plan shows there is not relevant exposure within 15m of the railway track so this can also be scoped out.

3.8 Industrial Estate - Potential Dust Emissions

The nearby industrial estate referred to in the EHO consultation response has been scoped for potential pollution sources. The main pollution source from the industrial estate is considered to be from road traffic and as such, vehicle emissions form its uses are captured within the traffic data used in dispersion modelling assessment described above. However, the following dust sources have also been identified:

- The Sidalls Bicester Ltd site, and
- The Wickes storage yard.

While the IAQM mineral dust guidance is written for the assessment of mineral dust, it is considered to contain a number of guidable principles to determine the potential risk of impacts from these sites. This is provided in section 6.

The assessment provided is a qualitative disamenity dust risk assessment following the Source – Pathway – Receptor framework, which determines the potential emission of dust from the source, the effectiveness of the pathway to the receptor and the sensitivity of the receptor to the impacts of dust on disamenity, to determine the magnitude of dust effect at the receptor location.

As background concentrations of PM_{10} in the area are below 17 µg/m^3 (see section 4) there is little risk that the Process Contribution (PC) from these sites would lead to an exceedance of the annual-mean objective for PM_{10} and thus lead to significant human health impacts. As such, no further assessment of human health impacts has been undertaken.

4. BASELINE AIR QUALITY CONDITIONS

Baseline air quality conditions in the study area have been established through compilation and review of appropriately sourced monitoring and modelling data.

4.1 UK-AIR background concentrations

Defra provides estimated background concentrations of AQS pollutants at the UK-AIR website. These estimates are produced using detailed modelling tools and are presented as concentrations at central 1km^2 National Grid square locations across the UK. At the time of writing, the most recent background maps were from August 2020 and based on monitoring data from 2018.

Estimated background concentrations of the key AQS pollutants relevant to this assessment are presented in Table 5 for NO_2, PM_{10} and $PM_{2.5}$. The background concentrations are all below the National Air Quality Objectives (NAQOs). Note the backgrounds are reported for across multiple grid squares.

Table 5 - UK-AIR background concentrations and NAQOs

Grid Square	Pollutant		Annual Mean National Air Quality Objectives (NAQO)	Annual Mean (µg/m^3)		
	Description	units		2019	2021	2026
459500, 222500	Nitrogen dioxide (NO_2)	µg/m^3	40	10.98	10.00	8.62
	Particles (PM_{10})	µg/m^3	40	14.63	14.17	13.50
	Particles ($PM_{2.5}$)	µg/m^3	25	9.77	9.40	8.86
460500, 222500	Nitrogen dioxide (NO_2)	µg/m^3	40	9.89	8.97	7.59
	Particles (PM_{10})	µg/m^3	40	14.34	13.88	13.21
	Particles ($PM_{2.5}$)	µg/m^3	25	9.62	9.25	8.70
459500, 221500	Nitrogen dioxide (NO_2)	µg/m^3	40	10.44	9.55	7.98
	Particles (PM_{10})	µg/m^3	40	14.96	14.50	13.84
	Particles ($PM_{2.5}$)	µg/m^3	25	9.92	9.56	9.03
460500, 221500	Nitrogen dioxide (NO_2)	µg/m^3	40	9.24	8.41	7.13
	Particles (PM_{10})	µg/m^3	40	14.69	14.24	13.57
	Particles ($PM_{2.5}$)	µg/m^3	25	9.42	9.06	8.52

The data show that annual mean background concentrations of NO_2, PM_{10} and $PM_{2.5}$ at the grid squares within which the application site is located are modelled by Defra to be well below the NAQOs for the verification year of 2019, 2021 and the future assessment year of 2026. The concentrations are predicted to decrease with time.

Concentrations of all pollutants are predicted to decline incrementally each year. These reductions are principally due to the forecast effect of the roll out of cleaner vehicles and strategies to reduce emissions across all sectors.

4.2 Air Quality Monitoring Data

In 2019 CDC monitored at 42 sites using passive diffusion tubes. CDC did not undertake any automatic monitoring of air quality in the district in 2019. The results for monitoring sites located within approximately 2km of the application site, and therefore most representative of local air quality conditions, are shown below in Figure 5 and reported in Table 6 below:

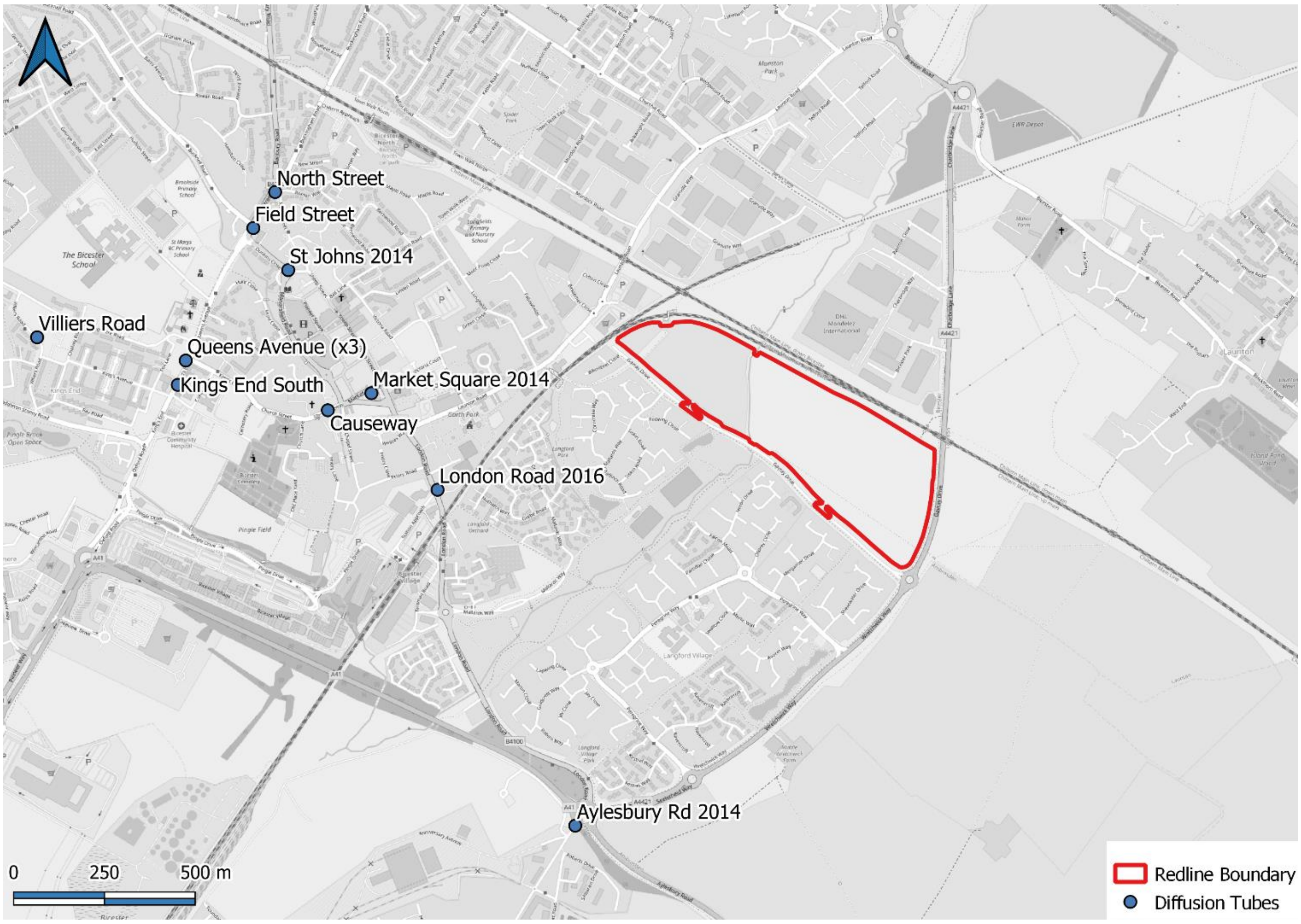

Figure 5 - Non-automatic Diffusion Tube Sites

Table 6 - Annual mean NO_2 concentrations at Non-automatic Sites

					Results (µg/m^3)				
Site ID	Site Type	In AQMA?	X	Y	2015	2016	2017	2018	2019
Kings End South	Roadside	YES	458006	222404	**46**	**46**	**41.7**	**41.9**	**41.5**
St Johns 2014	Kerbside	YES	458310	222720	38.3	36.2	37.8	38.6	31.7
Field Street	Kerbside	YES	458214	222836	36.5	34.3	33.5	31.6	32.1
North Street	Kerbside	YES	458274	222935	39.8	37.9	36.5	37.6	35.6
Queens Avenue (x3)	Kerbside	YES	458028	222471	38.7	38.7	39.5	35	35.6
Causeway	Kerbside	NO	458419	222334	20	22.5	18.3	-	25.5
Market Square 2014	Roadside	NO	458539	222381	23.7	25.4	24.7	23.1	22.2
Aylesbury Rd 2014	Roadside	NO	459100	221190	30.5	30	28.8	29.5	26.7
London Road 2016	Roadside	NO	458721	222115	-	29.1	26.3	25.7	23.6
Villiers Road	Urban Background	NO	457619	222535	16.9	18.2	17.9	17.2	17
Notes: **Bold** values denote exceedance of the Annual Mean NAQO.									

The only exceedances of the annual mean NAQO for NO_2 in study area in recent years have occurred within the CDC AQMA No.4 (the Bicester Centre AQMA). Since 2015, only the Kings End South monitoring site has exceeded the NO_2 annual mean NAQO. In 2019, this location monitored a 3.75% exceedance of the NAQO.

At all other monitoring locations, the 2019 annual mean NO_2 concentrations were not at risk of exceeding the NAQO, in accordance with Defra LAQM.TG (16), as were greater than 10% below the NAQO. The overall trend of the Roadside and Kerbside monitoring sites is a decreasing concentration of NO_2 since 2015. The exception to this trend is the Causeway monitoring site where 2019 concentrations were highest in 2019

Villiers Road monitoring site, which is representative of Urban Background concentrations in Bicester, was 57.7% below the annual mean NO_2 NAQO in 2019. The concentration of NO_2 at this site has consistently remained well below the NAQO, as would be expected in an urban background location.

5. CONSTRUCTION DUST RISK ASSESSMENT

5.1 Overview

The construction phase of the Proposed Development will involve a number of activities that will produce polluting emissions to air. Predominantly, these will be emissions of dust. A such, a qualitative construction dust risk assessment has been carried out in accordance with IAQM Guidance[11].

The risks of impact and the significance of each stage of the construction phase is classified as Negligible, Low, Medium or High, determined against a matrix which considers the distance from source, receptor sensitivity, background pollution concentrations and the potential dust emission magnitude of the works.

5.1.1 Construction Traffic Emissions

The IAQM's guidance states that, from experience of assessing exhaust emissions from site traffic, it is unlikely that any significant adverse impacts on local air quality would be caused and in the vast majority of cases, quantitative assessment is not needed. As such, short term effects of construction traffic emissions have not been assessed.

5.2 Dust Emission Magnitude

5.2.1 Demolition

There is no demolition associated with the Proposed Development as there are no existing built structures on site, therefore, the impact of demolition activities is Not Applicable.

5.2.2 Earthworks

The area of the application site is over the IAQM's Large threshold of 10,000m^2. There are likely to be more than 10 heavy moving vehicles active at one time. The underlying soil texture is described as loamy and clayey[18] and therefore may have a high potential for dust release when dry due to the small particle size. Therefore, the potential dust emission magnitude for this stage is considered 'Large'.

5.2.3 Construction

The key issues when determining the potential dust emission magnitude during the construction phase include the size of the building(s)/infrastructure, method of construction, construction materials, and duration of build.

At this stage, it is estimated that the total volume of building to be erected would be within the IAQM's Large threshold of >100,000m^3. Therefore, the potential dust emission magnitude for this stage is considered 'Large'.

5.2.4 Trackout

The risk of impacts occurring during Trackout is predominantly dependent on the number of vehicles accessing the application site on a daily basis. However, vehicle size, speed and the duration of activities are also factors which are used to determine the risk of impacts.

The unpaved road network is not likely to be greater than 50m in length, as the existing road network will be used to access the application site. However, the number of site vehicles is likely to be within the IAQM's

[18] Cranfield University, "Cranfield Soil and Agrifood Institute," n.d., http://www.landis.org.uk/soilscapes/.

'Medium' threshold of 10-50 HDV (>3.5t) outward movements. Accordingly, the potential dust emission magnitude during Trackout is considered to be 'Medium'.

5.2.5 Summary

Table 7 below shows a summary of the potential dust emission magnitudes from each activity:

Table 7 - Potential Dust Emission Magnitude

Activity	Dust Emission Magnitude
Earthworks	Large
Construction	Large
Trackout	Medium

5.3 Sensitivity of Area

The prevailing wind direction for the regionally representative meteorological measurement station, at Brize Norton, is shown below for 2019 in Figure 6. The wind rose shows that the prevailing winds are from the south-west. As such, receptors downwind (i.e. north-east) of the application site are more sensitive to dust impacts than those located upwind.

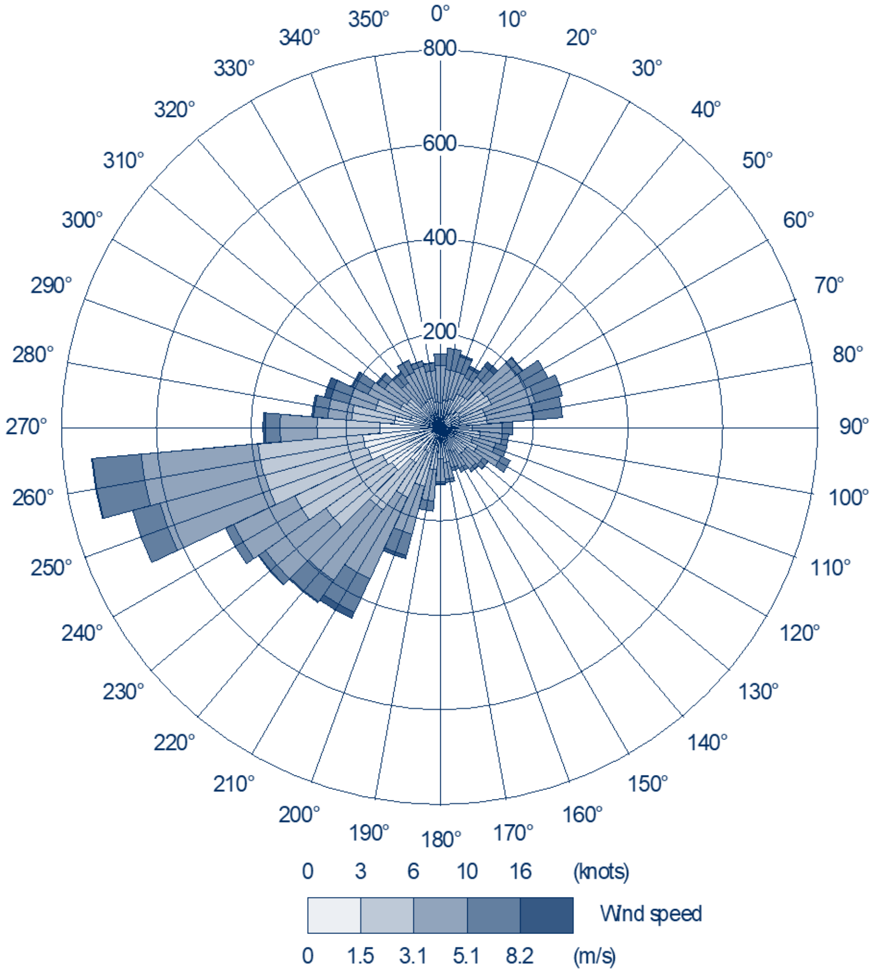

Figure 6 – 2019 wind Rose for Brize Norton Meteorological Station

The relevant human receptors within 350m of the Proposed Development boundary have been identified and are shown in Figure 7 below:

Figure 7 – Human Construction Dust Assessment Receptors

There are 1-10 high-sensitivity human receptors within 20m of the application site boundary. Additionally, there are 10-100 high-sensitivity receptors within 50m of the application site boundary. According to IAQM guidance, the overall sensitivity of the surrounding area to nuisance dust soiling effects during the Earthworks and Construction stages is defined as ‘Medium’.

Within the application site is the Gavray Drive Meadows LWS. This is considered to be located within 20m of all stages of construction phase activities. Consultation with the project ecologist, edp, has confirmed that the Gavray Drive Meadows LWS should be classified as a Low sensitivity receptor and risk assessed accordingly. Therefore, with reference to IAQM criteria, the overall sensitivity of the area to ecological impacts is defined as ‘Low’ for all stages.

With regard to Trackout, the sensitivity is assessed where receptors are located within 50m from Trackout routes up to 500m from the application site. As there are 1-10 high-sensitivity human receptors within 20m of the Trackout route and there are 10-100 high-sensitivity receptors within 50m of the Trackout route, the sensitivity to dust soiling impacts from Trackout is defined as ‘Medium’.

UK-AIR predictions show that annual mean concentrations of PM_{10} are well below 32 $\mu g/m^3$ in the vicinity of the application site (the concentration at which exceedance of the 24-hour NAQO is likely), and are not likely to exceed 24 $\mu g/m^3$. According to IAQM guidance, where PM_{10} concentrations are <24 $\mu g/m^3$ and there are fewer than 100 high sensitivity receptors within 20m of the application site boundary, the overall sensitivity of the surrounding area to human health impacts is defined as 'Low' for all stages.

The sensitivity of the surrounding area for the potential impacts discussed above are shown in Table 8 below.

Table 8 - Sensitivity of Local Area

Potential Impact	Sensitivity of the Surrounding Area		
	Earthworks	Construction	Trackout
Dust Soiling	Medium	Medium	Medium
Human Health	Low	Low	Low
Ecological	Low	Low	Low

5.4 Risk of Impacts

Using the methodology prescribed in the IAQM guidance, the overall risk of impacts can be defined by combining the sensitivity of the area with the potential dust emission magnitude of each stage of the construction phase as described above.

Table 9 provides a summary of the construction dust risk assessment. Overall, the development is considered to be **Medium Risk** for nuisance dust soiling effects, a **Low Risk** for PM_{10} health effects, and a **Low Risk** for ecological impacts, in the absence of mitigation.

Table 9 - Risk of adverse impacts during construction phase

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

Section 8 provides site specific mitigation measures to be adopted. The IAQM guidance states that implementing these measures should effectively reduce the risk of impacts to *Negligible* during this phase. On this basis, the residual construction phase effects are considered to be '**not significant**'.

6. OPERATIONAL ASSESSMENT

6.1 Impact Assessment

The results of the dispersion modelling assessment are shown below in Table 10, Table 11 and Table 12. The impact of the Proposed Development on local air quality has been assessed as the increase in pollutant concentrations from the DM to DS scenarios The significance of the impact, for each pollutant, at each receptor location has also been determined against the EPUK/IAQM guidance.

6.1.1 Annual Mean NO_2

Table 10 shows the model predicted concentrations of annual mean NO_2 at sensitive receptor locations surrounding the application site.

Table 10 – Modelled annual mean NO_2 Results (µg/m^3)

Receptor	Modelled NO_2				
	Model DM	Model DS	Increase (DM to DS)	% Increase relative to AQAL	Significance
R01	9.00	9.12	0.12	0.30	Negligible
R02	9.17	9.33	0.16	0.40	Negligible
R03	8.94	9.10	0.16	0.40	Negligible
R04	9.85	10.02	0.17	0.43	Negligible
R05	11.16	11.33	0.17	0.43	Negligible
R06	10.93	11.06	0.13	0.33	Negligible
R07	10.63	10.72	0.09	0.23	Negligible
R08	10.95	11.04	0.09	0.23	Negligible
R09	12.86	12.98	0.12	0.30	Negligible
R10	11.82	11.90	0.08	0.20	Negligible
R11	12.60	12.68	0.08	0.20	Negligible
R12	14.81	14.91	0.10	0.25	Negligible
R13	12.97	13.06	0.09	0.23	Negligible
R14	14.91	15.02	0.11	0.27	Negligible
R15	13.11	13.18	0.07	0.18	Negligible
R16	12.30	12.36	0.06	0.15	Negligible
R17	9.90	9.93	0.03	0.07	Negligible
R18	12.43	12.58	0.15	0.38	Negligible
R19	11.43	11.54	0.11	0.27	Negligible
R20	12.86	13.00	0.14	0.35	Negligible

The results show that the impact of the Proposed Development on annual mean NO_2 concentrations is **Negligible** at all receptor locations when assessing the increase from DM to DS (which accounts for cumulative impacts). The maximum increase in annual mean NO_2 was 0.17µg/m^3 at R04 and R05. With reference to IAQM significance criteria, as increases at all receptors are deemed to be Negligible, the predicted effects are **Not Significant**.

With regards to the 1-hour NO_2 objective, Defra's LAQM.TG(16) states where the annual means are below 60µg/m^3, it is unlikely that exceedances of the 1-hour mean will occur. As all modelled results are well below this threshold, it is unlikely that the 1-hour NO_2 NAQO is exceeded at any of the receptor locations.

6.1.2 Annual Mean PM_{10}

Table 11 shows the model predicted concentrations of annual mean PM_{10} at sensitive receptor locations surrounding the application site.

Table 11 – Modelled annual mean PM_{10} Results (µg/m³)

Receptor	Modelled PM_{10}				
	Model DM	Model DS	Increase (DM to DS)	% Increase relative to AQAL	Significance
R01	13.66	13.70	0.04	0.11	Negligible
R02	13.73	13.79	0.06	0.16	Negligible
R03	14.25	14.31	0.06	0.16	Negligible
R04	14.61	14.67	0.07	0.17	Negligible
R05	15.13	15.20	0.06	0.16	Negligible
R06	15.06	15.12	0.06	0.14	Negligible
R07	15.03	15.07	0.05	0.11	Negligible
R08	15.16	15.19	0.04	0.09	Negligible
R09	15.77	15.82	0.05	0.12	Negligible
R10	15.44	15.47	0.03	0.08	Negligible
R11	15.81	15.84	0.03	0.09	Negligible
R12	16.63	16.67	0.04	0.10	Negligible
R13	15.95	15.99	0.04	0.10	Negligible
R14	16.68	16.72	0.05	0.12	Negligible
R15	16.15	16.18	0.03	0.08	Negligible
R16	15.77	15.80	0.03	0.06	Negligible
R17	14.67	14.69	0.02	0.04	Negligible
R18	15.69	15.76	0.06	0.16	Negligible
R19	15.33	15.38	0.05	0.13	Negligible
R20	15.97	16.04	0.07	0.17	Negligible

The results show that the impact of the Proposed Development on annual mean PM_{10} concentrations is **Negligible** at all receptor locations when assessing the increase from DM to DS (which accounts for cumulative impacts). The maximum increase in annual mean PM_{10} was 0.07µg/m³ at R04 and R20. With reference to IAQM significance criteria, as increases at all receptors are deemed to be Negligible, the predicted effects are **Not Significant**.

The NAQO for 24-hour mean PM_{10} concentrations is 50µg/m³ not be exceeded more than 35 times a year. The results illustrate that the maximum annual mean PM_{10} concentration is 16.72µg/m³, predicted at receptor R14. As this predicted concentration is below 32µg/m³, the number of 24-hour mean PM_{10} concentrations that exceed 50µg/m³ are likely within the 35 compliance limit with reference to the IAQM's construction dust guidance. Therefore, the 24-hour mean NAQO will not be exceeded.

6.1.3 Annual Mean $PM_{2.5}$

Table 12 shows the model predicted concentrations of annual mean $PM_{2.5}$ at sensitive receptor locations surrounding the application site.

Table 12 – Modelled annual mean $PM_{2.5}$ Results (µg/m³)

Receptor	Modelled $PM_{2.5}$				
	Model DM	Model DS	Increase (DM to DS)	% Increase relative to AQAL	Significance
R01	8.95	8.97	0.02	0.10	Negligible
R02	8.99	9.02	0.03	0.14	Negligible
R03	9.26	9.29	0.04	0.14	Negligible
R04	9.45	9.49	0.04	0.15	Negligible
R05	9.74	9.78	0.04	0.14	Negligible
R06	9.70	9.73	0.03	0.12	Negligible
R07	9.68	9.71	0.02	0.10	Negligible
R08	9.75	9.77	0.02	0.08	Negligible
R09	10.10	10.12	0.03	0.10	Negligible
R10	9.91	9.93	0.02	0.07	Negligible
R11	10.11	10.13	0.02	0.08	Negligible
R12	10.57	10.59	0.02	0.09	Negligible
R13	10.19	10.21	0.02	0.09	Negligible
R14	10.59	10.62	0.03	0.10	Negligible
R15	10.30	10.32	0.02	0.07	Negligible
R16	9.76	9.78	0.01	0.05	Negligible
R17	9.16	9.17	0.01	0.03	Negligible
R18	9.73	9.76	0.04	0.14	Negligible
R19	9.52	9.55	0.03	0.11	Negligible
R20	10.38	10.42	0.04	0.15	Negligible

The results show that the impact of the Proposed Development on annual mean $PM_{2.5}$ concentrations is Negligible at all receptor locations when assessing the increase from DM to DS (which accounts for cumulative impacts). The maximum increase in annual mean $PM_{2.5}$ was 0.04µg/m³ at several receptors. With reference to IAQM significance criteria, as increases at all receptors are deemed to be Negligible, the predicted effects are **Not Significant**.

6.2 Sensitivity Analysis

A sensitivity analysis of the assessment was also performed whereby UK-AIR background concentrations and emissions factors for NO_2, PM_{10} and $PM_{2.5}$ for 2019 were used. This analysis therefore accounts for the worst-case scenario whereby traffic emissions do not improve in line with those in Defra's EFT and background concentrations do not decrease in line with UK-AIR predictions.

The results of this analysis show that the impact of the Proposed Development, assuming no improvement in vehicle emissions or background concentrations, was **Negligible** at all receptor locations for NO_2, PM_{10} and $PM_{2.5}$. Therefore, the predicted effects of the Proposed Development on annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ at receptors is still considered **Not Significant**. The full results of the sensitivity analysis are at Appendix E.

6.3 Exposure Assessment

Receptors were also modelled at the boundary of the Proposed Development to assess the risk of exposure of future residents of the Proposed Development to poor air quality. This was done for the DS scenario, where the highest concentrations of pollutants were predicted, accounting for cumulative impacts. The results of this assessment are shown in Table 13 below:

Table 13 - Exposure Assessment Results

Receptor	Model DS (µg/m³)			Sensitivity Analysis Model DS (µg/m³)		
	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
S01	9.76	14.59	9.44	14.49	15.76	10.38
S02	10.32	14.79	9.56	15.67	15.97	10.51
S03	9.95	14.04	9.16	13.91	15.20	10.10
S04	9.66	14.53	9.41	14.17	15.69	10.35
S05	9.28	13.77	9.01	12.43	14.91	9.93
S06	9.84	13.99	9.13	13.65	15.15	10.07

Concentrations of NO_2, PM_{10} and $PM_{2.5}$ at receptors S1 to S6 were all modelled to be well below the relevant NAQOs. Also, the results of the sensitivity study, using 2019 emissions factors and background concentrations from 2019 found concentrations were also below the NAQOs for all pollutants.

As these receptors have been modelled in the worst-case locations, adjacent to the roads and / or at the Proposed Development boundary, they represent the highest concentrations of air pollutants that will be experienced on site when considering local roads as the dominant source of air pollutants in the area. Therefore, exposure to poor air quality should not be a constraint to the Proposed Development.

6.3.1 Dust emissions from nearby Industrial Estate

6.3.1.1 Sources

A review of the Sidalls Bicester Ltd site shows that the potential dust generating activities would likely include materials handling, three small open stockpiles of potentially dust material located in the south west of the site and also on-site transportation of potentially dusty materials. Based on this, the potential source emission from on-site transportation is likely to be 'Small' due to the likely number of on-site HGV movements being <100 per day and the distance travelled on site likely to be less than 500m and on a paved surface.

With regard to the stockpiles on site, a review of satellite imagery shows some of these may be a potential source of dust. Whilst these appear to be long term stockpiles and open to the air, the small size of the stockpiles means the potential emission of dust from this source is considered 'Small'.

With regards to the Wickes storage yard, a review of this site shows that building aggregates are stored on site. Whilst these are not stored in open stockpiles, these along with materials handling activities and on-site transportation are thought to likely be a 'Small' potential source for nuisance dust.

Therefore, the overall worst-case potential emission of dust from either site is considered to be 'Small'.

6.3.1.2 Pathway

For this assessment, potentially dusty winds are considered as winds that come from 280 – 45°, have a wind speed of greater than 5m/s and occurred during dry weather. Meteorological data over a five-year period, from 2016 to 2020, was sourced from Brize Norton meteorological station, which is considered representative of the conditions in the area. An analysis of the meteorological data was performed to identify the occurrence of winds over this five-year period that were from the direction of the dust sources (winds from a direction of 280 – 45°), had a wind speed of >5m/s and did not experience precipitation. This revealed that the frequency of potentially dusty winds was 4.6%. With reference to the IAQM guidance, this is in the frequency of winds of <5%, and is therefore defined as 'Infrequent'.

The distance between source and proposed receptor has been classified as close for the Wickes storage yard site and Intermediate for the Sidalls Bicester Ltd site, as the sites are <100m and 100-200m from the closest proposed residential receptors, respectively. Combining these factors gives a pathway effectiveness of 'Ineffective'.

6.3.1.3 Receptor

As the Proposed Development is for residential use, the application site is considered a 'High sensitivity' receptor to the effects of disamenity and soiling from dust.

6.3.1.4 Conclusion

The risk of impacts from disamenity dust and associated effect from the nearby industrial estate is considered to be '**Negligible**', which is not significant, based on the assessment provided above.

7. DAMAGE COSTS ASSESSMENT

As requested by the Cherwell District Council EHO, a damage cost appraisal and emissions mitigation assessment has been produced. This has been performed in line with the standard approach as outlined in the IAQM guidance on Planning for Air Quality[10].

Increases in pollutant emissions (NO_X and $PM_{2.5}$) caused by the Proposed Development over a 5-year appraisal period have been estimated using development traffic data and Defra's Emissions Factor Toolkit (EFT) (v.10.1)[19].

The latest version of Defra's Air Quality Appraisal: Damage Costs Toolkit[20] (last updated March 2021) has been used to apply the 'damage costs', which are a set of impact values, defined per tonne of emission by pollutant, to these development emissions. The result is an indicative value to be spent on mitigation measures to reduce incremental worsening in local ambient air quality from new development.

The base damage costs for 'Road Transport Urban Medium' are provided below in £/tonne:

- NO_x: £ 7,614
- $PM_{2.5}$: £ 66,797

The damage cost calculation applies inflationary uplift factors of 2% cumulatively per annum to the central damage cost from Defra's damage cost valuations (2017) and assumes a discount rate of 3.5%.

The calculation used in this assessment is summarised in the below general formula:

$$EFT\ output\ \times\ Damage\ costs\ \times\ 5\ years\ =\ 5\ year\ health\ exposure\ cost\ value\ (in\ £)$$

It is noted that emissions were calculated by assuming a reduction in emissions, in line with the EFT, for each year in the appraisal. This was accounted for as an input into Defra's EFT. Table 14, below, shows the inputs used for the damage cost calculation:

Table 14 - Damage Cost Inputs

Input	Value	Unit	Source / Explanation
Trip Length	10	km	Standard distance for Damage Costs assessment. National Travel Survey UK Average.
Traffic Flow	986 (0% HDV)	AADT	Scheme generated traffic, provided by Markides Associates.
EFT Road Type	Urban (Not London)	-	-
Appraisal Years	2026 - 2030 (5 years)	-	Reductions in line with EFT as forecast by Defra.
Average Speed	50	kph	As is AQ technical guidance and EPUK / IAQM guidance.

[19] Defra, "Emissions Factors Toolkit (EFT) V10.1," August 20, 2020, https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html.
[20] DEFRA, "Air Quality Damage Cost Appraisal Toolkit," March 2021, https://www.gov.uk/government/publications/assess-the-impact-of-air-quality.

Using the above inputs, the emissions caused by the development traffic are calculated for the years 2026 to 2030, which are the five years following the opening of the development. These emissions per annum are shown below in Table 15.

Table 15 – Increase in Emissions (tonnes)

	Development Emissions (tonnes/year)				
Pollutant	2026	2027	2028	2029	2030
NO_x	0.546799228	0.489781356	0.439084024	0.395670105	0.359050352
PM_{10}	0.062476915	0.062238156	0.062047754	0.06188813	0.06174535

These emissions are then converted to a monetary value using the Air Quality Appraisal Damage Costs Toolkit[20]. For this, the price base year of 2021 (i.e., the year of appraisal) was used. The pollutant sector used was 'Road Transport Urban Medium'. The results of this are shown below in Table 16.

Table 16 – Calculated Damage Cost Outputs

Pollutant	Low Sensitivity Present Value	Central Present Value	High Sensitivity Present Value
NOx	£1,980	£21,356	£81,397
$PM_{2.5}$	£5,648	£25,995	£80,234
TOTAL	£7,628	**£47,351**	£161,632

Based on the outputs in Table 16, the total emissions 'damage costs' (sum of NO_x and $PM_{2.5}$) = **£47,351**, which is the indicative value of a package of air quality mitigation measures required to offset the real-world impact of emissions from the Proposed Development. Potential mitigation measures that could be employed to address these damage costs are discussed in section 8.

8. MITIGATION MEASURES

8.1 Construction Phase

The qualitative construction dust risk assessment shows that the application site is **Medium Risk** for adverse impacts during construction, as a worst-case, in the absence of mitigation.

To effectively reduce the risk of impacts to negligible, appropriate mitigation measures should be adopted. The IAQM's highly recommended mitigation measures for Medium risk sites are provided at Appendix F of this report. Implementing these measures should effectively reduce the risks of construction phase impacts on the local area to negligible.

8.2 Operational Phase

An assessment of the air quality impact of the operational phase of the Proposed Development has been undertaken using CERC's ADMS-Urban dispersion model. This also included an assessment of exposure of the future users of the Proposed Development to poor air quality.

The results of the exposure assessment indicate that future users of the Proposed Development will not experience exceedances of the NAQOs for NO_2, PM_{10} or $PM_{2.5}$. The predicted concentrations of these pollutants at the application site were all well below the relevant NAQOs. Therefore, there is no requirement for mitigation of the exposure of receptors at the application site, in terms of air quality.

All impacts of the Proposed Development at sensitive receptor locations have been shown to be Negligible for NO_2, PM_{10} and $PM_{2.5}$. However, the total emissions 'damage costs' (sum of NO_x and $PM_{2.5}$) is **£47,351**, which is the indicative value of a package of air quality mitigation measures to offset the real-world impact of emissions from the Proposed Development. Such mitigation measures could include, but are not limited to:

- Reducing demand for private car use through Travel Plans;
- Provision of Electric Vehicle Charging Infrastructure;
- Car Club / Car Sharing scheme to reduce reliance on single occupancy vehicles;
- Designate parking spaces for low emission vehicles;
- Provide electric bikes / scooters;
- Provide secure cycle storage;
- Encouraging / facilitating modal shift toward more sustainable travel options through scheme design such as;
  - » Ease of access to reliable public transport;
  - » Designated cycling routes, particularly avoiding congested/busy roads; and
  - » Pedestrianised areas and designated footpaths.

The Transport Consultant for the scheme, Markides Associates, are preparing a Travel Plan. Measures included in this Travel Plan are:

- Provision of a Sustainable Travel Information Pack to residents;
- Personalised Travel Planning session offered to each household;
- Each unit will be provided with dedicated cycle parking provision;
- Travel Plan Coordinator to formulate a Bicycle User Group scheme for residents; and,

- Car sharing to be promoted.

Implementing these measures will also be beneficial in terms of air quality, as they will reduce the number of polluting vehicle trips caused by the development. The cost of travel plan measures will count toward reducing the damage costs.

Finally, if any gas fired boilers are proposed for the heating / hot water strategy, it is recommended these have a NO_x emission rate of less than 5 mg/s. This is equivalent to meeting the ultra-low NO_x emission rating of <40mg/kWh, in accordance with EPUK/IAQM guidance.

9. DISCUSSION AND CONCLUSION

Hydrock have been commissioned to prepare an AQA for the OPA at Gavray Drive Bicester for the Proposed Development of:

"Residential development for up to 250 dwellings including affordable housing and ancillary uses including retained Local Wildlife Site, public open space, play areas, localised land remodelling, compensatory flood storage, structural planting and access."

UK-AIR background concentrations and local air quality monitoring have been used to establish baseline air quality for the study area. This review revealed no exceedances of the NO_2 annual mean NAQO in the local area in recent years. The UK-AIR modelled concentrations of NO_2, PM_{10} and $PM_{2.5}$ in 2021 were below the annual mean NAQOs at the Proposed Development.

A qualitative construction dust risk assessment has been undertaken in line with IAQM guidance. It has been shown that the construction phases of the Proposed Development could give rise to emissions that are **Medium Risk** for dust soiling effects on adjacent use, a **Low Risk** for human health impacts and a **Low Risk** for ecological impacts. However, by adopting appropriate mitigation measures to reduce emissions and their potential impact, such as those recommended in this report, there should be no significant residual effects.

In line with EPUK and IAQM guidance, detailed dispersion modelling using ADMS-Urban, has been performed to assess the significance of potential impacts of the Proposed Development on local air quality. This has used future years traffic data as provided Markides Associates and regionally representative meteorological data from Brize Norton meteorological station.

The modelling assessment has shown that the impact of the Proposed Development on air quality at high sensitivity receptors in the area is **Negligible** for NO_2, PM_{10} and $PM_{2.5}$. No exceedances of the relevant NAQOs were identified. Additionally, future receptors at the Proposed Development will not be introduced to an area of poor air quality, as no exceedances of the NAQOs were identified at the Proposed Development. In addition, risk of disamenity dust impacts from the nearby industrial estate is considered to be **Negligible**. Therefore, no mitigation is required with regards to the air quality impact of the Proposed Development or when considering exposure of future users.

However, as requested by the CDC EHO, a damage cost appraisal and emissions mitigation assessment has been undertaken and a damage cost of **£47,351** has been calculated from the traffic footprint of the Proposed Development. This value represents the indicative value of mitigation measures required to offset the real-world impact of emissions from the Proposed Development. One such measure is a travel plan, such as the one being prepared by Markides Associates. Implementing the sustainable transport measures in the Travel Plan will be beneficial in terms of air quality, as will act to reduce the number of polluting vehicle trips caused by the development.

Finally, if any gas fired boilers are proposed for the heating / hot water strategy, it is recommended these have a NO_x emission rate of less than 5 mg/s. This is equivalent to meeting the ultra-low NO_x emission rating of <40mg/kWh, in accordance with EPUK/IAQM guidance.

From the evidence presented, and by following the guidance provided herein, the Proposed Development will comply with all relevant air quality policy. As such, air quality should not pose any significant obstacles to the outline planning process.

Appendix A – Modelled Receptors

The receptors modelled in this assessment are shown below:

Table 17 - Modelled Receptors

Receptor number	Receptor Location	x	y	Modelled Height
R01	Redwing Close	459401.28	222317.12	1.5
R02	Heron Court	459671.38	222141.12	1.5
R03	Shearwater Drive	459883.03	221941.59	1.5
R04	Shearwater Drive	459955.34	221876.12	1.5
R05	Shearwater Drive	459975.12	221843.22	1.5
R06	Shearwater Drive	459966.69	221830.34	1.5
R07	Shearwater Drive	459928.69	221777.02	1.5
R08	Ravencroft	459557.12	221430.61	1.5
R09	Ravencroft	459445.5	221358.59	1.5
R10	Kestrel Way	459357.97	221309.84	1.5
R11	Kestrel Way	459260.78	221271.77	1.5
R12	Kestrel Way	459189.47	221260.05	1.5
R13	Kestrel Way	459147.59	221333.27	1.5
R14	Kestrel Way	459163.78	221282.78	1.5
R15	Robins Way	459021.38	221398.14	1.5
R16	London Road	458857.97	221488.52	1.5
R17	Flanders Close	458796.62	221579.05	1.5
R18	London Road	458755.62	221799.94	1.5
R19	London Road	458744.25	221879.88	1.5
R20	London Road	458736.22	222079.22	1.5
S01	Proposed Development	459991.16	221961.66	1.5
S02	Proposed Development	459962.81	221921.75	1.5
S03	Proposed Development	459799.72	222063.28	1.5
S04	Proposed Development	459907.44	221970.17	1.5
S05	Proposed Development	459413.31	222360.72	1.5
S06	Proposed Development	459714.22	222150.06	1.5

Appendix B - Traffic Data

Full traffic flows as provided by Markides Associates are shown below.

Table 18 - Traffic Data

Location	24 Hour AADT				
	Speed (mph)	%HGV	2019	DM	DS
Gavray Drive west of A4421	30	5.60%	1808	1619	2605
A4421 North of Gavray Drive	50	9.80%	12513	20899	21555
A4421 South of Gavray Drive	50	11.60%	11358	10016	10346
A4421 North of Peregrine Way (N)	50	8.60%	11358	10162	10478
A4421 South of Peregrine Way (N)	50	8.60%	11358	9093	9393
A4421 North of Peregrine Way (S)	50	8.60%	11358	9092	9378
A4421 South of Peregrine Way (S)	50	8.60%	11358	11696	11965
London Road (N)	40	5.70%	10758	7213	7450
A4421 E	40	8.60%	14967	11950	12187
A41 South	40	6.80%	21631	18360	18828
A41 North	40	8.60%	23699	30985	30985

Appendix C – Background Concentrations

The background concentrations used in the modelling assessment, from UK-AIR backgrounds, are shown below.

Table 19 - Background Concentrations

Receptor	Year	X	Y	NO_2 Concentration (ug/m^3)	PM_{10} Concentration (ug/m^3)	$PM_{2.5}$ Concentration (ug/m^3)
R01	2026	459500	222500	8.62	13.50	8.86
R02	2026	459500	222500	8.62	13.50	8.86
R03	2026	459500	221500	7.98	13.84	9.03
R04	2026	459500	221500	7.98	13.84	9.03
R05	2026	459500	221500	7.98	13.84	9.03
R06	2026	459500	221500	7.98	13.84	9.03
R07	2026	459500	221500	7.98	13.84	9.03
R08	2026	459500	221500	7.98	13.84	9.03
R09	2026	459500	221500	7.98	13.84	9.03
R10	2026	459500	221500	7.98	13.84	9.03
R11	2026	459500	221500	7.98	13.84	9.03
R12	2026	459500	221500	7.98	13.84	9.03
R13	2026	459500	221500	7.98	13.84	9.03
R14	2026	459500	221500	7.98	13.84	9.03
R15	2026	459500	221500	7.98	13.84	9.03
R16	2026	458500	221500	8.19	13.92	8.75
R17	2026	458500	221500	8.19	13.92	8.75
R18	2026	458500	221500	8.19	13.92	8.75
R19	2026	458500	221500	8.19	13.92	8.75
R20	2026	458500	222500	8.64	14.11	9.36
S01	2026	459500	221500	7.98	13.84	9.03
S02	2026	459500	221500	7.98	13.84	9.03
S03	2026	459500	222500	8.62	13.50	8.86
S04	2026	459500	221500	7.98	13.84	9.03
S05	2026	459500	222500	8.62	13.50	8.86
S06	2026	459500	222500	8.62	13.50	8.86
R01	2019	459500	222500	10.98	14.63	9.77
R02	2019	459500	222500	10.98	14.63	9.77
R03	2019	459500	221500	10.44	14.96	9.92
R04	2019	459500	221500	10.44	14.96	9.92
R05	2019	459500	221500	10.44	14.96	9.92
R06	2019	459500	221500	10.44	14.96	9.92
R07	2019	459500	221500	10.44	14.96	9.92
R08	2019	459500	221500	10.44	14.96	9.92
R09	2019	459500	221500	10.44	14.96	9.92
R10	2019	459500	221500	10.44	14.96	9.92
R11	2019	459500	221500	10.44	14.96	9.92
R12	2019	459500	221500	10.44	14.96	9.92
R13	2019	459500	221500	10.44	14.96	9.92
R14	2019	459500	221500	10.44	14.96	9.92
R15	2019	459500	221500	10.44	14.96	9.92
R16	2019	458500	221500	10.82	15.02	9.64
R17	2019	458500	221500	10.82	15.02	9.64
R18	2019	458500	221500	10.82	15.02	9.64
R19	2019	458500	221500	10.82	15.02	9.64
R20	2019	458500	222500	11.05	15.25	10.27
S01	2019	459500	221500	10.44	14.96	9.92
S02	2019	459500	221500	10.44	14.96	9.92
S03	2019	459500	222500	10.98	14.63	9.77
S04	2019	459500	221500	10.44	14.96	9.92
S05	2019	459500	222500	10.98	14.63	9.77
S06	2019	459500	222500	10.98	14.63	9.77

Appendix D – Model Verification

An important stage in the modelling process is model verification of the road traffic model, which involves comparing the model output with measured concentrations in order to increase confidence in modelled predictions. According to LAQM.TG (16), the difference between modelled results and monitored concentrations is acceptable where it is within 25% (10% is preferable).

It is most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides ($NOx = NO + NO_2$). The model output of road- NO_x (i.e., the component of total NO_x coming from road traffic) has been compared with the 'measured' road-NO_x. Measured road-NO_x has been calculated from the measured NO_2 concentrations using the NOx from NO_2 calculator (Version 8.1) available on the Defra LAQM Support website[21].

The model has been verified against the council monitoring diffusion tubes London Road 2016 and Aylesbury Rd 2014, hereafter abbreviated to LON and AYL respectively.

The background NO_2 concentration used in the model was the 2019 annual mean from the UK-AIR for the relevant grid squares the tubes were located in.

The pre-adjusted modelled and monitored verification results are given in Table 20:

Table 20 - 2019 Pre-adjusted Modelled and monitored diffusion results

Diffusion Tube	Modelled NOx µg/m³	Monitored NOx µg/m³	%Difference NOx	Modelled NO_2 µg/m³	Monitored NO_2 µg/m³	%Difference NO_2
LON	14.0	22.7	-38.5%	19.1	23.6	-18.9%
AYL	19.1	29.9	-36.1%	21.3	26.7	-20.1%

As shown, modelled concentrations of NO_x and NO_2 were underpredicted by the model at all locations, and whilst results were within the ideal 25% threshold in difference between monitored and modelled results at LON and AYL for NO_2 model adjustment is still appropriate. As such, an adjustment factor of **1.587** has been determined as the equation of the slope of the best-fit line between the 'measured' road contribution and the model derived road contribution of NO_x, as shown below in Figure 8:

[21] Defra, "NOx to NO2 Calculator" (Defra, 2019), https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOXNO2calc.

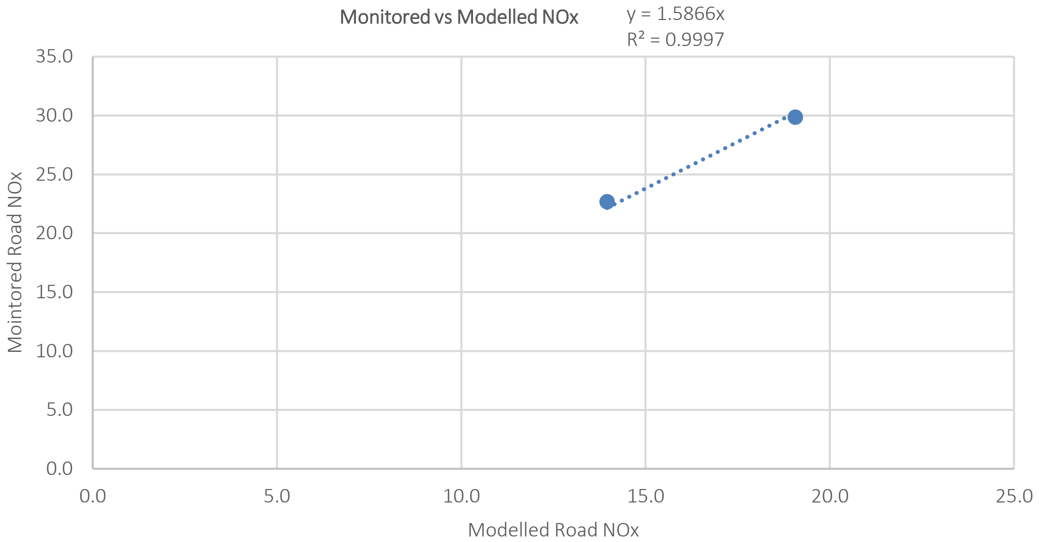

Figure 8 - Monitored vs Modelled NO_x

Table 21 shows total monitored versus modelled NO_2 following the adjustment of the road contribution of NO_x by this factor. The total nitrogen dioxide concentration was determined by adding the background NO_2 concentration to the modelled road contribution.

Table 21 - Post-adjusted 2019 Modelled and monitored results

Diffusion Tube	Adjusted Modelled NO_2 µg/m³	Monitored NO_2 µg/m³	%Difference NO_2
LON	23.3	23.6	-1.1%
AYL	26.9	26.7	0.7%

Following adjustment of NO_x by a factor of **1.587**, all modelled concentrations of NO_2 were within 10% of monitored concentrations. In addition, the overall post-adjusted uncertainty (RMSE) for annual mean NO_2 was 0.6%, which is within the ideal 10% range of the NAQO according to LAQM.TG (16). As such, the factor was considered to be acceptable.

As there is no suitable PM_{10} or $PM_{2.5}$ monitoring data in the study area, it was not possible to perform model verification for these pollutants. As such, the NO_2 adjustment factor has also been applied to PM_{10} and $PM_{2.5}$ model results, in accordance with LAQM.TG (16).

Appendix E – Results of Sensitivity analysis

The result of the sensitivity analysis performed of the ADSM-Urban modelling study are shown below. This used 2019 emission factors and 2019 UK-AIR background concentrations.

Table 22 - Results of the Sensitivity analysis for NO_2

Receptor	Modelled NO_2				
	Model DM	Model DS	Increase (DM to DS)	% Increase relative to AQAL	Significance
R01	11.83	12.07	0.24	0.60	Negligible
R02	12.21	12.55	0.34	0.85	Negligible
R03	12.61	12.96	0.35	0.88	Negligible
R04	14.71	15.09	0.38	0.95	Negligible
R05	17.75	18.11	0.36	0.90	Negligible
R06	17.20	17.50	0.30	0.75	Negligible
R07	16.43	16.65	0.22	0.55	Negligible
R08	17.13	17.31	0.18	0.45	Negligible
R09	21.34	21.60	0.26	0.65	Negligible
R10	19.02	19.19	0.17	0.43	Negligible
R11	20.69	20.86	0.17	0.42	Negligible
R12	25.42	25.62	0.20	0.50	Negligible
R13	21.36	21.55	0.19	0.48	Negligible
R14	25.53	25.76	0.23	0.58	Negligible
R15	21.66	21.81	0.15	0.37	Negligible
R16	19.86	19.98	0.12	0.30	Negligible
R17	14.59	14.67	0.08	0.20	Negligible
R18	19.90	20.22	0.32	0.80	Negligible
R19	17.78	18.03	0.25	0.63	Negligible
R20	20.07	20.39	0.32	0.80	Negligible

Table 23 - Results of the Sensitivity analysis for PM_{10}

Receptor	Modelled PM_{10}				
	Model DM	Model DS	Increase (DM to DS)	% Increase relative to AQAL	Significance
R01	14.80	14.84	0.05	0.12	Negligible
R02	14.87	14.94	0.07	0.16	Negligible
R03	15.39	15.46	0.07	0.17	Negligible
R04	15.77	15.84	0.07	0.18	Negligible
R05	16.34	16.41	0.07	0.17	Negligible
R06	16.26	16.32	0.06	0.15	Negligible
R07	16.22	16.27	0.05	0.12	Negligible
R08	16.36	16.40	0.04	0.10	Negligible
R09	17.02	17.07	0.05	0.12	Negligible
R10	16.66	16.69	0.03	0.09	Negligible
R11	17.05	17.09	0.04	0.09	Negligible
R12	17.93	17.97	0.04	0.11	Negligible
R13	17.20	17.24	0.04	0.11	Negligible
R14	17.98	18.03	0.05	0.12	Negligible
R15	17.40	17.44	0.03	0.09	Negligible
R16	16.98	17.01	0.03	0.07	Negligible
R17	15.82	15.84	0.02	0.04	Negligible
R18	16.90	16.97	0.07	0.17	Negligible
R19	16.51	16.57	0.05	0.14	Negligible
R20	17.22	17.29	0.07	0.18	Negligible

Table 24 - Results of the Sensitivity analysis for $PM_{2.5}$

Receptor	Modelled $PM_{2.5}$				
	Model DM	Model DS	Increase (DM to DS)	% Increase relative to AQAL	Significance
R01	9.86	9.89	0.03	0.11	Negligible
R02	9.91	9.95	0.04	0.15	Negligible
R03	10.17	10.21	0.04	0.16	Negligible
R04	10.39	10.44	0.04	0.16	Negligible
R05	10.72	10.77	0.04	0.16	Negligible
R06	10.68	10.71	0.03	0.14	Negligible
R07	10.65	10.68	0.03	0.11	Negligible
R08	10.73	10.75	0.02	0.09	Negligible
R09	11.12	11.15	0.03	0.12	Negligible
R10	10.91	10.93	0.02	0.08	Negligible
R11	11.13	11.15	0.02	0.08	Negligible
R12	11.64	11.67	0.03	0.10	Negligible
R13	11.22	11.24	0.02	0.10	Negligible
R14	11.67	11.70	0.03	0.11	Negligible
R15	11.33	11.35	0.02	0.08	Negligible
R16	10.76	10.78	0.02	0.06	Negligible
R17	10.10	10.11	0.01	0.04	Negligible
R18	10.72	10.76	0.04	0.16	Negligible
R19	10.49	10.52	0.03	0.13	Negligible
R20	11.39	11.43	0.04	0.17	Negligible

Appendix G - Construction Dust Mitigation for Medium Risk sites

In order to mitigate the worst-case dust impacts the following general mitigation measures are highly recommended by the IAQM for Medium Risk construction sites. Highly recommended mitigation measures applicable specifically to Earthworks, Construction and Trackout are provided based on the respective risk of adverse impact.

Communications:

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information
- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections.

Site Management:

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.

Monitoring:

- Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.

Preparing and maintaining the site:

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period

- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicle/machinery and sustainable travel:

- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.

Operations:

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

Waste Management:

- Avoid bonfires and burning of waste materials.

Measures specific to Construction:

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.