LAND EAST OF WARWICK ROAD, BANBURY

Proposed Residential Development

Air Quality Assessment

Prepared for: Vistry Homes Ltd

SLR Ref: 410.V06713.00005
Version No: v1.0
August 2022

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1.0 INTRODUCTION

SLR Consulting Ltd (SLR) has been commissioned by Vistry Homes Ltd to undertake an air quality assessment in support of a planning application for a proposed residential development comprising up to 200 dwellings (the 'Proposed Development') on Land off Warwick Road, Banbury (the 'Site').

The Site is located at the approximate National Grid Reference (NGR): x443350, y243100 and is bounded by:

- agricultural fields in a western, northern and eastern direction; and
- existing residential dwellings approximately 50m to the south.

Primary vehicular access to the Site will be via Warwick Road to the west.

1.1 Scope of Assessment

Pre-assessment discussion[1] was undertaken with the Environmental Health Officer (EHO) at Cherwell District Council (CDC – the Council) in order to agree the extent and methodology of the air quality assessment. Furthermore, pre-application advice was provided by CDC. In relation to air quality, the following was stated within the pre-application report:

> *"There are two Air Quality Management Areas in Banbury. An air quality assessment to include a damage cost calculation will be required. The provision of EV charging points / infrastructure will also need to be considered.*
>
> *For the construction phase the CEMP will also need to consider dust mitigation."*

The following scope of works have been undertaken as part of this air quality assessment as agreed with CDC:

- Baseline Evaluation – Assessment of existing air quality in the local area;
- Construction Phase Assessment – Identification and assessment of potential air quality effects associated with the construction phase of the Proposed Development;
- Operational Phase Assessment – Identification of air quality effects and design constraints associated with the operational phase of the Proposed Development;
- Damage Cost Calculation – Determination of the financial estimate of the air quality impacts on human health; and
- Mitigation Measures – as required.

[1] Email from SLR Consulting Ltd (17th January 2022) to CDC, response received from Jim Guest (1st February 2022).

2.0 RELEVANT AIR QUALITY LEGISLATION AND GUIDANCE

2.1 Legislative Context

2.1.1 Air Quality Standards

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

In the interim period the UK has formally left the EU, however despite this, EU rules and regulations referred above have subsequently been written into UK law and are still relevant.

2.1.2 Air Quality Strategy

Irrespective of the above, the UK Government and the devolved administrations are required under the Environment Act 1995 to produce a national air quality strategy to improve air quality. The latest Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland was published in 2007[5]. The AQS provides the over-arching strategic framework for air quality management in the UK and contains national air quality standards and objectives established by the UK Government and Devolved Administrations for the protection of public health and the environment. There is no legal requirement to meet these objectives except where they mirror an equivalent legally binding Limit Value as prescribed within EU legislation, however compliance is regulated by local planning authorities.

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

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

Table 2-1
Relevant Ambient AQALs

Pollutant	AQAL (µg/m^3)	Averaging Period
Nitrogen Dioxide (NO_2)	40	Annual mean
	200	1-hour mean (not to be exceeded on more than 18 occasions per annum)
Particles (PM_{10})	18	Annual mean
	50	24-hour mean (not to be exceeded on more than 35 occasions per annum)
Particles ($PM_{2.5}$)	25	Annual mean

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

Table 2-2
Human Health Relevant Exposure

AQAL Averaging Period	AQALs should apply at	AQALs should not apply at
Annual mean	Building facades of residential properties, schools, hospitals etc.	Facades of offices Hotels Gardens of residences Kerbside sites
24-hour mean	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure is expected to be short term
1-hour mean	As above together with kerbside sites of regular access, car parks, bus stations etc.	Kerbside sites where public would not be expected to have regular access

2.1.3 Local Air Quality Management

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

Where any of the prescribed AQS objectives are not likely to be achieved, the authority must designate an Air Quality Management Area (AQMA). For each AQMA, the local authority is required to prepare an Air Quality Action Plan (AQAP), which details measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the objective.

2.2 Clean Air Strategy

The Clean Air Strategy (CAS)[6], published in 2019, sets out the Government's proposals aimed at delivering cleaner air in England, and indicates how devolved administrations intend to make emissions reductions. It sets out the comprehensive action that is required from across all parts of government and society to deliver clean air.

2.3 General Nuisance Legislation

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

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

2.4 Planning Policy

The following policies have been considered within this assessment.

2.4.1 National Policy

The 2021 update to the National Planning Policy Framework[7] (NPPF) sets out planning policy for England. The NPPF states that the planning system should contribute to and enhance the natural and local environment, by preventing

[6] The Clean Air Strategy, DEFRA. January 2019.
[7] National Planning Policy Framework (2021). Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2

new development from contributing to or being adversely affected by unacceptable concentrations of air pollution and development should, wherever possible, help to improve local environmental conditions such as air quality.

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

Chapter 15 - Conserving and Enhancing the Natural Environment

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

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

> *"DEFRA carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values […] It is important that the potential impact of new development on air quality is taken into account […] where the national assessment indicates that relevant limits have been exceeded or are near the limit."*
>
> *"Whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife)."*

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

2.4.2 Local Policy

The Cherwell Local Plan 2011 – 2031[8] is the currently adopted strategic planning document within CDC and contains the planning policy used to guide development in the area until 2031, and was adopted in July 2015. Within the Cherwell Local Plan 2011 – 2031, the following policies relate to air quality:

> ***"Policy ESD 10: Protection and Enhancement of Biodiversity and the Natural Environment***
>
> *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 and increase in air pollution*
>
> *[…]"*

[8] Cherwell District Council, The Cherwell Local Plan 2011 – 2031, 20th July 2015

"Policy ESD 15: The Character of the Built and Historic Environment

Successful design is founded upon an understanding and respect for an area's unique built, natural and cultural context. New development will be expected to complement and enhance the character of its context through sensitive siting, layout and high quality design. All new development will be required to meet high design standards. Where development is in the vicinity of any of the District's distinctive natural or historic assets, delivering high quality design that complements the asset will be essential.

New development proposals should:

[…]

Integrate and enhance green infrastructure and incorporate biodiversity enhancement features where possible (see Policy ESD 10: Protection and Enhancement of Biodiversity and the Natural Environment and Policy ESD 17 Green Infrastructure). Well designed landscape schemes should be an integral part of development proposals to support improvements to biodiversity, the micro climate, and air pollution and provide attractive places that improve people's health and sense of vitality

[…]"

2.5 Assessment Guidance

The air quality assessment has been carried out in accordance with the following guidance documents:

- DEFRA: Local Air Quality Management Technical Guidance (LAQM.TG(16));
- DEFRA: COVID-19: Supplementary Guidance. Local Air Quality Management Reporting in 2021[9];
- Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM): Land-Use Planning and Development Control: Planning for Air Quality[10] (hereafter referred to as the 'EPUK/IAQM guidance');
- IAQM: Guidance on the Assessment Dust from Demolition and Construction[11]; and
- IAQM: Implications of the COVID-19 pandemic on air quality monitoring and assessments[12].

[9] DEFRA and the Greater London Authority, COVID-19: Supplementary Guidance. Local Air Quality Management Reporting in 2021. April 2021.
[10] EPUK and IAQM, Land-Use Planning and Development Control: Planning for Air Quality, v1.2 2017.
[11] IAQM, Guidance on the Assessment Dust from Demolition and Construction, v1.1 2016.
[12] IAQM, Implications of the COVID-19 pandemic on air quality monitoring and assessments. 6th April 2021.

3.0 ASSESSMENT METHODOLOGY

3.1 Construction Phase

A construction dust assessment has been undertaken with reference to IAQM guidance. The assessment of risk is determined by considering the risk of dust effects arising from four activities in the absence of mitigation:

- demolition;
- earthworks;
- construction; and
- track-out.

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

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

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

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

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

Given the short-term nature of the construction phase and the comparatively low volume of vehicle movements that will likely arise (when compared to the operational phase, for which a full assessment has been undertaken), it is unlikely that significant air quality effects from development related road traffic emissions during the construction phase will arise. Such potential effects have therefore been scoped out from requiring detailed assessment based on their assumed insignificant effect following the EPUK & IAQM guidance.

3.2 Operational Phase

In order to appropriately assess road traffic impacts associated with the operation of the Proposed Development, detailed dispersion modelling has been undertaken using the Cambridge Environmental Research Consultants (CERC) ADMS-Roads v5.0.0.1 dispersion model, focussing on concentrations of NO_2, PM_{10} and $PM_{2.5}$ for the following scenarios:

- 2019 Base Case (2019 BC) – Without development base flows for the year (2019);

- 2027 Do Minimum (2027 DM) – Without development flows for the proposed year of opening (2027), inclusive of any relevant committed development flows; and
- 2027 Do Something (2027 DS) – 'Do Minimum' flows, plus all trips associated with the Proposed Development flows for the proposed year of opening (2027).

For the above future year scenarios (2027), concurrent emission factors and background pollutant concentrations have been used.

Details of model inputs are discussed in turn, below. Advanced inputs are discussed in Appendix A.

3.2.1 Traffic Inputs

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

Traffic data was provided by Jubb – the appointed transport consultant. This data has principally informed the spatial extent and inclusion of road links within the assessment. The provided traffic data was supplemented by the Department for Transport (DfT) Road Traffic Statistics[13], and adjusted accordingly by Jubb.

Traffic speeds were modelled at the relevant posted speed limit for each road. However, where appropriate, the speeds have been reduced to simulate queues at junctions, traffic lights and other locations where queues or slower traffic are known to be an issue in accordance with LAQM.TG(16). Traffic speeds have been assumed to be consistent across all the modelled scenarios.

The Emissions Factors Toolkit (EFT) version 11.0 developed by DEFRA[14] has been used to determine vehicle emission factors for input into the ADMS-Roads dispersion model.

Details of the traffic flows used in this assessment are provided in Appendix A, whilst the modelled roads in relation to the Site are presented in Figure 3-2.

The Transport Assessment (TA) predicted a total 24-hour annual average daily traffic (AADT) of 869, based upon 200 dwellings, distributed onto the local road network. The TA further provides trip distribution on the wider highway network. To inform the spatial extent of the model, net changes in traffic volumes on the local road network were compared to screening thresholds provided within EPUK/IAQM guidance. Where identified, interconnecting/adjacent road links were included within the modelling exercise to ensure cumulative modelled predictions, rather than rely on background concentrations.

3.2.2 Meteorological Data

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

The dispersion modelling has been undertaken using 2019 data from the Church Lawford meteorological station, located approximately 31km to the north of the Site – the closest representative meteorological station relative to the Site.

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

A windrose is presented in Figure 3-1.

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[13] https://roadtraffic.dft.gov.uk/manualcountpoints/77703, accessed August 2021
[14] DEFRA, EFT v11.0 (2021). https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html.

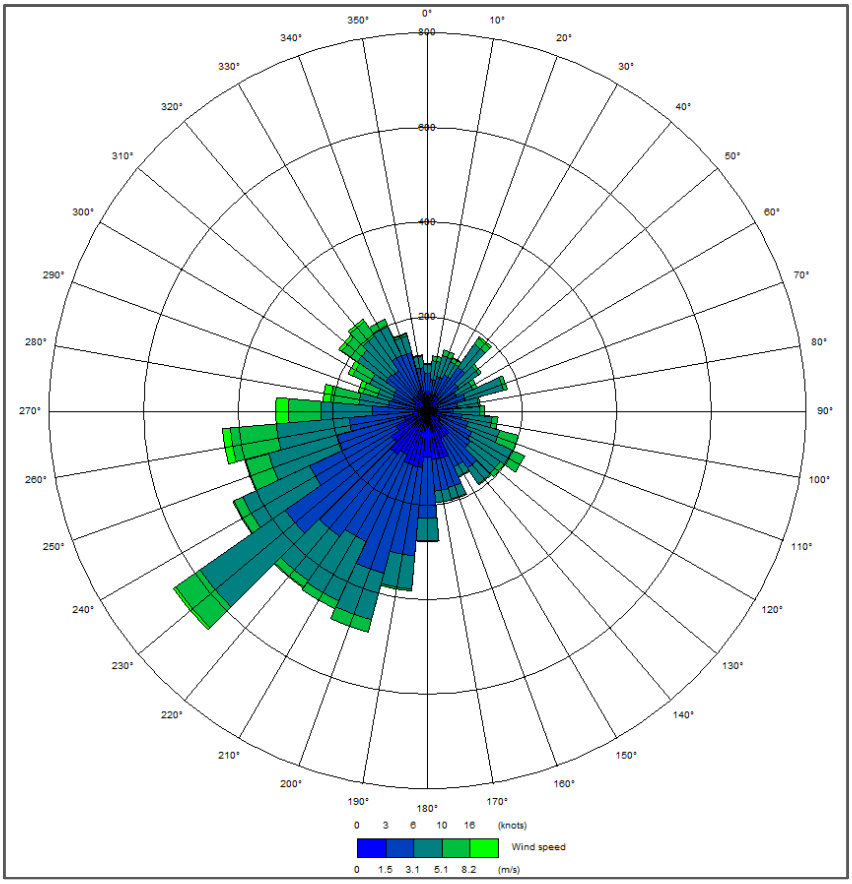

Figure 3-1
Windrose for Church Lawford Meteorological Station (2019)

3.2.3 Background Concentrations

Annual mean background concentrations used for the purposes of the assessment have been obtained from the DEFRA supplied background maps (2018 reference year)[15], based on the 1km grid squares which cover the modelled area. Further detail on these datasets can be found in Section 4.1.3.

To avoid double counting of potential source contributions already contained within the ADMS-Roads dispersion model, 'Primary A Road in' was removed from each grid square, as recommended in the DEFRA Background Maps User Guide[16].

As the relationship between NO_2 and oxides of nitrogen (NOx) is not linear, the NO_2 Adjustment for NOx Sector Removal Tool[17] has been used – in accordance with LAQM.TG(16). No adjustment for background concentration variability with height has been made.

3.2.4 Sensitive Receptors

Human receptors considered in the assessment of emissions from road traffic are shown Table 3-1, whilst their locations are illustrated in Figure 3-2.

Receptors HR1 – HR25 are representative of worst-case exposure locations at existing receptors within the development locale, relative to the affected road network. New receptors introduced as a result of the Proposed

[15] DEFRA Background Maps (2018-Reference) http://uk-air.defra.gov.uk/data/laqm-background-home.
[16] DEFRA Background Concentration Maps User Guide. August 2020.
[17] DEFRA NO_2 Adjustment for NO_x Sector Removal Tool (v8.0)

Development, N_HR1 – N_HR4, are selected as the locations of worst-case exposure on the Site relative to the surrounding modelled road network.

Most receptors were considered in relation to exposure at breathing height relative to the adjacent modelled road, and were considered in relation to exposure at ground level, i.e. 1.5m height. A number of further receptors represented flats situated above shops and therefore modelled at a height of 4m. Receptor locations represent relevant exposure – in accordance with LAQM.TG(16) presented in Table 2-2.

Table 3-1
Receptor Locations Considered

Receptor	X	Y	Height (m)
Existing Receptor			
HR1	443270	242736	1.5
HR2	443317	242744	1.5
HR3	443346	242606	1.5
HR4	443498	242559	1.5
HR5	443456	242482	1.5
HR6	443564	242533	1.5
HR7	443624	242561	1.5
HR8	443679	242570	1.5
HR9	443851	242635	1.5
HR10	443923	242678	1.5
HR11	443979	242656	1.5
HR12	444060	242689	1.5
HR13	444380	242525	1.5
HR14	444860	242542	1.5
HR15	445056	242720	1.5
HR16	445326	240774	4.0
HR17	445346	240763	4.0
HR18	445349	240748	4.0
HR19	445355	240684	4.0
HR20	445356	240572	4.0
HR21	445355	240515	1.5
HR22	445335	240373	4.0
HR23	445326	240324	4.0
HR24	445288	240318	1.5
HR25	445342	240225	4.0
New Receptors			
N_HR1	443185	243065	1.5
N_HR2	443203	243018	1.5
N_HR3	443207	243003	1.5

Receptor	X	Y	Height (m)
N_HR4	443219	242976	1.5

3.2.5 Model Outputs

The background pollutant values discussed in Section 4.1.3 have been used in conjunction with the concentrations predicted by the ADMS-Roads model to calculate predicted total annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ for each respective scenario.

For the prediction of annual mean NO_2 concentrations for all modelled scenarios at receptor locations, the road NOx contributions (adjusted as per Appendix A) have been converted to total NO_2 following the methodology in LAQM.TG(16) using the latest version of DEFRA's NOx to NO_2 conversion tool (v8.1)[18]. The modelled NO_2 road contribution was then added to the appropriate NO_2 background concentration value to obtain an overall total annual mean NO_2 concentration.

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

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

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

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

Verification of the ADMS-Roads model has been undertaken, as per Appendix A. All results presented in the assessment are those calculated following the process of model verification.

3.2.6 Assessing Significance

Guidance for determining the significance of a development's impact on local air quality is provided by EPUK/IAQM.

When describing the developmental impact at a specific receptor, the resultant total concentration as well as the magnitude of change in relation to respective AQALs are both considered – using the approach detailed in Table 3-2.

Table 3-2
Impact Descriptor Matrix for Receptors

Long Term Average Concentration at Receptor in Assessment Year	Change in Concentration relative to AQAL			
	1% (A)	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

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

Long Term Average Concentration at Receptor in Assessment Year	Change in Concentration relative to AQAL			
	1% (A)	2-5%	6-10%	>10%
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial
Note: (A) Changes <0.5% will be described as 'Negligible'.				

Following derivation of impacts at all receptor locations assessed, the overall significance of the developmental 'effect' is determined based upon consideration, as necessary, of the following factors:

- the existing and future air quality in the absence of the Proposed Development;
- the extent of current and future population exposure to the impacts;
- the worst-case assumptions adopted when undertaking the prediction of impacts; and
- the extent to which the Proposed Development has adopted best practice to eliminate and minimise emissions.

3.2.7 Uncertainty

Dispersion modelling is inherently uncertain and is principally reliant on the accuracy and representativity of its inputs. In acknowledgement of this, the ADMS-Roads dispersion model has been verified with the latest publicly available local monitoring data, as collected by CDC (collected prior to the COVID-19 pandemic).

In addition, there is a widely acknowledged disparity between emission factors and ambient monitoring data[19]. To help minimise any associated uncertainty when forming conclusions from the results, this assessment has utilised the latest EFT version 11 utilising COPERT 5.3 emission factors, and associated tools/datasets published by DEFRA.

Notwithstanding the above, in consideration of the potential uncertainty in predictions of future year pollutants, as well as the current national and local sensitivities seen in response to elevated roadside NO_2 concentrations, an additional sensitivity assessment has been provided in Appendix B, utilising 2019 as the proposed year of opening for the Proposed Development. This theoretically assumes that there is no improvement in emission factors or background concentrations for the pollutants considered, within CDC for future years, relative to the verified/baseline year (2019). These modelled scenarios are likely to represent an overly conservative approach as, despite uncertainty in quantification, it is generally accepted that variables such as background concentrations and/or vehicle emission factors will improve to some degree in future years, with local monitoring trends somewhat supporting this (see Section 4.1).

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

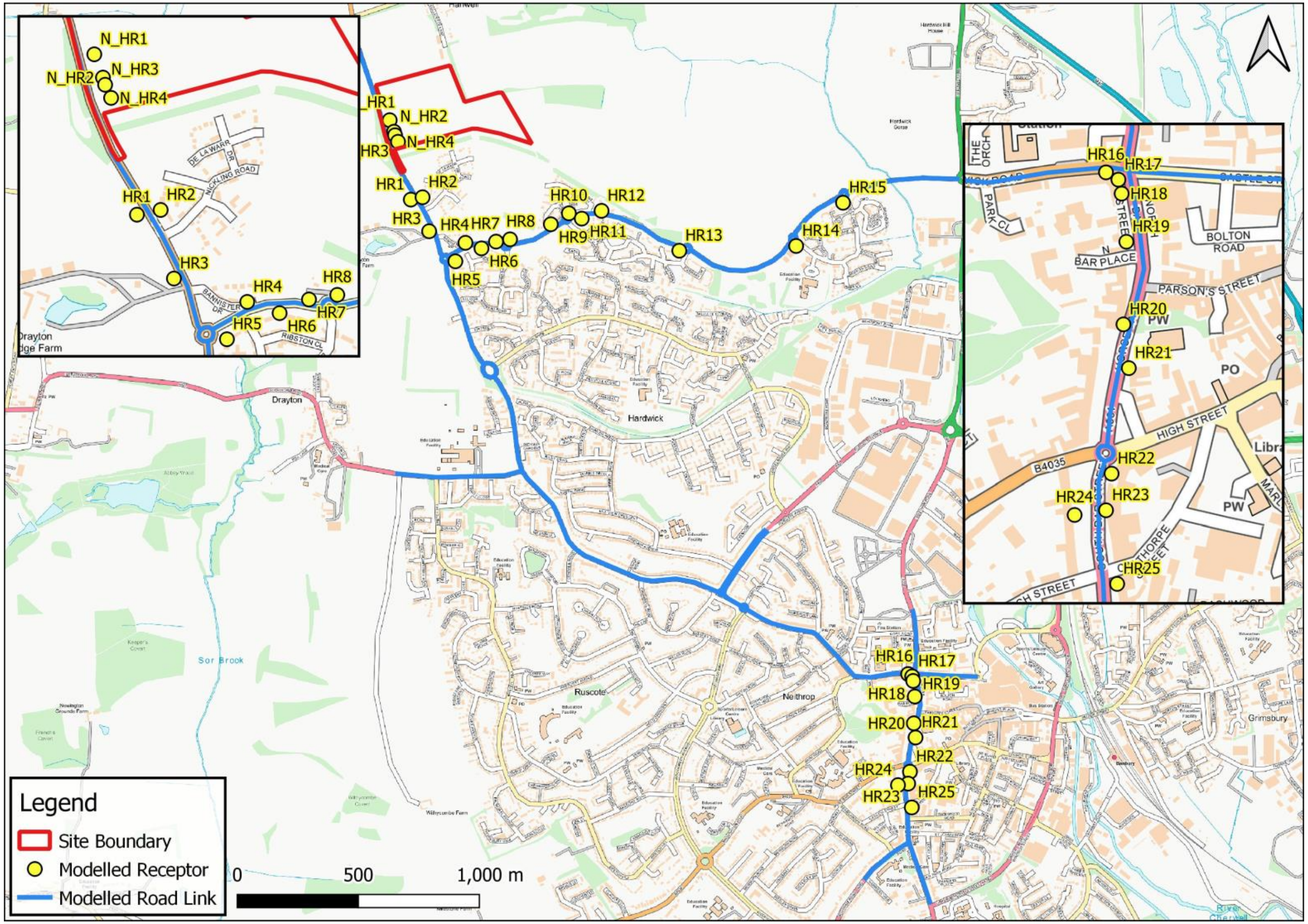

Figure 3-2
Modelled Road Links and Receptor Locations

4.0 BASELINE ENVIRONMENT

4.1 Baseline Air Quality

Monitoring data collected prior to the COVID-19 pandemic (i.e. pre-2020) has been used to characterise the baseline environment, as pollutant concentrations monitored during 2020 and 2021 are expected to be atypical, and not representative of the local environment and have therefore not been considered as per DEFRA's supplementary guidance and the IAQM position statement.

4.1.1 LAQM Review and Assessment

CDC, in fulfilment of statutory requirements, has conducted an on-going exercise to review and assess air quality within their administrative area (Review and Assessment). The latest publicly available LAQM report for CDC at the time of writing (prior to the onset of the COVID-19 pandemic within the UK) is the 2020 Annual Status Report[20] (ASR).

Through the annual Review and Assessment process, CDC has consequently declared four AQMAs within the council's administrative area. The nearest AQMAs to the Site are: 'AQMA No.1' at an approximate distance of 2.5km to the south-east, declared in 2011 for exceedences of the annual mean and 1-hour mean NO_2 AQALs at locations of relevant public exposure; and 'AQMA No.2' located approximately 2.6km south-east of the Site, declared in 2014 for exceedences of the annual mean NO_2 AQAL at locations of relevant public exposure.

With reference to the TA, developmental trips are only predicted to pass through the 'AQMA No.2'. No further consideration has been given to 'AQMA No.1' within this assessment.

4.1.2 Review of Air Quality Monitoring

Automatic Air Quality Monitoring

CDC do not undertake any automatic monitoring of pollutants. Furthermore, the closest Automatic Urban and Rural Network (AURN) monitor to the Site is >25km away. Due to the separation distance between this monitor and the Site, comparable pollutant concentrations are not anticipated, and data from the AURN has not been considered within this assessment.

Passive Diffusion Tube Monitoring

Passive NO_2 diffusion tube monitoring is currently undertaken by CDC within the development locale, at numerous locations.

The details and results of the monitoring locations of relevance to the Site are presented in Table 4-1 and Table 4-2 respectively, whilst their locations are illustrated in Figure 4-1. All monitoring data presented has been ratified by CDC.

Table 4-1
Local LAQM NO_2 Passive Diffusion Tube Monitoring Sites: Details

Site ID	Site Type	NGR (m)		Height (m)	Within AQMA	Distance and Direction to Site (km)
		X	Y			
Warwick Road North	Roadside	443905	241392	2.0	No	1.6 S

[20] Cherwell District Council, 2020 Air Quality Annual Status Report (2020).

Site ID	Site Type	NGR (m)		Height (m)	Within AQMA	Distance and Direction to Site (km)
		X	Y			
Sinclair Avenue	Urban Background	444274	241289	2.0	No	1.7 SES
Ruscote Avenue	Roadside	444611	241172	2.0	No	2.0 SES
North Bar	Kerbside	445352	240774	2.0	Yes (No.2)	2.7 SE
Horsefair (x3)	Roadside	445351	240578	2.5	Yes (No.2)	2.9 SE
High Street	Kerbside	445407	240421	2.0	Yes (No.2)	3.0 SE
Oxford Rd / South Bar	Kerbside	445333	240100	2.0	Yes (No.2)	3.3 SE

Table 4-2
Local LAQM NO_2 Passive Diffusion Tube Monitoring Sites: Results

Site ID	2019 Data Capture %	Annual Mean NO_2 Concentration (µg/m^3)				
		2015	2016	2017	2018	2019
Warwick Road North	100.0	23.1	26.1	23.3	21.9	20.3
Sinclair Avenue	100.0	14.5	16.8	14.4	14.3	14.4
Ruscote Avenue	100.0	21.9	23.6	20.1	20.6	18.9
North Bar	100.0	38.9	36.5	36.9	34.5	34.0
Horsefair (x3)	100.0	40.9	38.8	41.8	38.7	38.6
High Street	91.7	35.3	34.6	35.0	32.3	34.6
Oxford Rd / South Bar	100.0	33.2	35.5	33.4	36.1	35.3

As shown in Table 4-2, the monitoring locations within the Site locale (outside of an AQMA) have all recorded annual mean NO_2 concentrations 'well below' the AQAL of 40µg/m^3 across all considered years.

The diffusion tube closest to the Site (Warwick Road North – approximately 1.6km to the south) recorded an annual mean NO_2 concentration of 20.3µg/m^3 in 2019, representing 50.8% of the AQAL.

The diffusion tubes within the 'AQMA No.2' all recorded annual mean NO_2 concentrations below the AQAL in 2019. Only one of these tubes (Horsefair (x3)) recorded an exceedance of the AQAL at any point across the considered years.

The empirical relationship given in LAQM.TG(16) states that exceedences of the 1-hour mean AQAL for NO_2 is unlikely to occur where annual mean concentrations are <60µg/m^3. This indicates that an exceedence of the 1-hour mean AQAL is unlikely to have occurred at any of the considered monitoring sites between 2015 and 2019.

4.1.3 DEFRA Mapped Background Concentrations

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

Annual mean background concentrations of NOx, NO_2, PM_{10} and $PM_{2.5}$ have been obtained from the DEFRA published background maps (2018 base year), based on the 1km grid squares which cover the modelled domain. The DEFRA mapped background concentrations for base year of 2019 and the predicted opening year of the development (2027) are presented in Table 4-3.

Table 4-3
DEFRA Mapped Background Pollutant Concentrations

Grid Square (X, Y)	Year	Annual Mean Background Concentration ($\mu g/m^3$)			
		NOx	NO_2	PM_{10}	$PM_{2.5}$
443500, 243500	2019	10.2	8.0	14.6	9.2
	2027	7.8	6.2	13.5	8.3
443500, 242500	2019	11.1	8.6	15.0	9.8
	2027	8.6	6.7	13.9	8.9
444500, 242500	2019	13.0	9.9	15.8	10.4
	2027	10.1	7.8	14.7	9.5
445500, 242500	2019	19.3	14.0	17.9	12.5
	2027	15.5	11.5	16.6	11.5
445500, 240500	2019	18.8	13.8	15.4	10.6
	2027	14.5	10.9	14.2	9.7
AQAL		**-**	***40***	***40***	***25***

All of the mapped background concentrations presented are well below the respective annual mean AQALs.

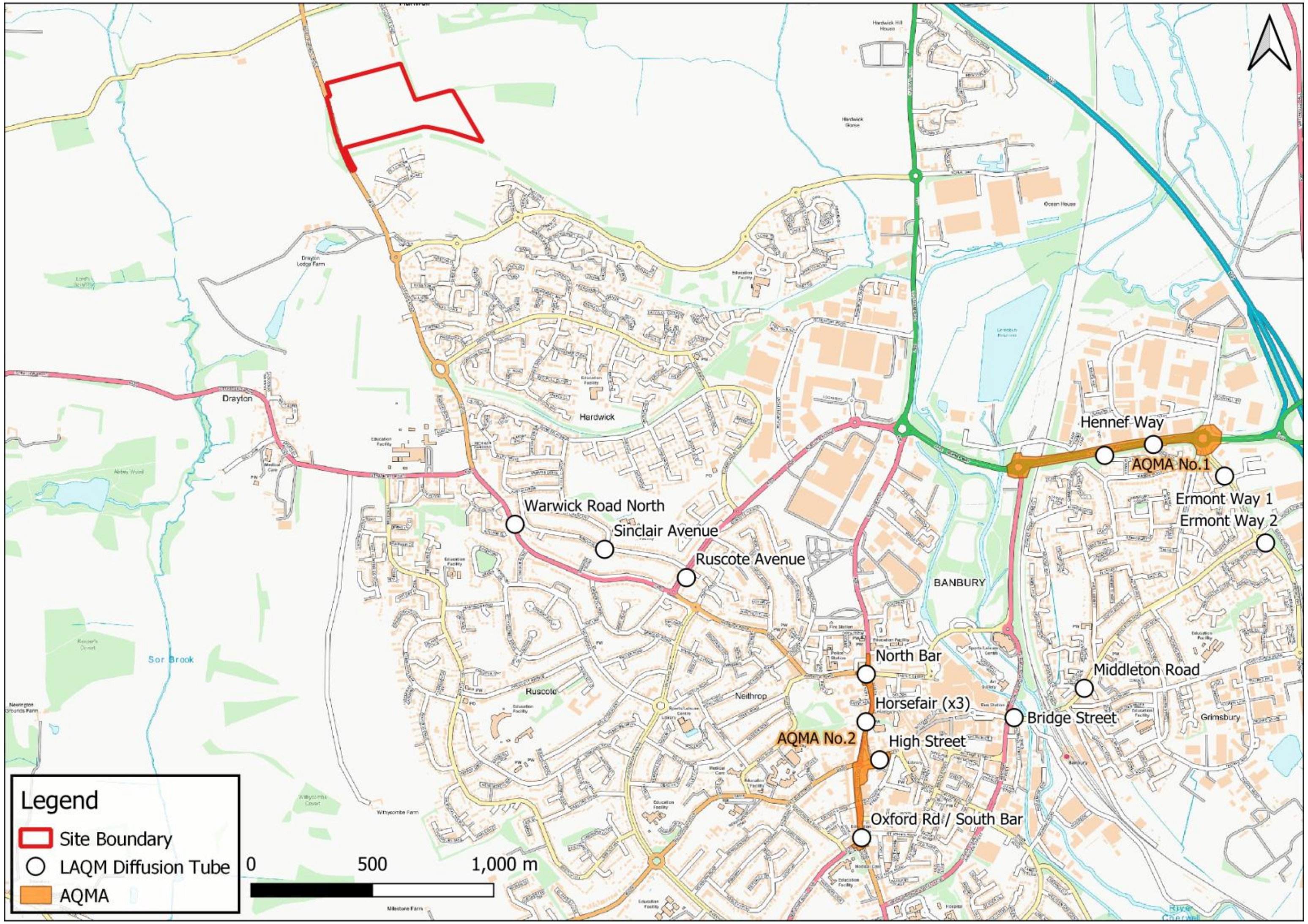

Figure 4-1
Site Setting and Local Baseline Datasets

5.0 CONSTRUCTION PHASE ASSESSMENT

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

5.1 Construction Dust Assessment

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

5.1.1 Assessment Screening

There are 'human receptors' within 350m of the Site but no designated habitat sites within 50m of the Site boundary or up to 500m of the Site entrance(s) / 50m of the roads anticipated to witness construction traffic movements. Therefore, an assessment of construction dust on human receptors, only, is required.

5.1.2 Potential Dust Emissions Magnitude

Demolition

The Site is currently vacant agricultural land with no existing buildings or structures that require demolition. As such, impacts associated with demolition have been screened out of this assessment.

Earthworks

The proposals comprise the construction of up to 200 residential units. However, in recognition of the phased construction of residential schemes, Site earthworks are not believed to be required over an area >10,000m^2 at any one given time.

As such, the dust emission magnitude for earthworks is therefore initially considered to be 'medium'.

Construction

The total building volume associated with the Proposed Development is predicted to be >25,000m^3. However, in recognition of the phased construction of residential schemes, the total building volume associated with the Proposed Development is predicted to be <100,000m^3 at any one given time.

As such, the dust emission magnitude for construction is therefore initially considered to be 'medium'.

Trackout

Construction vehicles are expected to access the Site via a newly constructed entrance off Warwick Road. No details are available at the time of assessment on the number of additional HDV movements associated with construction works. However, given the scale and nature of works required, it is considered unlikely that >50 HDV outward movements will occur in any worst-case day. In addition, the unpaved road length is likely to be <100m at any one given time as a result of phasing.

The dust emission magnitude for trackout is therefore initially considered to be 'medium'.

Table 5-1
Potential Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	N/A
Earthworks	Medium

Activity	Dust Emission Magnitude
Construction	Medium
Trackout	Medium

5.1.3 Sensitivity of the Area

Dust Soiling Impacts

Overall, there are anticipated to be 10-100 existing residential properties (highly sensitive receptors) within 100m of the Site. In addition, there are believed to be 1-10 residential receptors within 20m of sections of Site accesses within 200m (commensurate of a medium site[21]) of the Site entrance. It has been assumed that construction vehicles will travel north and south on Warwick Road.

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

Human Health Impacts

The maximum 2019 mapped background PM_{10} concentration (2018 base year) for the 1km^2 grid square centred on the Site is estimated to be 15.0µg/m^3 (i.e. falls into the <24µg/m^3 class). As discussed in Section 4.1.3, no local background PM_{10} monitoring exists within the development locale.

Given the above information regarding the number of residential receptors within 50m of the Site and within 200m from the Site entrance on access roads, the sensitivity of the area with respect to human health impacts in relation to earthworks, construction and trackout is therefore considered to be 'low'.

Table 5-2
Sensitivity of the Area

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

5.1.4 Risk of Impacts (Unmitigated)

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

Table 5-3
Risk of Dust Impacts

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

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

5.1.5 Mitigation

Following the construction dust assessment, the Site is found to be at worst 'Low Risk' in relation to dust soiling effects on people and property and in relation to human health impacts (Table 5-3). However, potential dust effects during the construction phase are considered to be temporary in nature and may only arise at particular times (i.e. certain activities and/or meteorological conditions).

Nonetheless, commensurate with the above designation of dust risk, mitigation measures, as identified by IAQM guidance are required to ensure that any potential impacts arising from the construction phase of the Proposed Development are reduced and, where possible, completely removed. In accordance with IAQM guidance, providing effective mitigation measures are implemented, such as those outlined in Section 7.0, construction dust effects are considered to be 'not significant'.

Figure 5-1
Construction Dust Assessment Buffers

6.0 OPERATIONAL PHASE ASSESSMENT

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

6.1 NO_2 Modelling Results

Table 6-1 presents the annual mean NO_2 concentrations predicted at all assessed receptor locations for the 2019 BC, 2027 DM and 2027 DS scenarios.

Table 6-1
Predicted Annual Mean NO_2 Concentrations – 2027 Development Opening Year

Receptor	Predicted Annual Mean NO_2 Concentration (µg/m³)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
Existing Receptors						
HR1	9.5	7.3	7.4	0.1	18.5	Negligible
HR2	10.6	8.1	8.2	0.3	20.5	Negligible
HR3	9.8	7.5	7.6	0.2	19.0	Negligible
HR4	10.2	7.9	8.0	0.3	20.0	Negligible
HR5	11.0	8.4	8.5	0.3	21.3	Negligible
HR6	9.5	7.4	7.4	0.1	18.5	Negligible
HR7	10.6	8.2	8.4	0.5	21.0	Negligible
HR8	10.7	8.3	8.5	0.5	21.3	Negligible
HR9	9.6	7.4	7.5	0.2	18.8	Negligible
HR10	10.5	8.1	8.3	0.5	20.8	Negligible
HR11	9.3	7.3	7.3	0.2	18.3	Negligible
HR12	11.3	8.9	9.0	0.4	22.5	Negligible
HR13	10.6	8.4	8.4	0.2	21.0	Negligible
HR14	10.6	8.3	8.4	0.2	21.0	Negligible
HR15	14.4	11.9	11.9	0.1	29.8	Negligible
HR16	19.0	13.8	13.9	0.1	34.8	Negligible
HR17	20.3	14.4	14.4	0.1	36.0	Negligible
HR18	19.7	13.9	14.0	<0.1	35.0	Negligible
HR19	17.0	12.4	12.4	<0.1	31.0	Negligible
HR20	35.3	22.1	22.1	0.2	55.3	Negligible
HR21	23.7	15.8	15.8	<0.1	39.5	Negligible
HR22	20.0	13.9	13.9	<0.1	34.8	Negligible
HR23	20.0	13.9	13.9	<0.1	34.8	Negligible
HR24	16.0	11.8	11.8	<0.1	29.5	Negligible
HR25	18.5	12.9	12.9	<0.1	32.3	Negligible

Receptor	Predicted Annual Mean NO_2 Concentration (µg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
New Receptors						
N_HR1	-	-	7.0	-	17.5	-
N_HR2	-	-	7.0	-	17.5	-
N_HR3	-	-	7.0	-	17.5	-
N_HR4	-	-	7.5	-	18.8	-

The maximum predicted annual mean NO_2 concentration at all existing receptors during the 2019 BC scenario was at receptor HR20 with a predicted concentration of 35.3µg/m^3; representing 88.3% of the AQAL. Receptor R20 is located within the CDC 'AQMA No.2', at the façade of a residential dwelling and in an area of limited dispersion (due to the presence of buildings and foliage bordering the road link) and where start-stop conditions are likely. Therefore, higher predicted concentrations are to be expected.

The maximum predicted annual mean NO_2 concentration at all existing receptors with the development in place (2027 DS) was at HR20 with a predicted concentration of 22.1µg/m^3, representing 55.3% of the AQAL. The change in the annual mean NO_2 concentration at this location, due to the Proposed Development (i.e. 2027 DS vs. 2027 DM) relative to the AQAL was 0.2%.

The maximum observed increase in annual mean NO_2 concentrations at all existing receptors as a result of the Proposed Development (2027 DS vs. 2027 DM) was 0.5% of the AQAL at receptors HR7, HR8 and HR10.

In accordance with EPUK/IAQM guidance, the impact of the development on annual mean NO_2 concentrations at all assessed existing receptors is considered to be 'negligible'. Given the marginal increase in annual mean NO_2 concentrations associated with the Proposed Development, and that there are no predicted exceedences of the annual mean NO_2 AQAL in the 2027 Proposed Development opening year, unmitigated effects associated with annual mean NO_2 concentrations at all assessed receptor locations are therefore considered to be 'not significant'.

The maximum predicted annual mean NO_2 concentration (2027 DS) at all new receptors introduced by the Proposed Development was at N_HR4, with a predicted concentration of 7.5µg/m^3; this represents 18.8% of the AQAL (i.e. 'well-below'). As such, the site is considered to be suitable for residential development in relation to NO_2 concentrations and unmitigated effects from air quality would be considered 'not significant'.

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

6.2 PM_{10} Modelling Results

Table 6-2 presents the annual mean PM_{10} concentrations predicted at all assessed receptor locations of relevant exposure for the 2019 BC, 2027 DM and 2027 DS scenarios.

Table 6-2
Predicted Annual Mean PM_{10} Concentrations – 2027 Development Opening Year

Receptor	Predicted Annual Mean PM_{10} Concentration (µg/m³)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
Existing Receptors						
HR1	15.2	14.2	14.2	<0.1	35.5	Negligible
HR2	15.4	14.5	14.6	0.1	36.5	Negligible
HR3	15.3	14.2	14.3	<0.1	35.8	Negligible
HR4	15.3	14.4	14.4	0.1	36.0	Negligible
HR5	15.5	14.6	14.6	<0.1	36.5	Negligible
HR6	15.2	14.2	14.2	<0.1	35.5	Negligible
HR7	15.4	14.5	14.5	0.2	36.3	Negligible
HR8	15.4	14.5	14.6	0.2	36.5	Negligible
HR9	15.2	14.2	14.2	<0.1	35.5	Negligible
HR10	15.4	14.4	14.5	0.2	36.3	Negligible
HR11	15.2	14.1	14.1	<0.1	35.3	Negligible
HR12	16.1	15.1	15.1	0.1	37.8	Negligible
HR13	15.9	14.9	14.9	<0.1	37.3	Negligible
HR14	15.9	14.9	14.9	<0.1	37.3	Negligible
HR15	18.0	16.8	16.8	<0.1	42.0	Negligible
HR16	16.4	15.3	15.4	<0.1	38.5	Negligible
HR17	16.5	15.4	15.4	<0.1	38.5	Negligible
HR18	16.4	15.3	15.3	<0.1	38.3	Negligible
HR19	16.2	15.1	15.1	<0.1	37.8	Negligible
HR20	19.9	19.0	19.0	<0.1	47.5	Negligible
HR21	17.6	16.5	16.5	<0.1	41.3	Negligible
HR22	16.8	15.7	15.7	<0.1	39.3	Negligible
HR23	16.8	15.7	15.7	<0.1	39.3	Negligible
HR24	16.1	14.9	14.9	<0.1	37.3	Negligible
HR25	16.5	15.3	15.3	<0.1	38.3	Negligible
New Receptors						
N_HR1	-	-	13.9	-	34.8	-
N_HR2	-	-	13.9	-	34.8	-
N_HR3	-	-	13.9	-	34.8	-
N_HR4	-	-	14.2	-	35.5	-

The maximum predicted annual mean PM_{10} concentration at all existing receptors during the 2019 BC scenario was at Receptor HR20 with a predicted concentration of 19.9µg/m³, representing 49.8% of the AQAL.

The maximum predicted annual mean PM_{10} concentration at existing receptors with the development in place (2027 DS) was at Receptor HR20 with a predicted concentration of 19.0µg/m^3; this represents 47.5% of the AQAL. The change in the annual mean PM_{10} concentration at this location, due to the Proposed Development (2027 DS vs. 2027 DM) relative to the AQAL was <0.1%.

The maximum observed increase in annual mean PM_{10} concentrations at all existing receptors as a result of the Proposed Development (2027 DS vs. 2027 DM) was 0.2% of the AQAL at receptors HR7, HR8 and HR10.

In accordance with EPUK/IAQM guidance, the impact of the development on annual mean PM_{10} concentrations at all assessed existing receptors is considered to be 'negligible'. Given the marginal increase in annual mean PM_{10} concentrations associated with the Proposed Development, and that there are no predicted exceedences of the annual mean PM_{10} AQAL, unmitigated effects associated with annual mean PM_{10} concentrations at all assessed receptor locations are therefore considered to be 'not significant'.

The maximum predicted annual mean PM_{10} concentration (2027 DS) at all new receptors introduced by the Proposed Development was at N_HR4, with a predicted concentration of 14.2µg/m^3; this represents 35.5% of the AQAL (i.e. 'well-below'). As such, the site is considered to be suitable for residential development in relation to PM_{10} concentrations and unmitigated effects from air quality would be considered 'not significant'.

Based upon the maximum predicted annual mean PM_{10} concentrations at all existing receptors, there are predicted to be two days where the 24-hour mean PM_{10} concentrations are predicted to be greater than 50µg/m^3, at receptor HR20. There are predicted to be zero days where the 24-hour mean PM_{10} concentrations are predicted to be greater than 50µg/m^3 at any of the other receptor locations. This is compliant with the 35 allowable exceedences per annum. Effects associated with likely 24-hour mean PM_{10} concentrations at all assessed receptor locations are therefore considered to be 'not significant'.

6.3 $PM_{2.5}$ Modelling Results

Table 6-3 presents the annual mean $PM_{2.5}$ concentrations predicted at all assessed receptor locations of relevant exposure for the 2019 BC, 2027 DM and 2027 DS scenarios.

Table 6-3
Predicted Annual Mean $PM_{2.5}$ Concentrations – 2027 Development Opening Year

Receptor	Predicted Annual Mean $PM_{2.5}$ Concentration (µg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
Existing Receptors						
HR1	9.9	9.0	9.0	<0.1	36.0	Negligible
HR2	10.0	9.2	9.3	0.1	37.2	Negligible
HR3	9.9	9.1	9.1	<0.1	36.4	Negligible
HR4	10.0	9.1	9.2	0.1	36.8	Negligible
HR5	10.0	9.3	9.3	<0.1	37.2	Negligible
HR6	9.9	9.0	9.0	<0.1	36.0	Negligible
HR7	10.0	9.2	9.2	0.2	36.8	Negligible
HR8	10.0	9.2	9.3	0.2	37.2	Negligible
HR9	9.9	9.1	9.1	<0.1	36.4	Negligible
HR10	10.0	9.2	9.2	0.2	36.8	Negligible
HR11	9.9	9.0	9.0	<0.1	36.0	Negligible

Receptor	Predicted Annual Mean $PM_{2.5}$ Concentration (µg/m³)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
HR12	10.6	9.7	9.7	0.1	38.8	Negligible
HR13	10.5	9.6	9.6	<0.1	38.4	Negligible
HR14	10.5	9.6	9.6	<0.1	38.4	Negligible
HR15	12.6	11.5	11.6	<0.1	46.4	Negligible
HR16	11.2	10.3	10.3	<0.1	41.2	Negligible
HR17	11.3	10.3	10.3	<0.1	41.2	Negligible
HR18	11.2	10.3	10.3	<0.1	41.2	Negligible
HR19	11.1	10.1	10.1	<0.1	40.4	Negligible
HR20	13.2	12.3	12.3	<0.1	49.2	Negligible
HR21	11.9	10.9	10.9	<0.1	43.6	Negligible
HR22	11.4	10.4	10.5	<0.1	42.0	Negligible
HR23	11.4	10.5	10.5	<0.1	42.0	Negligible
HR24	11.0	10.0	10.0	<0.1	40.0	Negligible
HR25	11.3	10.3	10.3	<0.1	41.2	Negligible
New Receptors						
N_HR1	-	-	8.6	-	34.4	-
N_HR2	-	-	8.5	-	34.0	-
N_HR3	-	-	8.5	-	34.0	-
N_HR4	-	-	9.1	-	36.4	-

The maximum predicted annual mean $PM_{2.5}$ concentration at all existing receptors during the 2019 BC scenario was at Receptor HR20 with a predicted concentration of 13.2µg/m³, representing 52.8% of the AQAL.

The maximum predicted annual mean $PM_{2.5}$ concentration at existing receptors with the development in place (2027 DS) was at HR20 with a predicted concentration of 12.3µg/m³; representing 49.2% of the AQAL. The change in the annual mean $PM_{2.5}$ concentration at HR20, due to the Proposed Development (2027 DS vs. 2027 DM) relative to the AQAL was <0.1%.

The maximum observed increase in annual mean $PM_{2.5}$ concentrations at all existing receptors as a result of the Proposed Development (2027 DS vs. 2027 DM) was 0.2% of the AQAL at receptors HR7, HR8 and HR10.

In accordance with EPUK/IAQM guidance, the impact of the development on annual mean $PM_{2.5}$ concentrations at all assessed existing receptors is considered to be 'negligible'. Given the marginal increase in annual mean $PM_{2.5}$ concentrations associated with the Proposed Development, and that there are no predicted exceedences of the annual mean $PM_{2.5}$ AQAL, unmitigated effects associated with annual mean $PM_{2.5}$ concentrations at all assessed receptor locations are therefore considered to be 'not significant'.

The maximum predicted annual mean $PM_{2.5}$ concentration (2027 DS) at all new receptors introduced by the Proposed Development was at N_HR4, with a predicted concentration of 9.1µg/m³; this represents 36.4% of the AQAL (i.e. 'well-below'). As such, the site is considered to be suitable for residential development in relation to $PM_{2.5}$ concentrations and unmitigated effects from air quality would be considered 'not significant'.

7.0 MITIGATION MEASURES

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

7.1 Construction Dust

As discussed in Section 5.0, construction impacts associated to the Proposed Development would result in the generation of dust and PM_{10}.

IAQM guidance outlines a number of Site-specific mitigation measures based on the assessed risk. The measures are grouped into those which are highly recommended and those which are desirable. With the effective application of the dust mitigation measures, as detailed in Table 7-1, residual effects will be 'not significant'. Mitigation measures can be secured by planning condition.

Table 7-1
Construction Dust Mitigation Measures

Site Application	Mitigation Measures
Highly Recommended	
Communications	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.
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.
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.
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.
	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.

Site Application	Mitigation Measures
Preparing and Maintaining the Site	Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
	Avoid site runoff of water or mud.
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
	Make the complaints log available to the local authority when asked.
	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.
Waste Management	Avoid bonfires and burning of waste materials.
Desirable	
Communications	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.
Construction	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.
Monitoring	Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.
Operating Vehicle/Machinery and Sustainable Travel	Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
Operations	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Preparing and Maintaining the Site	Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
	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.

Site Application	Mitigation Measures
	Cover, seed or fence stockpiles to prevent wind whipping.
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 continuously in use.
	Avoid dry sweeping of large areas.
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
	Record all inspections of haul routes and any subsequent action in a site log book.
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

7.2 Operational Phase Road Traffic Emissions

In accordance with EPUK/IAQM guidance, the overall effect of the development on NO_2, PM_{10} and $PM_{2.5}$ concentrations at all assessed receptor locations is considered to be 'not significant'. In addition, predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ within the Site at new receptor locations are considered to be 'well below' both the long and short-term AQALs. Effects associated with likely exposure of future occupants are therefore considered to be 'not significant'.

Notwithstanding the above, the appointed transport consultant for the Proposed Development has prepared a Travel Plan[22] (TP) to support the planning application. The TP contains a number of measures which would help to limit associated air quality effects within the locale by reducing reliance upon car movements to and from the Site. These measures include:

- Information provision - The provision of relevant information conducive to change travel habits of residents and visitors to the site is considered to be key to the success of a TP;
- Measures to promote walking and cycling - In terms of external access for pedestrians and cyclists, the improvements proposed as part of the proposed development will improve pedestrian connections to Banbury and extend the local pedestrian and cycle network to the north of the town;
- Measures to promote the use of public transport - Public transport use should be encouraged where possible;
- To reduce the need of travel - The Travel Plan Co-ordinator will negotiate with local suppliers to establish a regular delivery service of daily essentials such as milk, orange juice and fresh baked bread to the residents with the intention to reduce the need of travel;
- Measures to promote car sharing - Joining a Car Share Scheme is another effective way to reduce solo car journeys in and out of the site, particularly for work purposes; and
- Provision of car club - The OCC [Oxfordshire County Council] Travel Plan guidance states that *"Car clubs should be provided for residential developments where Oxfordshire County Council is of the view that the conditions are suitable to support their set-up and ongoing success. In these circumstances, measures such as the provision of infrastructure (such as marked parking bays and electric vehicle charging points for car*

[22] Jubb, Land East of Warwick Road, Banbury, Framework Travel Plan, July 2022

club vehicles), the promotion of the car club, and a contribution towards the set-up costs of the car club should be provided by the developer."

7.2.1 Damage Cost Calculation

In-line with CBC's Air Quality Action Plan (AQAP) and the CDC's pre-application advice, an estimation of the likely financial operational emission impact of the Proposed Development (Damage Cost Calculation) has been undertaken. The approach prescribed within the EPUK/IAQM guidance document has been used – with use of the Defra's Air Quality Appraisal Toolkit and guidance[23].

Pollutant emissions costs associated with additional operational development trips over a 5-year period (from the first year of operation – i.e. 2027 to 2031) have been calculated to indicate potential mitigation requirements. The latest version of the EFT (presently v11.0) has been used to determine vehicle emission factors as input into the Damage Cost Calculation.

2027 has been used as the opening year for the Proposed Development. The latest version of the EFT only provides NOx and PM_{10} emission factors up to 2030. Therefore, two years have been run at 2030 (i.e. 2027, 2028, 2029, 2030 & 2030). As such, the derived financial emission impact of the Proposed Development is likely to be overinflated in recognition of the forecasted reductions in vehicle emission factors, as low, and zero (tailpipe), emission technologies permeate the road fleet - not accounted for within this calculation. The Proposed Development is expected to generate 869 additional vehicle movements.

Reference should be made to Table 7-2 and Table 7-3 for a presentation of the Damage Cost Calculation inputs and outputs, respectively.

Table 7-2
Damage Cost Calculation – Inputs

Input Parameter		Inputs
Total Trips (AADT)	LDVs	869
	HDVs	0
Average trip length (km) (A)		10
Speed (kph)		48.0
2017 Base Damage cost NOx (£ per tonne) (B)		9,066
2017 Base Damage cost $PM_{2.5}$ (£ per tonne) (B)		81,518
Notes: (A) Average trip length from the National Travel Survey: England 2013. (B) A 2% uplift per annum has been applied to calculate the corresponding damage costs over a five year period, commencing from the assumed development opening year (2027).		

Table 7-3
Damage Cost Calculation – Outputs

Output Parameter	Year					5 – Year Total
	2027	2028	2029	2030	2031	
Annual NOx Emissions (tonnes/year)	0.44	0.39	0.35	0.32	0.32	1.82
Annual PM_{10} Emissions (tonnes/year)	0.10	0.10	0.10	0.10	0.10	0.49

[23] https://www.gov.uk/government/publications/assess-the-impact-of-air-quality

Output Parameter	Year					5 – Year Total
	2027	2028	2029	2030	2031	
Annual $PM_{2.5}$ Emissions (tonnes/year) (A)	0.06	0.06	0.06	0.06	0.06	0.31
NOx contribution (£) (rounded up)	5,318	4,699	4,173	3,732	3,678	£21,601
$PM_{2.5}$ contribution (£) (rounded up)	6,880	6,769	6,662	6,558	6,463	£33,333
Total contribution (£) (rounded up)						***£54,934***
Note: (A) Converted utilising the Road Transport PM_{10} to $PM_{2.5}$ factor of 0.635.						

In summary, over a 5-year period (commencing from 2027 – the assumed opening year of development), an emission cost has been calculated at **£54,934**.

The above damage cost provides an indicator of the financial commitment required to offset emissions. The amount (value) determined is not a direct indication of the monetary contribution required to off-set impacts upon air quality. Rather, the scale of damage cost will determine the level of appropriate mitigation required for specific proposals. The Interdepartmental Group on Costs and Benefits (IGCB) department of DEFRA, who produced the 'Damage Cost' guidance, has stated that[24]:

> *"The damage costs methodology was designed for economic appraisal of government policies that lead to air quality changes and wider cost-benefit analysis. While our guidance can be used to estimate the damage to society caused per tonne of emissions, we don't provide any recommendations for the right level of compensation required to offset the impacts of air pollution."*

[24] E-mail communication between Interdepartmental Group on Costs and Benefits department of DEFRA, and SLR Consulting Ltd, dated 28th January 2016.

8.0 CONCLUSIONS

SLR Consulting Ltd has been commissioned to undertake an assessment of potential air quality impacts of a proposed residential development on Land East of Warwick Road, Banbury, comprising up to 200 residential units.

8.1 Construction Phase

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

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

Given the short-term nature of the construction phase and the comparatively low volume of vehicle movements that will likely arise (when compared to the operational phase, for which a full assessment has been undertaken), there is predicted to be an insignificant effect on air quality from construction-generated vehicle emissions.

8.2 Operational Phase

The assessment of operational phase effects considered impacts on all relevant receptors from road traffic emissions associated with the Proposed Development.

The ADMS-Roads dispersion model was used to determine the likely NO_2, PM_{10} and $PM_{2.5}$ concentrations at all assessed receptor locations for a series of scenarios, in accordance with technical guidance presented in LAQM.TG(16). Predicted pollutant concentration changes relevant receptor locations as a result of the Proposed Development were assessed using the EPUK/IAQM significance criteria.

In accordance with EPUK/IAQM guidance, the impacts of the Proposed Development on NO_2, PM_{10} and $PM_{2.5}$ concentrations at all assessed receptor locations are considered to be 'negligible'. Unmitigated effects associated with NO_2, PM_{10} and $PM_{2.5}$ concentrations at all assessed receptor locations are therefore considered 'not significant'.

A mitigation assessment (and associated Damage Cost Calculation) has been undertaken in line with the CDC AQAP and the CDC pre-application advise. This calculated a Damage Cost of £54,934 over the 5-year period following the Site becoming operational. Details of the mitigation Vistry Homes Ltd aim to include are provided in Section 7.0.

APPENDIX A – Advanced Model Input and Verification

Advanced Model Input Summary

Advanced modelling input parameters used (not previously disclosed) are summarised in Table A-1.

Table A-1
Advanced Modelling Inputs

Parameter	Input Variable
Surface Roughness	A roughness length z0 of 0.5m was used to represent the surface roughness of the principal study area – i.e. open suburbia.
	A roughness length z0 of 0.02m was used to represent the surface roughness of the meteorological site – i.e. open grassland.

Traffic Data

Traffic used within the assessment was provided by Jubb, and supplemented by the Department for Transport (DfT) Road Traffic Statistics website - as detailed in Table A-2. The 2027 DM and 2027 DS scenarios are inclusive of committed development flows.

Table A-2
Traffic Data Used Within the Assessment

Link		2019 BC		2027 DM		2027 DS		Speed (kph) [(A)]
ID	Description	AADT	% HDV	AADT	% HDV	AADT	% HDV	
1	Warwick Rd North of Site Access	5,211	4.6	8,001	4.6	8,017	4.6	66
2	Warwick Rd South of Site Access	5,211	4.2	8,001	4.2	8,853	4.2	66
3	Warwick Rd South of Drayton Northern Access	5,214	4.2	7,899	4.2	8,751	4.2	66
4	Warwick Rd South of Nickling Road	5,597	3.9	8,489	3.9	9,341	3.9	66
5/6	Warwick Rd South of Duke Meadow Rd	7,728	3.0	12,419	3.1	12,740	3.1	64
7	A422 Stratford Rd	4,583	3.8	6,252	3.8	6,299	3.8	48
8/9	Warwick Rd South of Stratford Rd	8,725	4.4	12,408	4.4	12,681	4.4	48
10	Ruscot Avenue North of Warwick Rd	12,567	3.2	17,829	3.2	17,829	3.2	48

Link		2019 BC		2027 DM		2027 DS		Speed (kph) (A)
ID	Description	AADT	% HDV	AADT	% HDV	AADT	% HDV	
11	Warwick Rd East of Ruscot Avenue	12,719	3.2	18,006	3.2	18,279	3.2	48
12	Duke Meadow Road	2,174	0.5	3,566	0.5	4,098	0.5	48
13	A361 Southam Road (DfT: 38618)	13,005	3.7	14,515	3.7	14,620	3.7	48
14	A361 North Bar Street (DfT: 56401)	19,896	3.1	22,317	3.1	22,455	3.1	48
17	Castle Street (DfT: 945922)	1,356	3.1	1,553	3.1	1,553	3.1	48
Model Verification Purposes								
15	A361 Bloxham Road (DfT: 77208)	13,096	2.5	-	-	-	-	48
16	Oxford Road (DfT: 77207)	19,025	2.5	-	-	-	-	48

Note:

(A) Speeds based upon posted National Speed Limits and average speeds recorded from traffic surveys undertaken by Jubb. Traffic speeds have been adjusted to take into account queues and congestion in accordance with LAQM.TG(16).

Model Verification

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

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

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

Consistent with advice provided by DEFRA to local authorities across England, 2019 has been used for the purposes of model verification as relates to the most recent year of monitoring data available which hasn't been impacted by the COVID-19 pandemic. Use of monitoring data recorded in 2020 for the purposes of model verification introduces an element of uncertainty into the final adjusted modelled predictions, as monitoring conditions experienced for the majority of 2020 are not deemed to be representative of long-term baseline conditions and could lead to a systematic underprediction at modelled receptor locations.

NOx / NO_2 Verification

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

For NOx / NO_2 model verification, 2019 LAQM NO_2 CDC's monitoring data has been used for those roadside locations situated adjacent to a modelled link i.e. where traffic data exists. Table A-3 presents all local monitoring data available for model verification.

Table A-3
Local Monitoring Data Available for Model Verification

Site ID	X	Y	2019 Monitored NO_2 Concentration (µg/m^3)	2019 Data Capture (%)
DT.WRN	443905	241392	20.3	100.0
DT.RA	444611	241172	18.9	100.0
DT.NB	445352	240774	34.0	100.0
DT.HF	445351	240578	38.6	100.0
DT.ORSB	445333	240100	35.3	100.0

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

Verification was completed using the 2019 DEFRA background mapped concentrations (2018 reference year) for the relevant 1km x 1km grid squares (i.e. those within which the model verification locations are located), as displayed in Section 4.1.3, with those already modelled sources removed, to avoid duplication.

Comparison of the modelled vs. monitored road NO_x contribution at all relevant verification locations outlined in Table A-3 is provided in Table A-4. An adjustment factor of 1.197 has been derived, based on a linear regression forced through zero, as shown in Figure A-1.

Table A-4
NO_x/NO_2 Model Verification (1.197)

Site ID	Monitored Road NOx (µg/m^3)	Modelled Road NOx (µg/m^3)	Ratio (Monitored vs. Modelled Road NOx)	Adjustment Factor	Adjusted Modelled Total NO_2 (µg/m^3)	Monitored Total NO_2 (µg/m^3)	% Difference (Adjusted Modelled NO_2 vs Monitored NO_2)
DT.WRN	22.1	11.6	1.9	1.197	16.0	20.3	-21.0
DT.RA	13.1	12.8	1.0		20.1	18.9	6.2
DT.NB	42.3	21.9	1.9		26.4	34.0	-22.5
DT.HF	52.5	51.1	1.0		42.3	38.6	9.6
DT.ORSB	45.2	37.3	1.2		35.1	35.3	-0.7

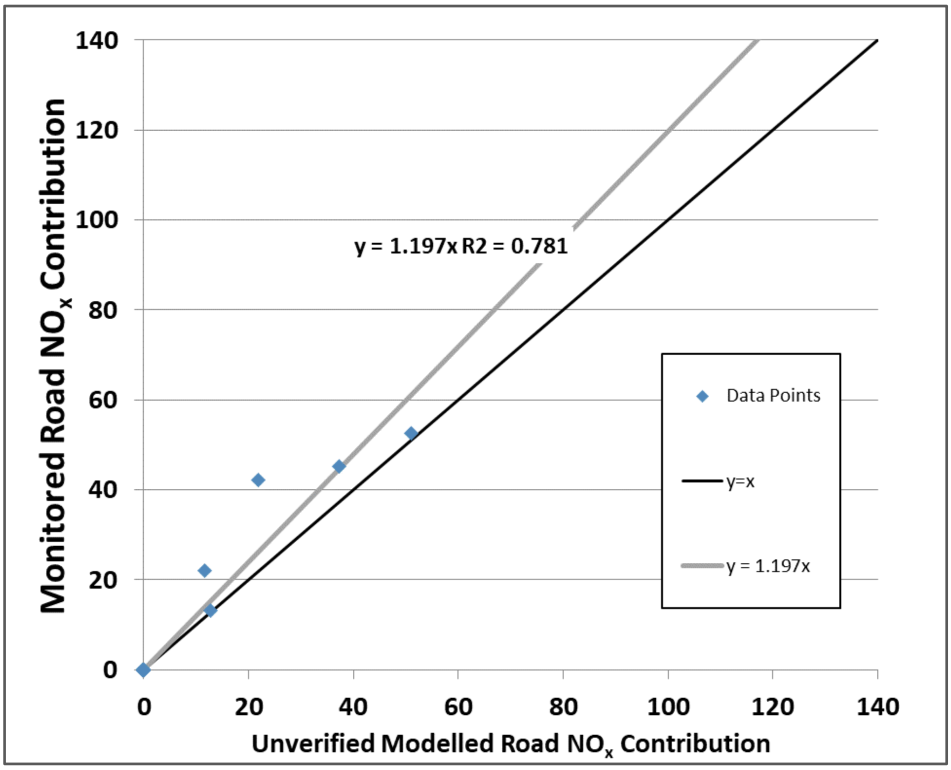

Figure A-1
Comparison of Modelled vs. Monitored Road NO_x Contributions (1.197)

LAQM.TG(16) states that:

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

Table A-4 illustrates that the difference between the adjusted modelled NO_2 and monitored NO_2 is within ±25% at all verification locations and therefore within the LAQM.TG(16) prescribed limit. In addition, a verification factor of 1.197 reduces the Root Mean Square Error (RMSE) from a value of 5.3µg/m^3 to 4.3µg/m^3 (i.e. 10.8% of the annual mean NO_2 AQAL) – within the LAQM.TG(16) prescribed tolerance limit (25% of the annual mean AQAL). On this basis, the derived verification factor (1.197) was considered acceptable and was subsequently applied to all road-NOx concentrations predicted (as output of the ADMS Roads dispersion model).

PM_{10} / $PM_{2.5}$ Verification

The calculated NOx adjustment factors discussed above were also applied to road-PM_{10} and $PM_{2.5}$ concentrations (as output of the ADMS Roads dispersion model), following the recommendations of LAQM.TG(16) guidance, in the absence of local particulate monitoring.

APPENDIX B – Sensitivity Analysis

In consideration of the potential uncertainty in predictions of future year pollutants, as well as the current national and local sensitivities seen in response to elevated roadside NO_2 concentrations, an additional scenario has been assessed (as described in Section 3.2.7) which considers:

- 2019 NOx / NO_2, background concentrations (2018 reference year); and
- 2019 NOx emission factors obtained from EFT v11.0.

Use of these variables therefore assumes that there is no improvement in either emission factors and / or background concentrations within CDC for future years, relative to 2019. These modelled scenarios are likely to represent an overly conservative approach as, despite uncertainty in quantification, it is generally accepted that variables such as background concentrations and / or vehicle emission factors will improve to some degree in future years.

The results of this sensitivity assessment with respect to annual mean NO_2 concentrations are presented in Table B-1 below. Any exceedences are displayed in bold text.

Table B-1
Predicted Annual Mean NO_2 Concentrations: Sensitivity Test

Receptor	Predicted Annual Mean NO_2 Concentration (µg/m^3)			% Change of AQAL	% of 2019 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2019 DM	2019 DS			
Existing Receptors						
HR1	9.5	9.9	10.0	0.3	25.0	Negligible
HR2	10.6	11.7	12.0	0.8	30.0	Negligible
HR3	9.8	10.4	10.6	0.4	26.5	Negligible
HR4	10.2	11.1	11.4	0.6	28.5	Negligible
HR5	11.0	12.4	12.6	0.6	31.5	Negligible
HR6	9.5	10.0	10.1	0.3	25.3	Negligible
HR7	10.6	11.8	12.2	1.0	30.5	Negligible
HR8	10.7	12.0	12.5	1.1	31.3	Negligible
HR9	9.6	10.2	10.4	0.5	26.0	Negligible
HR10	10.5	11.7	12.2	1.1	30.5	Negligible
HR11	9.3	9.8	10.0	0.4	25.0	Negligible
HR12	11.3	12.2	12.5	0.7	31.3	Negligible
HR13	10.6	11.1	11.2	0.4	28.0	Negligible
HR14	10.6	11.0	11.2	0.4	28.0	Negligible
HR15	14.4	14.8	14.9	0.3	37.3	Negligible
HR16	19.0	20.7	20.8	0.2	52.0	Negligible
HR17	20.3	21.7	21.8	0.2	54.5	Negligible
HR18	19.7	20.8	20.8	0.2	52.0	Negligible
HR19	17.0	17.6	17.6	<0.1	44.0	Negligible

Receptor	Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)			% Change of AQAL	% of 2019 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2019 DM	2019 DS			
HR20	35.3	37.7	37.8	0.4	94.5	Negligible
HR21	23.7	24.9	24.9	0.2	62.3	Negligible
HR22	20.0	20.7	20.7	0.1	51.8	Negligible
HR23	20.0	20.5	20.6	0.1	51.5	Negligible
HR24	16.0	16.2	16.2	<0.1	40.5	Negligible
HR25	18.5	18.6	18.6	<0.1	46.5	Negligible
New Receptors						
N_HR1	-	-	10.0	-	25.0	-
N_HR2	-	-	9.8	-	24.5	-
N_HR3	-	-	9.8	-	24.5	-
N_HR4	-	-	10.3	-	25.8	-

The maximum predicted annual mean NO_2 concentration at all existing receptors with the development in place (2019 DS) was at Receptor HR20 with a predicted concentration of 37.8$\mu g/m^3$, representing 94.5% of the AQAL. The change in the annual mean NO_2 concentrations at this location, due to the Proposed Development (2019 DS vs. 2019 DM) relative to the AQAL was 0.4% (i.e. 0.1$\mu g/m^3$).

The greatest predicted increase in annual mean NO_2 concentrations due to the Proposed Development (2019 DS vs. 2019 DM) relative to the AQAL was 1.1% at receptors HR8 and HR10.

In accordance with EPUK/IAQM guidance, the impact of the development on annual mean NO_2 concentrations at all assessed existing receptors is considered to be 'negligible'. Given the overly-conservative methodology applied within the sensitivity assessment (i.e. 2027 traffic flows with no improvement in background concentrations or emission factors from 2019), unmitigated effects associated with case sensitivity annual mean NO_2 concentrations at all assessed receptor locations are therefore still considered to be 'not significant'.

The empirical relationship given in LAQM.TG(16) states that exceedences of the 1-hour mean AQAL for NO_2 are only likely to occur where annual mean concentrations are 60$\mu g/m^3$ or above. Annual mean NO_2 concentrations predicted at all receptor locations are well below this limit, despite the overly worst-case nature of the sensitivity assessment approach. Effects associated with case sensitivity 1-hour mean NO_2 concentrations at all assessed receptor locations are therefore considered to be 'not significant'.

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