AIR POLLUTION SERVICES

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Air Quality Assessment: Nuneaton and Bedworth Borough Plan Review

Date: 31 July 2023

Quality Assurance

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03	31/07/2023	Minor updates to text	EJ	AC	AC

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Experts in Air Quality, Odour and Climate Change

Contents

1. Introduction

1.1. Air Pollution Services (APS), part of KALACO Group Ltd, has been commissioned by Nuneaton and Bedworth Borough Council (the 'Client') (NBBC) to assess the air quality impacts associated with the proposed housing and employment allocations set out in the Borough Plan within the administrative boundary of Nuneaton and Bedworth Borough Council.

1.2. NBBC has identified locations with measured exceedances of the annual mean nitrogen dioxide (NO_2) objective. As a result, two Air Quality Management Areas (AQMAs) have been declared in Nuneaton.

1.3. The spatial planning system has an important role to play in improving air quality and reducing exposure to air pollution both within these AQMAs and elsewhere in the district. In particular, the Borough Planning policies set the framework for the determination of individual planning applications.

1.4. NBBC is currently preparing an updated Borough Plan for Nuneaton and Bedworth, which will guide the area's future development for the next 16 years. The updated Borough Plan process will consider various sources of evidence to inform the NBBC's emerging policies. Extensive analysis of the transport impacts of the proposals has already been undertaken using Warwickshire County Council's (WCC's) Nuneaton and Bedworth Wide Area (NBWA) Paramics model. Details are provided in the Strategic Transport Assessment (Vectos microsim, 2023). This work involved calculating the impacts of the proposals on peak-hour traffic flows in Nuneaton and Bedworth, including within the Nuneaton AQMAs. Air quality is an issue that has been identified as requiring further work to ascertain the impacts of development decisions on these areas in more detail. This report uses the outputs of the Paramics traffic model, to assess air quality impacts (in terms of concentrations) of the emerging Borough Plan in Nuneaton and Bedworth, paying particular attention to the AQMAs in Nuneaton and the AQMA in the neighbouring borough of Coventry.

1.5. The air quality impacts from development associated with the adopted Borough Plan have previously been assessed (AQC, 2018). The housing requirements within the Borough Plan have since changed and this report assesses the air quality impacts from changes in road traffic emissions associated with the emerging Borough Plan. This report describes existing local air quality conditions (2019), which have also been used to verify the model, and the predicted air quality in 2031 and 2039 assuming that the emerging Borough Plan either does or does not proceed.

1.6. The assessment has been carried out by APS. Further details of the assessment authors are set out in Section 12.

1.7. This document provides an assessment of the baseline conditions and impacts of the emerging Borough Plan with regards to ambient air quality, as well as relevant context in terms of planning policy, strategies and legislation. This document should be read in conjunction with the following appended documents:

- Air Quality Policy/Legislation Context: Nuneaton and Bedworth Borough Plan Review, APS_L1007A_C1-1 (Appended)

- Air Quality Baseline: Nuneaton and Bedworth Borough Plan Review, APS_L1007A_D1-2 (Appended)
- Air Quality Modelling Approach: Nuneaton and Bedworth Borough Plan Review, APS_L1007A_E1-2 (Appended)
- Air Quality at Locations of Human Health Exposure: Nuneaton and Bedworth Borough Plan Review, APS_L1007A_G1-1 (Appended)

2. Local Air Quality Management

2.1. This report has been produced in recognition of the legal requirement on the local authority to work towards Air Quality Strategy (AQS) objectives under Part IV of the Environment Act 1995 (HMSO, 1995) and relevant regulations (and amendments through the Environment Act 2021) made under that part and to meet the requirements of the Local Air Quality Management (LAQM) statutory process.

2.2. Local Authorities are required to review and assess air quality in their areas and to report annually against air quality objectives for specified pollutants of concern, to Defra. For each air quality objective, local authorities have to consider whether the objective is likely to be achieved. Where it appears likely that an air quality objective (AQO) is not being met, the authority must declare an AQMA. Following the declaration of an AQMA, the authority must then develop an Air Quality Action Plant (AQAP) which sets out the local measures to be implemented in pursuit of the air quality objectives.

2.3. The range of pollutants which need to be considered includes NO_2. NBBC have declared two AQMAs for this pollutant and produced an AQAP; therefore, NO_2 is the primary pollutant of concern.

3. Limit Values

3.1. In addition to the Air Quality Standards and Objectives, the UK Government has also set limit values for the protection of human health. These legally binding parameters are set out in the Air Quality Standards Regulations 2010 (HM Government, 2010) and amended in The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 (HM Government) and must not be exceeded. Limit values (LVs) are set for individual pollutants and are made up of a concentration value, an averaging time over which it is to be measured, the number of exceedances allowed per year, if any, and a date by which it must be achieved. Some pollutants have more than one LV covering different endpoints or averaging times.

3.2. Compliance with LVs is a national obligation. The LVs cover a range of pollutants, including NO_2.

4. $PM_{2.5}$ Targets

4.1. The Environment Act (2021) requires the Secretary of State to set a long-term target (defined as no less than 15 years after the date on which the target was set) to reduce people's exposure to $PM_{2.5}$. It also enables the Secretary of State to set other air quality targets, including for other air pollutants.

4.2. The targets are an annual mean concentration target (AMCT) of 10 µg/m^3 by 2040 together with a 35% population exposure reduction target (PERT) by 2040 compared to 2018. The Environmental

Targets (Fine Particulate Matter) (England) Regulations 2023 (HM Government) (SI 2023/96) set these targets in legislation.

4.3. The Secretary of State must prepare an Environmental Improvement Programme (EIP) and produce an annual report on the implementation of the EIP, including progress towards meeting the targets. Every five years the EIP must be reviewed. The current EIP was published in 2023 (HM Government, 2023). This includes two interim targets to be achieved by the end of January 2028. These are an AMCT of 12 µg/m^3 and a PERT of 22% compared to 2018.

4.4. While the $PM_{2.5}$ targets are published, there is an explicit instruction from the Chief Planning Office to local authorities (DLUHC, 2023) advising them not to currently (at the time this report was prepared) consider the $PM_{2.5}$ targets as part of assessments.

4.5. Furthermore, Defra is in the process of determining how to integrate the targets into the planning system including at the strategic planning level.

4.6. Compliance with the targets will be assessed using measurements at a series of reference analysers. The Borough do not currently have one of these analysers within the boundary. There has, however, been a permitted development application for an analyser at Millais Close in Bedworth (ref: 039450). The application has been granted and it is anticipated that it will be operational by the end of 2023 or the beginning of 2024.

4.7. The targets are based on modelling carried out on behalf of Defra. This modelling incorporates the complex nature of the formation of $PM_{2.5}$ in the atmosphere which is an important part of the total concentrations. The modelling is based on an emission reduction strategy which relies on all sectors and the whole county delivering reduction. Achieving the targets is a national requirement, however, the latest air quality strategy puts an emphasis on local authorities supporting through ensuring emissions are reduced.

5. Evidence Scope

5.1. The evidence in this study only considers the impact on NO_2 concentrations due to traffic emissions associated with the emerging Borough Plan.

5.2. Achievement of the AQOs and LVs of all other pollutants is expected nationally and therefore not considered.

5.3. This study does not address the compliance with the $PM_{2.5}$ targets, however, further work can be carried out to present the range of statistics in relation to $PM_{2.5}$ looking at:

- The direct emissions which the local authority may have some control over, including a detailed emissions inventory for the local authority. From this the emission reductions the local authority would need to deliver to support the national Government in their obligations.
- The predicted concentrations incorporating both the direct emissions and the secondary formation in the atmosphere along with background and transboundary imported concentration (concentration from outside the Borough).
- Presentation of information including:

- Median, mean, maximum and 95th percentile of annual mean concentrations across the Borough.
- People Exposed - Population (number of people) living in locations above a threshold.
- Area Exposed - Area above a threshold.
- Accumulative Exceedance.
- Population weighted mean concentration (PWMC).
- Population weighted mean exceedance (PWME).
- Population Weighted Exposure Level (PWEL).

- This will enable confirmation that the plan would be consistent with the required emission reduction and exposure reduction at the local authority level in line with the national obligations and the Air Quality Strategy.

6. The Emerging Borough Plan

6.1. NBBC have conducted a Borough Plan review which has sought to assess the remaining options that have not yet come forward as part of the original Borough Plan as well as sites that could be adopted to extend the plan delivery period.

6.2. The aim is to determine the potential air quality impacts of delivering the development allocations identified through the emerging Borough Plan. The key focus of this assessment is to identify any air quality risks and set out appropriate mitigation measures as required to support the planned growth in the Borough up until 2039.

6.3. An additional sensitivity test assessment, including the site allocations within the neighbouring Local Authorities, has also been considered within this study.

6.4. The emerging Borough Plan allocation sites have been informed by NBBCs Preferred Options Site Assessment document included as Appendix B of the Strategic Transport Assessment (Vectos microsim, 2023). This includes a mix of both strategic and non-strategic residential and employment sites. Several of the sites have already been granted permission and are therefore already included as Committed Development sites within the Reference case scenarios, i.e. SHA-1, Top Farm and SEA-1, Gypsy Lane.

6.5. The sites were then limited, as is common practice in assessments of this nature, to developments with 50 dwellings or greater, or in the case of employment sites, the equivalent trip generation levels, roughly 0.6 Has. As such, smaller sites have not been explicitly included within the assessment and are, instead, accounted for indirectly through the forecasting methodology and general growth informed by the forecasts derived from the National Trip End Model (NTEM).

6.6. Figure 1 illustrates the location of all emerging Borough Plan allocation sites identified, and Figure 2 illustrates the sites explicitly included within the scenarios.

Figure 1: NBBC Borough Plan Site Allocation Locations – All

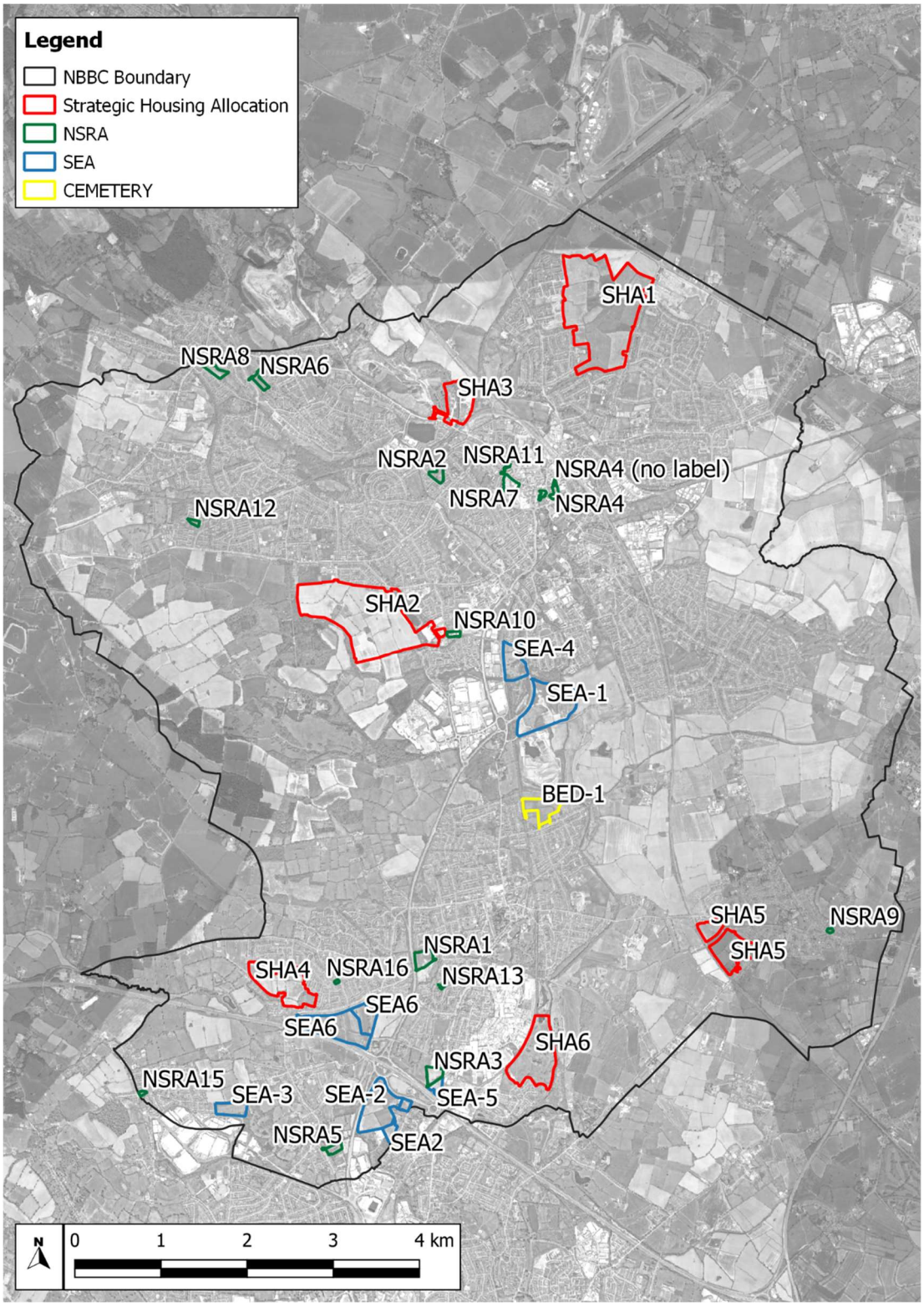
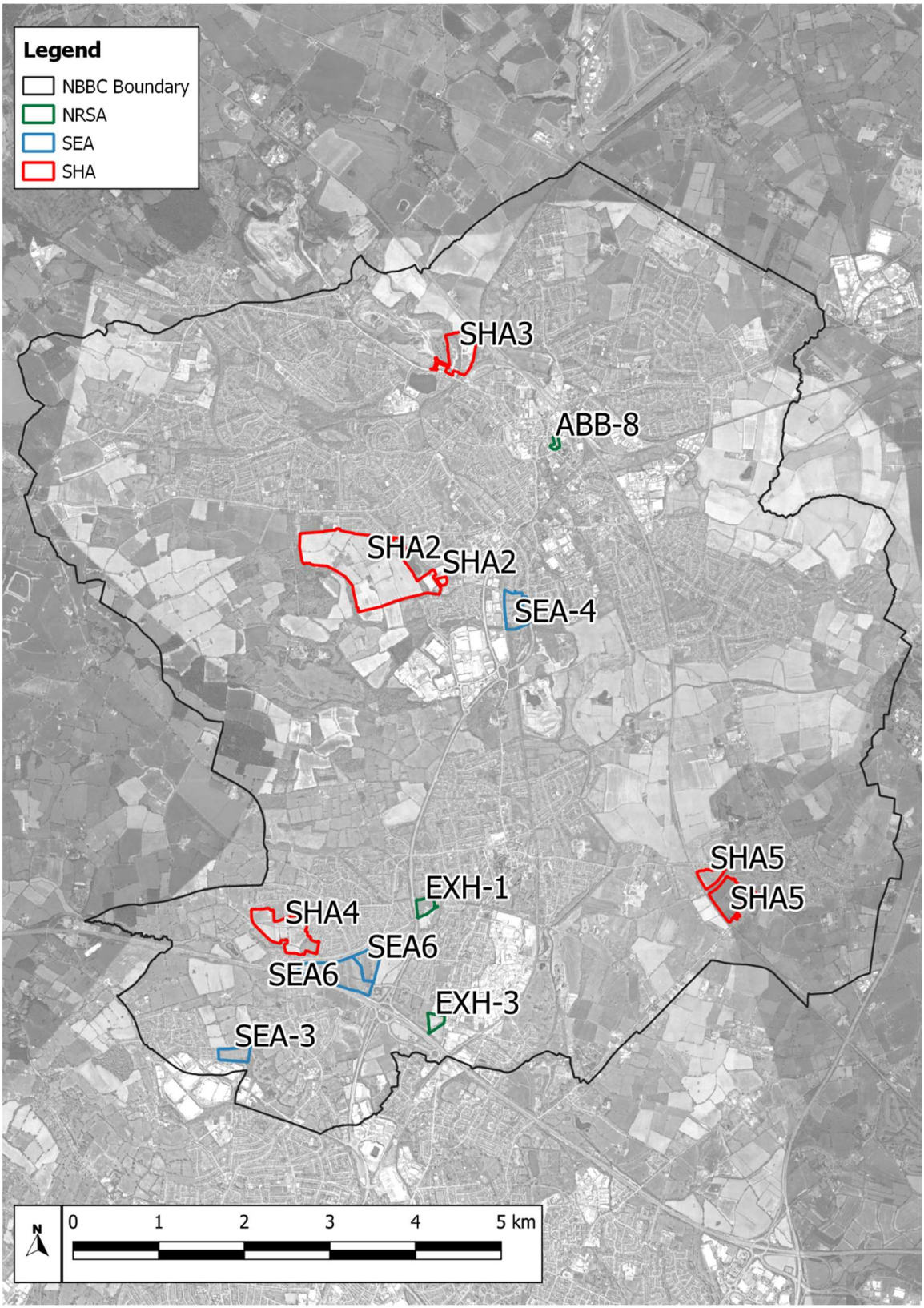


Figure notes: Imagery © 2023 Google, Map data © 2023 Google

Figure 2: NBBC Borough Plan Site Allocation Locations - Filtered



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7. Baseline Conditions

7.1. NBBC has declared two AQMAs for exceedances of the annual mean NO_2 AQO (NBBC, 2021). The Leicester Road Gyratory AQMA was declared in 2007 and the Midland Road/Corporation Street AQMA was declared in 2009.

7.2. Baseline conditions have been considered from a variety of sources, including NBBC measurements, Defra predicted background and roadside concentrations, and predicted concentrations for Reference scenario traffic flows from the WCC's NBWA Paramics model (see appended document APS_L1007A_D1-1 for further details). The predicted concentrations are based on detailed dispersion modelling (see appended document APS_L1007A_E1-1) which has been verified against NBBC measured concentrations. These predicted baseline concentrations in 2031 and 2039 are presented in Figure 3 and Figure 4 respectively.

7.3. Concentrations within Coventry City Council (CCC) boundary have also been displayed due to the proximity of the Coventry AQMA to the NBBC boundary.

Figure 3: Predicted Baseline Annual Mean NO_2 Concentrations in 2031

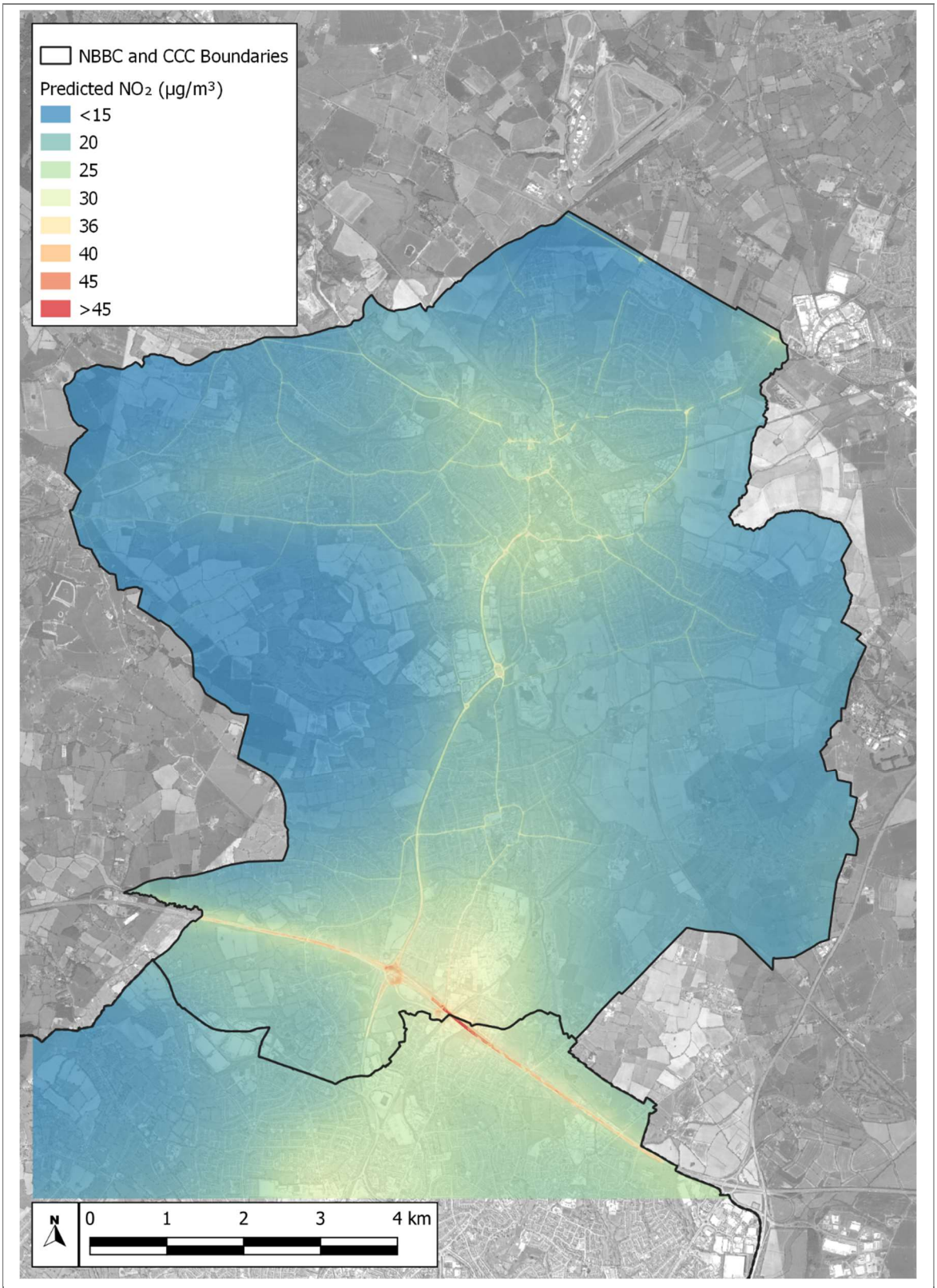

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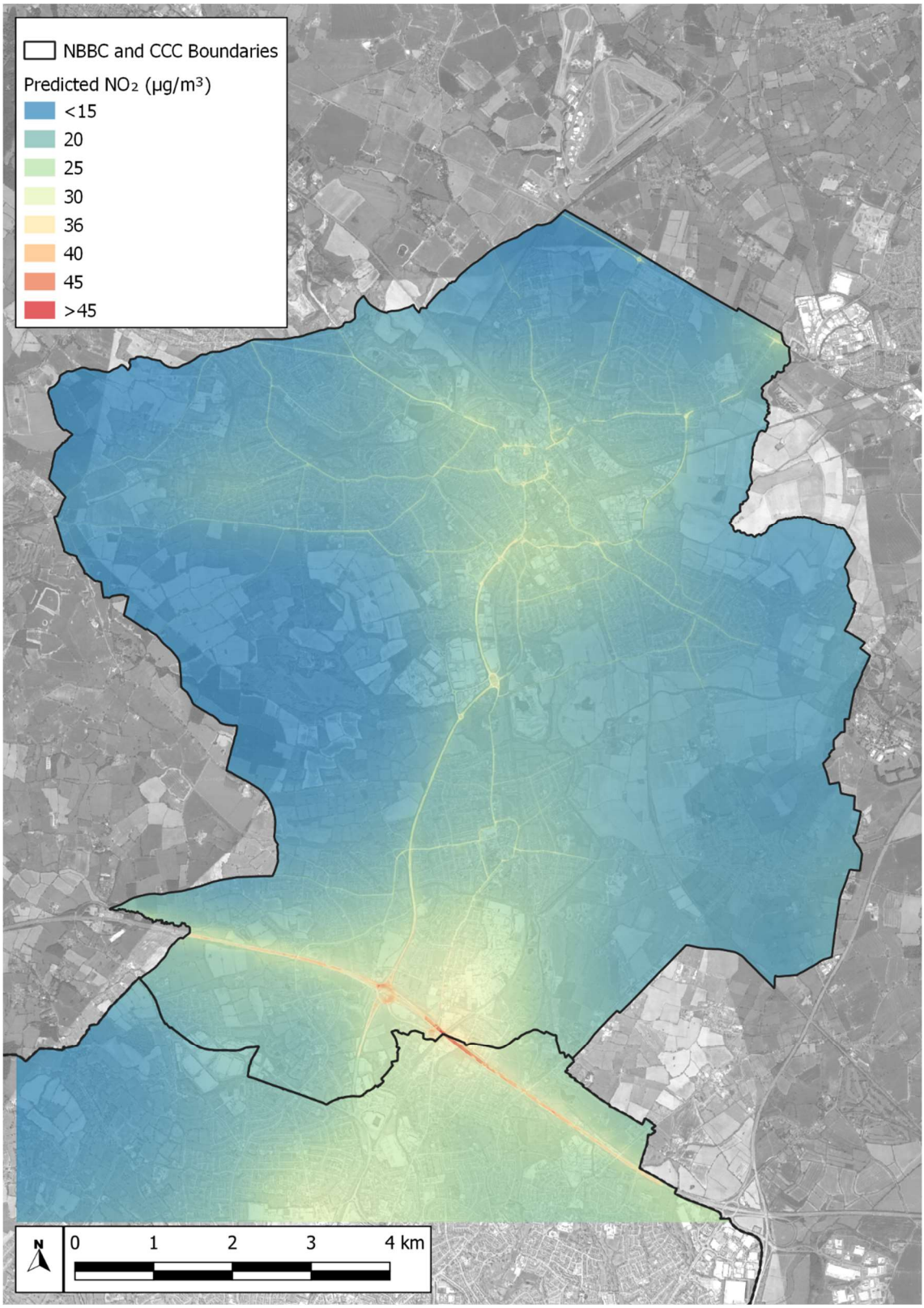
Figure 4: Predicted Baseline Annual Mean NO_2 Concentrations in 2039



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Air Quality Objective Compliance

7.4. Measured annual mean NO_2 concentrations within the borough exceeded the AQO at two locations in 2019 (16 and 52 Midland Road). No other exceedances were recorded within the borough, but predicted concentrations demonstrate there were likely to be other locations in exceedance throughout the borough.

7.5. By 2031, concentrations are predicted to be significantly lower due to the Government's assumed reduction in emissions from vehicles (as more lower emission vehicles are adopted) and cleaner technologies for other pollution sources come through. This includes the end of the sale of petrol and diesel cars by 2030.

7.6. Between 2031 and 2039 predicted concentrations continue to reduce but only marginally.

7.7. There are no exceedances predicted in 2031 or 2039.

Limit Value Compliance

7.8. There are several relevant locations within Nuneaton where the LV is predicted to be non-complaint in 2019; however, these have not been identified at sensitive receptor locations. Defra has predicted there to be no exceedances in 2023 or 2030. In 2031 and 2039, there are no predicted exceedances of the LV at relevant locations for compliance reporting.

8. Evidence – Air Quality Impacts of the emerging Borough Plan

8.1. The impacts of development associated with the emerging Borough Plan upon air quality in the borough have been considered, as well as within Coventry City Council's AQMA. The impacts of emissions from changes in operational vehicle movements on local roads has been assessed using detailed dispersion modelling (see appended document APS_L1007A_E1-1).

Predicted Concentrations

8.2. Concentrations of NO_2 have been predicted at relevant locations of sensitive exposure in the borough and within Coventry City Council's AQMA for the years of 2031 and 2039 assuming the Borough Plan is implemented ('Do Something' scenario). In addition, a sensitivity test has been carried out for the year of 2039 to take account of mode shift ('Do Something' scenario with Mode Shift), further details of which can be found in the Strategic Transport Assessment (Vectos microsim, 2023).

8.3. The predicted concentrations for each of the scenarios are presented below in Figure 5, Figure 7 and Figure 9. The predicted changes in concentrations compared to the baseline situations are presented in Figure 6, Figure 8 and Figure 10 which have been used in conjunction with guidance from Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) (2017) to determine the impacts and significance of the emerging Borough Plan. Further details are set out in the appended document APS_L1007A_G1-1.

8.4. Predicted concentrations of NO_2 for the 2031 'Do Something' scenario in relation to Strategic Housing Allocations (SHAs) are displayed in Figure 11. Statistics at these locations are shown in Table 1.

Figure 5: Predicted Annual Mean NO_2 Concentrations in 2031 in the 'Do Something' scenario

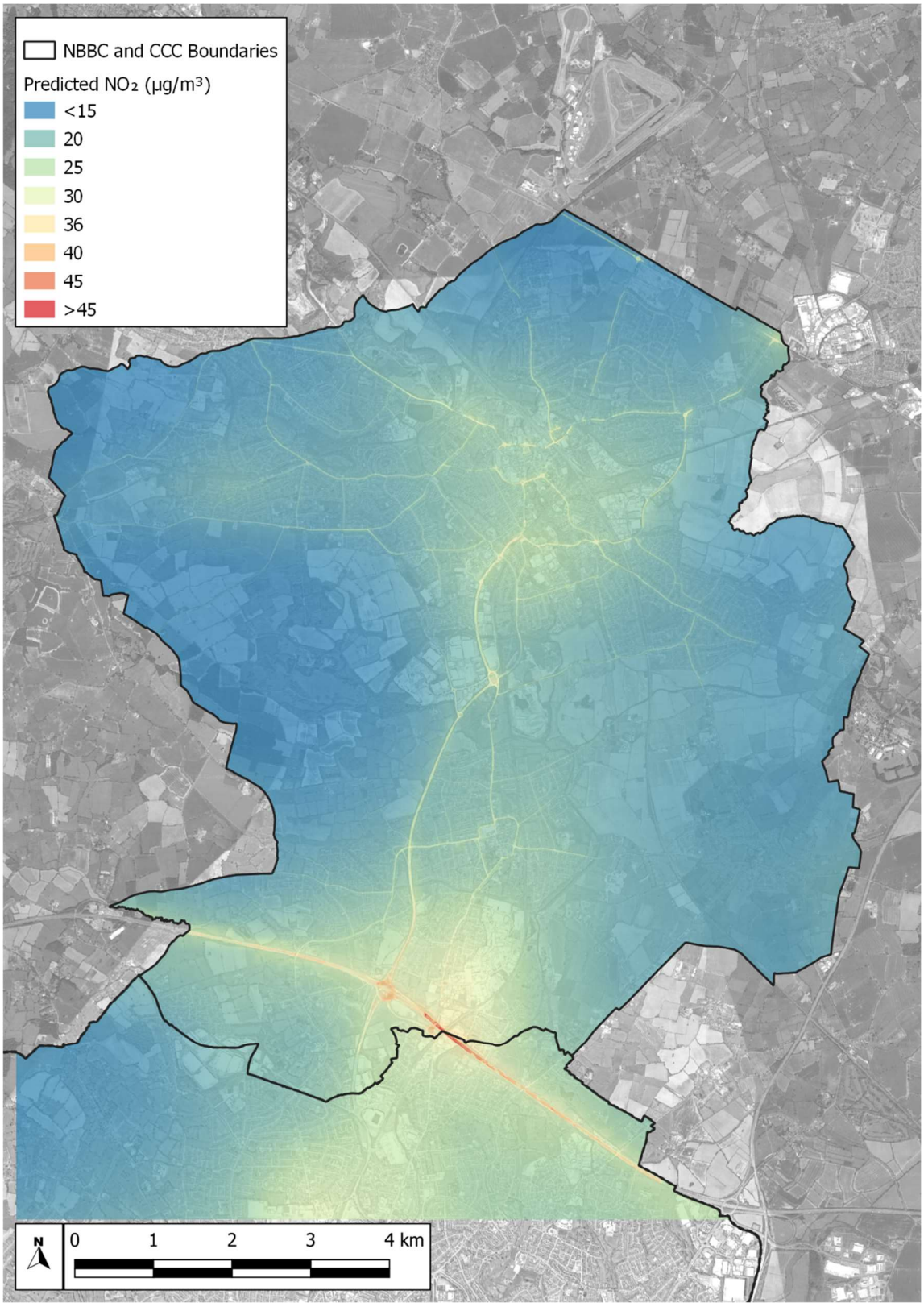

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Figure 6: Predicted Annual Mean NO_2 Concentration Change 2031 in the 'Do Something' scenario

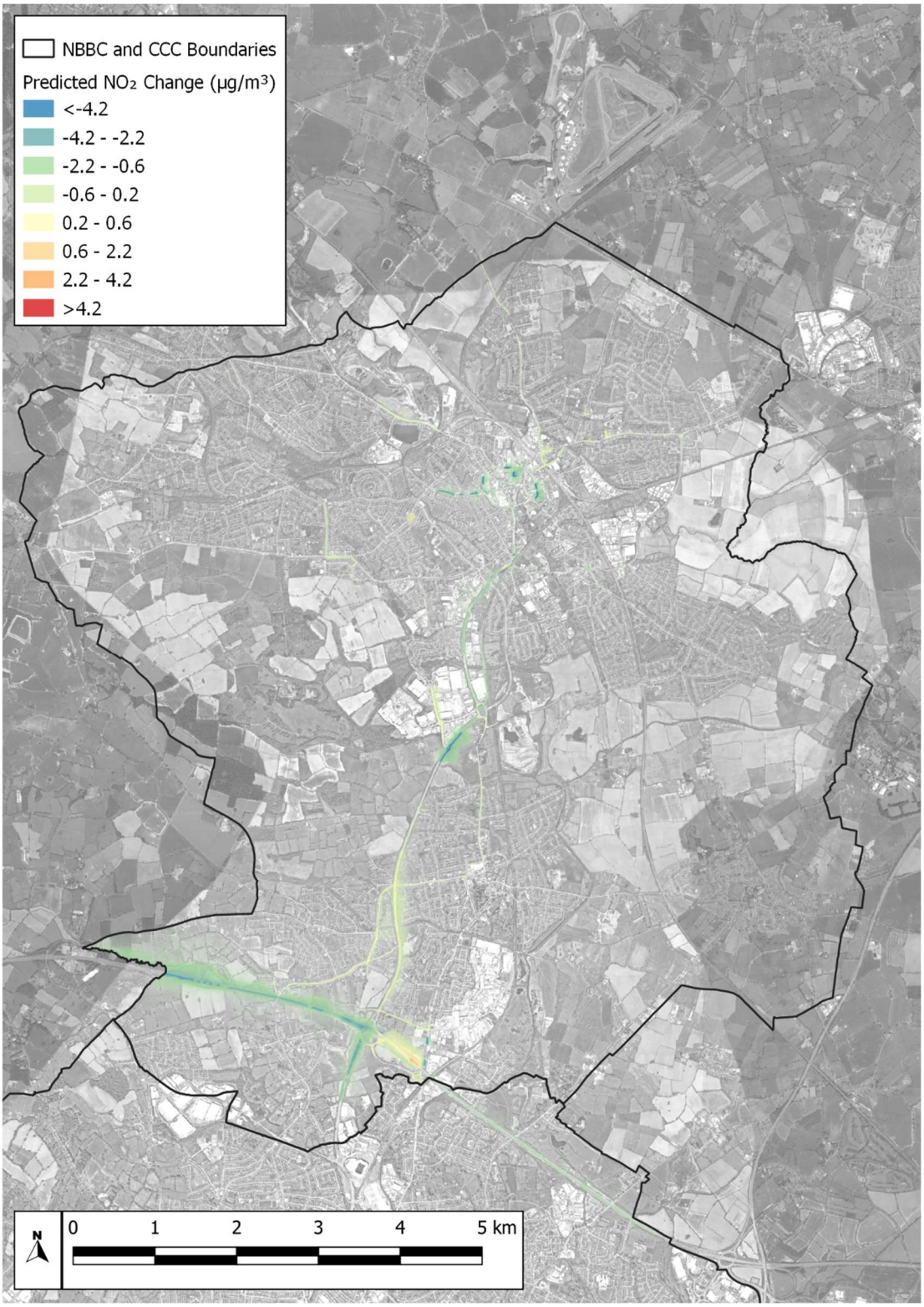

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Figure 7: Predicted Annual Mean NO_2 Concentrations in 2039 in the 'Do Something' scenario

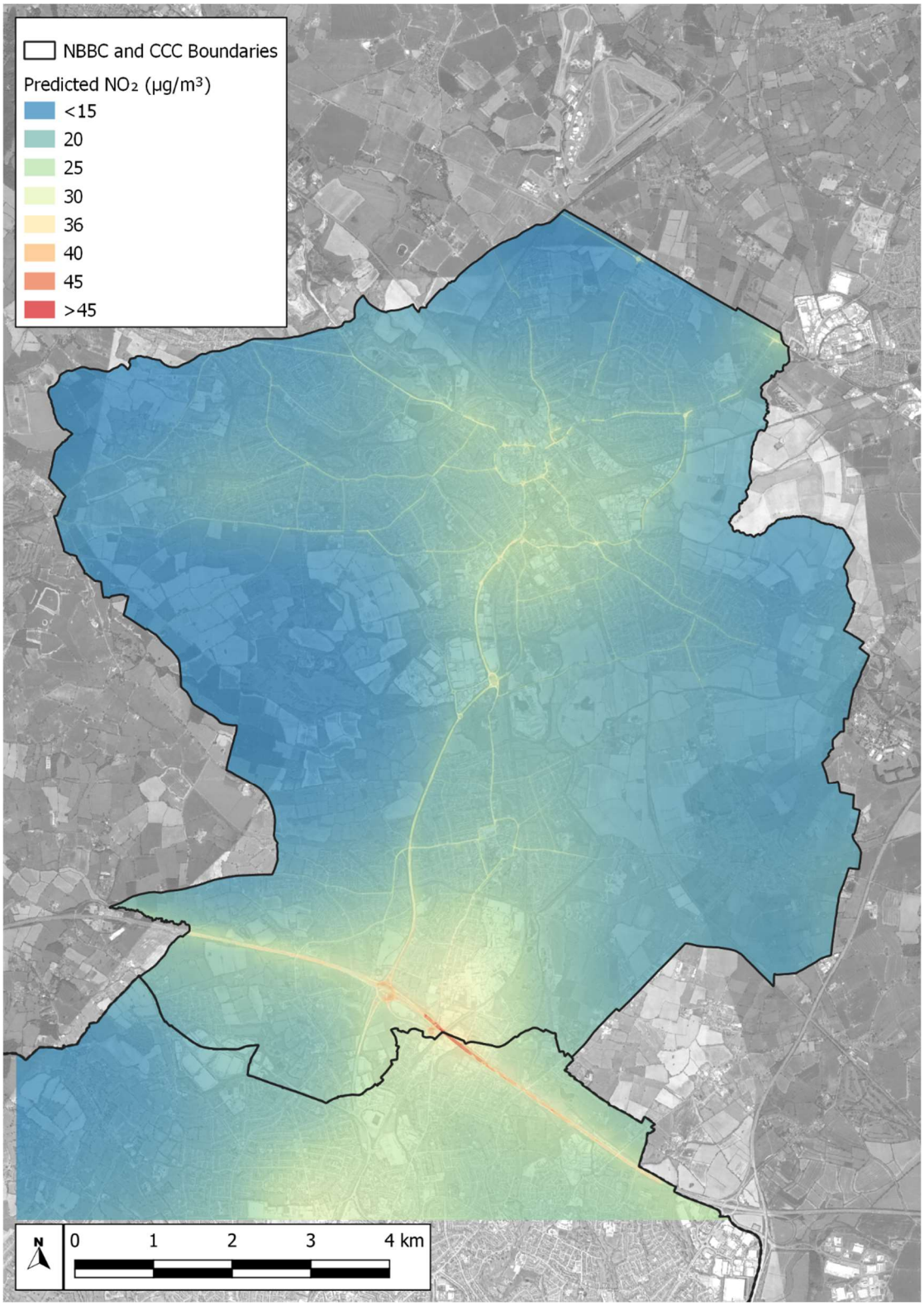

Figure notes: Imagery © 2023 Google, Map data © 2023 Google

Figure 8: Predicted Annual Mean NO_2 Concentration Change 2039 in the 'Do Something' scenario

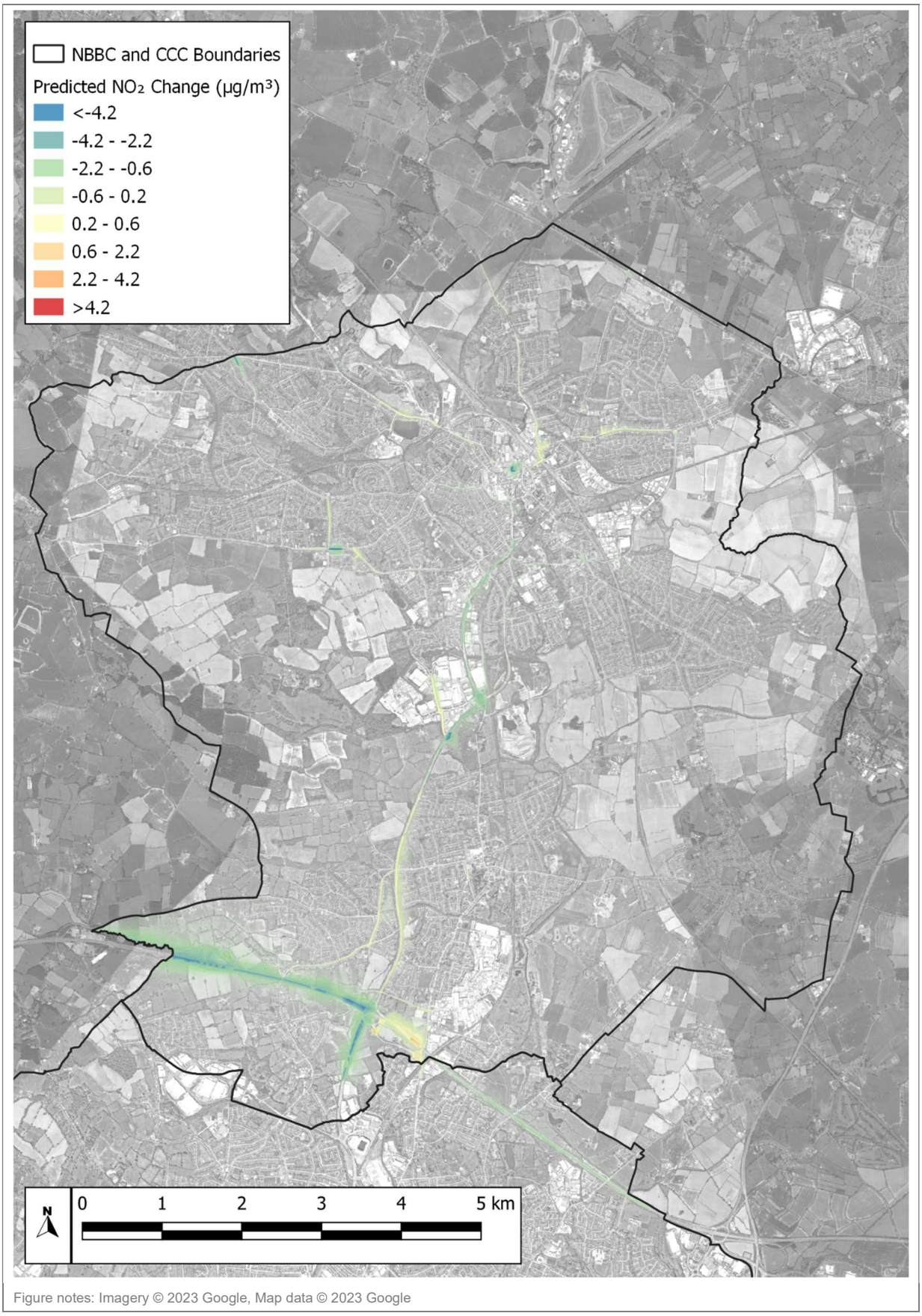

Figure notes: Imagery © 2023 Google, Map data © 2023 Google

Figure 9: Predicted Annual Mean NO_2 Concentrations in 2039 in the 'Do Something' scenario with Mode Shift

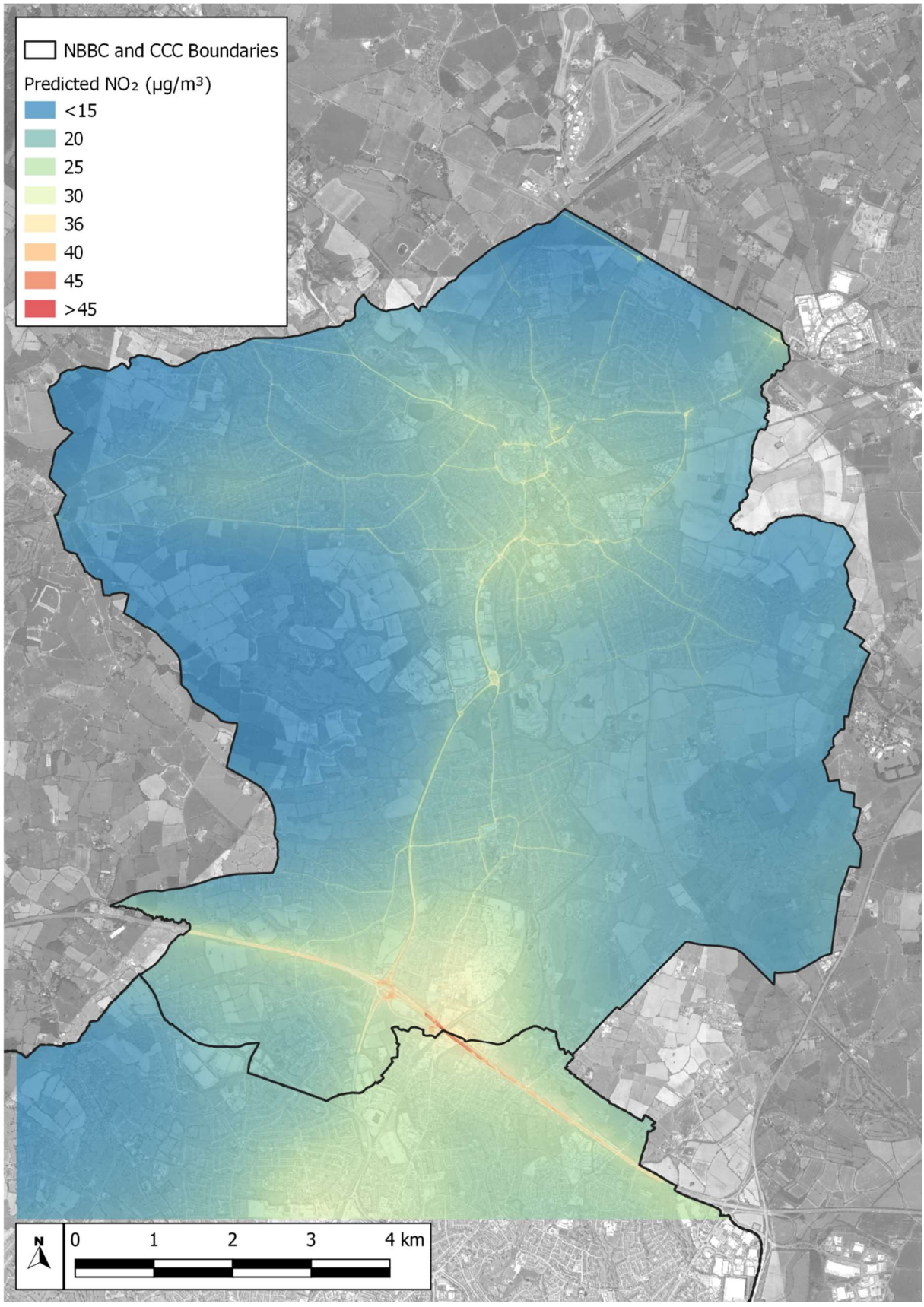

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Figure 10: Predicted Annual Mean NO_2 Concentration Change 2039 in the 'Do Something' scenario with Mode Shift

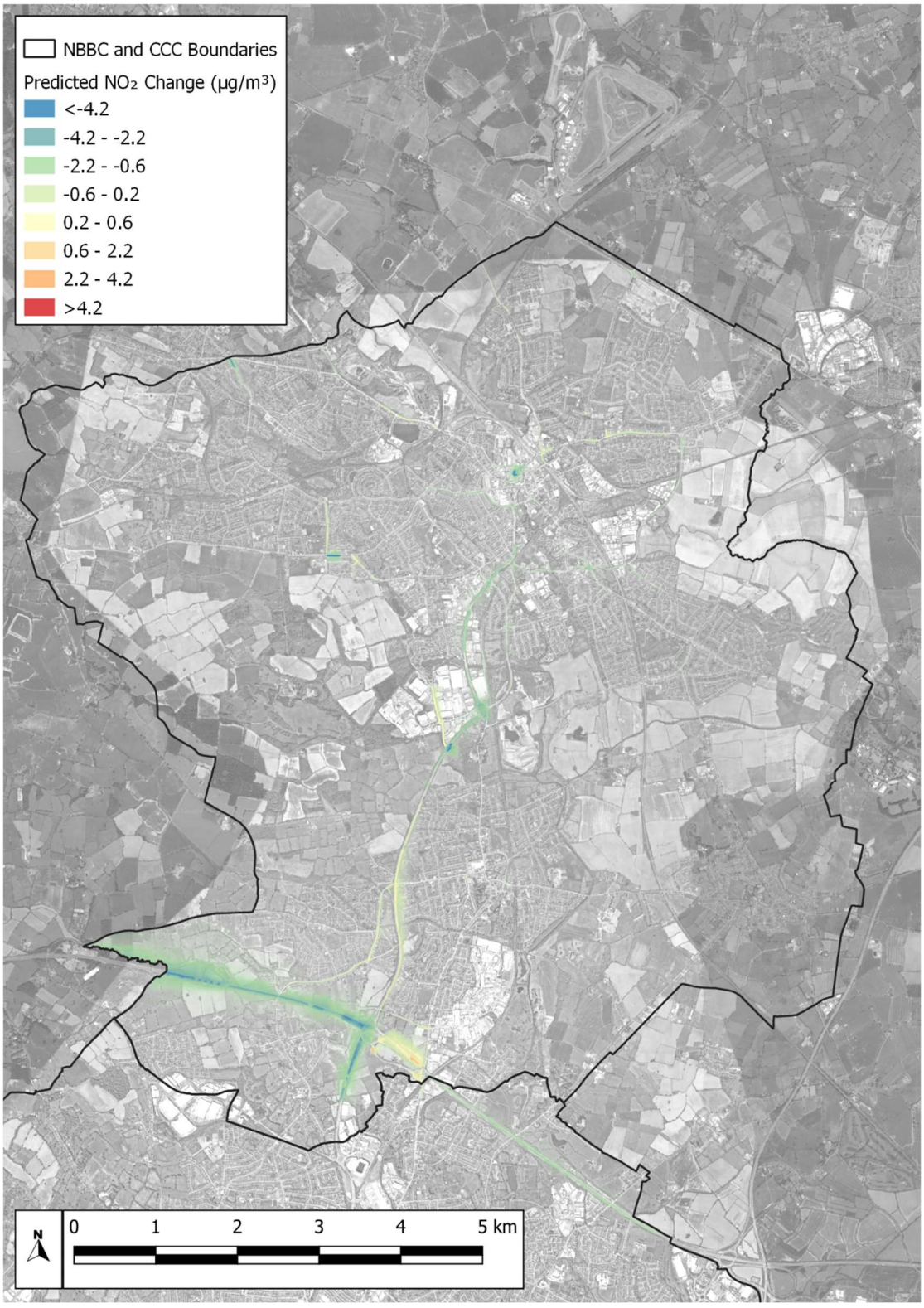

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Figure 11: Predicted NO_2 Concentrations for 2031 'Do Something Scenario' with Strategic Housing Allocation LocaionsLocations

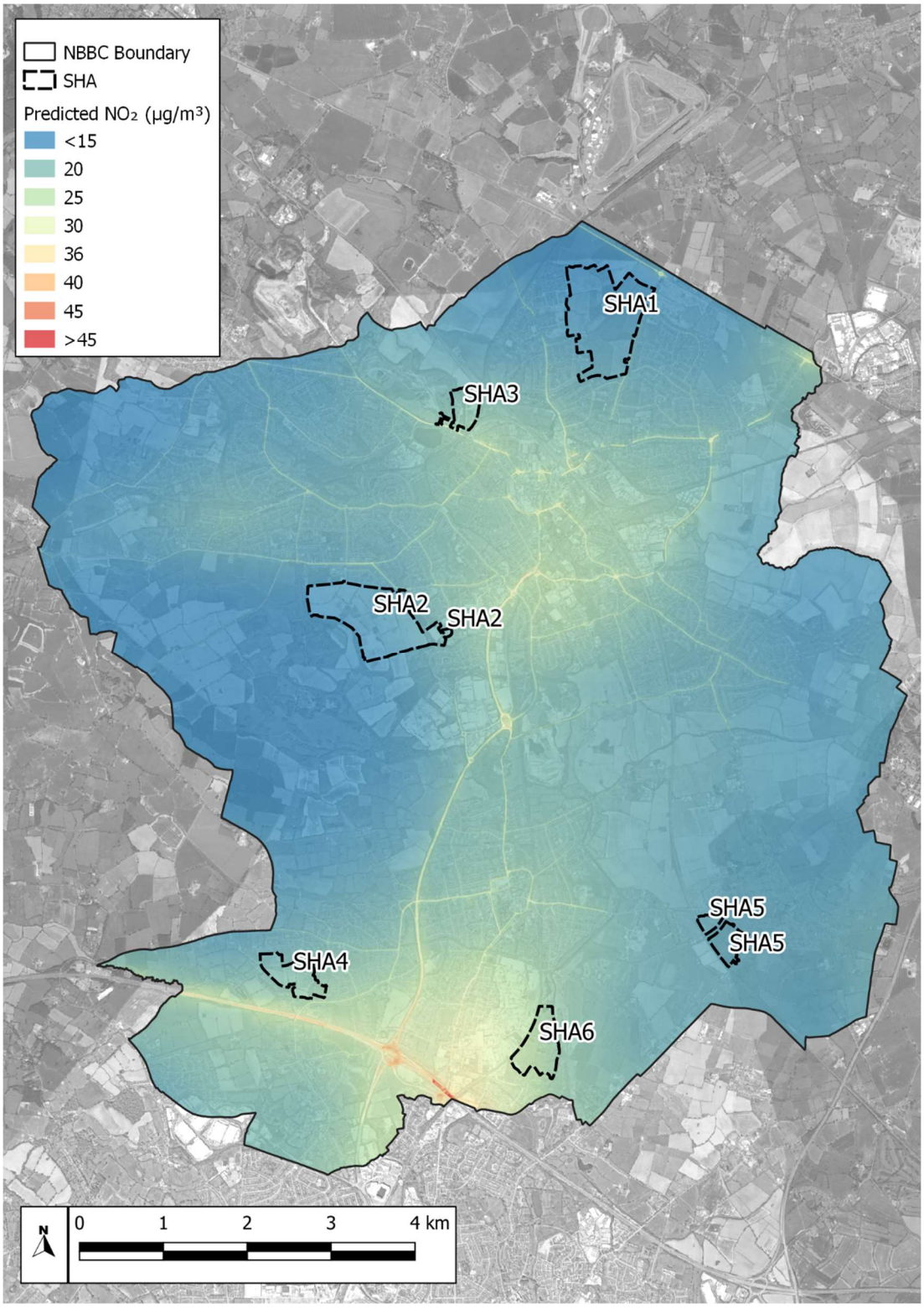

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Table 1: Predicted NO_2 Concentration Statistics at SHAs for 2031 'Do Something' Scenario

SHA	Mean	Median	Maximum	Minimum	95th Percentile
1	16.3	16.2	19.5	14.9	19.1
2	16.8	16.6	20.4	15.5	19.9
3	19.9	19.9	20.2	19.6	26.0
4	21.0	21.0	26.4	19.6	22.5
5	21.0	20.9	23.5	18.8	18.0
6	17.9	17.9	18.1	17.7	26.5
Table notes: -					

Air Quality Objectives

8.5. The predicted concentrations have been reviewed carefully for all locations of sensitive exposure within the borough as well as within the CCC AQMA. At all locations the impacts have been determined as negligible in both 2031 and 2039 (including with Mode Shift). The emerging Borough Plan will therefore not result in any adverse impacts.

8.6. Consideration has also been given as to whether these scenarios will cause any locations of sensitive exposure to become in exceedance of the AQO. There are not predicted to be any exceedances of the AQO at locations of sensitive exposure in 2031 or 2039 and it can therefore be concluded that the emerging Borough Plan will not lead to exceedances at any locations of sensitive exposure.

8.7. In addition, the predicted concentrations at the proposed allocated development sites are all below the annual mean AQO. NO_2 concentrations at proposed development allocation sites will therefore, depending on the specific development designs, be acceptable for future residential use with respect to regulated thresholds in 2031 and 2039.

8.8. The short-term NO_2 AQO is likely to be achieved in all scenarios since the predicted concentrations are well below the indicative annual mean equivalent for this AQO. The impacts of the emerging Borough Plan upon the short-term AQO are therefore considered negligible.

Limit Values

8.9. In 2031 and 2039 in all scenarios, there are no predicted exceedances of the LV at relevant locations for compliance reporting. The emerging Borough Plan will therefore not delay NBBC achieving compliance with the LVs.

9. Summary and Conclusions

9.1. The air quality impacts of the emerging Borough Plan have been assessed using detailed dispersion modelling. The findings demonstrate that the Borough Plan will not lead to any exceedances of the AQOs, not cause any adverse impacts and not lead to any breach of the LVs.

9.2. Overall, the air quality effects of the emerging Borough Plan will be 'not significant'.

10. Glossary

AMCT	Annual Mean Concentrations Target
APS	Air Pollution Services
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Standards
CCC	Coventry City Council
Cemetery	Cemetery Allocation
EIP	Environmental Improvement Programme
EPUK	Environmental Protection UK
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LV	Limit Value
NBBC	Nuneaton and Bedworth Borough Council
NBWA	Nuneaton and Bedworth Wider Area
NO_2	Nitrogen dioxide
NOx	Nitrogen Oxides
NRSA	Non-strategic Residential Allocations
PERT	Population Exposure Reduction Target
PWEL	Population Weighted Exposure Level
PWMC	Population Weighted Mean Concentration
PWME	Population Weighted Mean Exposure
SEA	Strategic Housing Allocations
SHA	Strategic Housing Allocation
WCC	Warwickshire County Council

11. References

AQC. (2018). Air Quality Assessment: Development Associated with the Borough Plan, Nuneaton and Bedworth, Report No. J2728B/1/F2.

DLUHC. (2023). Department for Levelling Up, Housing & Communities, Planning Newsletter, By Email Only, Message from Chief Planner, 3rd March 2023, Page 6, Considerations when integrating the PM2.5 targets in the planning system. Retrieved from

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1140170/03_Chief_Planners_Newsletter_March_2023.pdf

EPUK/IAQM. (2017). Land-Use Planning & Development Control: Planning For Air Quality.

HM Government. (2010). The Air Quality Standards Regulations 2010. London.

HM Government. (2020). The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020. London.

HM Government. (2021). Environment Act 2021. London.

HM Government. (2023). Environmental Improvement Plan 2023: First revision of the 25 Year Environment Plan.

HM Government. (2023). The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023. London.

HMSO. (1995). Environment Act. HMSO.

NBBC. (2021). Nuneaton and Bedworth Air Quality Action Plan .

Vectos microsim. (2023). STA - Nuneaton and Bedworth Borough Plan 2023, Nuneaton and Bedworth Borough Council, Strategic Transport Assessment, VM225433 - NBBC STA Update 2023.

12. Professional Experience

Dr Austin Cogan, MPhys (Hons) PhD CEnv MIEnvSc MIAQM

Austin is a Director and cofounder of Air Pollution Services, is a Chartered Environmentalist and has over 15 years' experience in environmental sciences. He has extensive experience of air quality, dust, and odour assessments, having been involved in hundreds of projects including residential and commercial developments, road schemes, airports, waste management processes, industrial processes, quarries, power generating facilities and agricultural facilities. This has included provision of expert witness services at several public inquiries and hearings. Austin has also supported many local authorities with Clean Air Zone studies (such as Bath, Bristol, Newcastle, Gateshead, North Tyneside and South Gloucestershire), Borough Plan modelling, microsimulation modelling and developing AQMAs and AQAPs. He has also contributed to multiple guidance documents, including DMRB and GLA evidence bases, and most recently IAQM's guidance on indoor air quality. Furthermore, Austin led the development of AirChecker, a bespoke air quality conveyancing search report, providing useful information on air quality to home and commercial property buyers and renters. Austin is also an international expert in the field of climate change, having monitored greenhouse gases globally. Austin gained two years' experience in scientific instrument design and spent four years' pioneering research in satellite observations of greenhouse gases and aerosols at the Space Research Centre, Leicester. Austin has worked with many international bodies, including NASA, JAXA, CNES and ESA, and published numerous scientific papers and presented at conferences both nationally and internationally. Additionally, he led the

development of officially licensed quality assured observational meteorological data at APS, which is used regularly by most of the air quality and odour industry in the UK.

Kieran Laxen, MEng (Hons) MIEnvSc MIAQM

Kieran is a Director and cofounder of Air Pollution Services and has over 15 years' experience in the field of air quality. He has worked on hundreds of projects, including port schemes, road schemes, residential and commercial developments, industrial processes, energy from waste sites, infrastructure projects. Kieran is an active member of the IAQM committee and currently holds the position of vice chair. He has led a number of IAQM air quality position statements and has recently been involved in developing guidance on indoor air quality and good practice dispersion modelling guidance. He has extensive experience of ambient air quality monitoring and is a leading UK expert in the dispersion modelling. He has been a stakeholder in Defra's and the Environment Agency's consultations. He has substantial experience in assessing air quality and dust for planning and permitting applications, for a diverse range of developments, and supporting local authorities with their LAQM duties, such as AQMA and AQAP development. He also supports government bodies with national projects, mostly recently this has included supporting JNCC with selecting the air quality dispersion model for use in the UK AERIUS tool, aiding the assessment of air quality impacts upon ecological habitats. He also led the development of Numerical Weather Prediction (NWP) meteorological data provision at APS, which is used regularly by the air quality and odour industry in the UK.

Katya Kaczmarczyk, MBChB BSc (Hons) AMIEnvSc AMIAQM

Mrs Kaczmarczyk is a Consultant at APS. She has over three years' experience of undertaking air quality assessments for planning and permit applications as well as assessments of odour, dust and climate change and has been involved in research in the field of indoor air quality. She completed BSc Medical Biochemistry at the University of Leicester and continued her studies at the University of Warwick to complete a MBChB Medicine, working as a Doctor in the Southwest Deanery afterwards. Her focus is now on the effects on health from air pollution.

Ellie Tsiarapa, MSc AMIEnvSc AMIAQM

Mrs Tsiarapa is an Assistant Consultant at APS with several years' experience. Prior to working at APS, she previously gained six months' experience working at the Air Quality Management Resource Centre (AQMRC). She was involved in several EU and UK research projects, and she also has experience in dispersion modelling. She holds an MSc in Environmental Consultancy from the University of the West of England (UWE), and she is an Associate Member of the Institution of Environmental Sciences (IES) and the Institute of Air Quality Management (IAQM). She is currently gaining experience at APS in projects for Planning, Environmental Permitting, Local Authority Work and Indoor Air Quality.

Elen Jones, BSc (Hons) AMIEnvSc AMIAQM

Miss Jones is an Assistant Consultant at APS, having recently completed a BSc Geography degree at the University of the West of England (UWE). She is currently gaining experience in undertaking air quality assessments for planning and permit applications, local authority work, and indoor air quality. Elen has worked on multiple residential and mixed-use developments across the UK on behalf of both the public and private sector. Elen also provided support with the development of

the JNCC's UK AERIUS tool, which provides an approach to assessing air quality in combination for ecological habitats.

Thomas Wescott, BSc (Hons) AMIEnvSc AMIAQM

Mr Wescott is a Consultant at APS, with over three years' air quality, dust, and odour consultancy experience, having previously worked at ACCON UK and as a freelancer. He has significant experience working on assessment to support planning applications as well as working on some infrastructure projects. He has used a range of dispersion models, including ADMS Roads, ADMS 5, Breeze AERMOD and Breeze Roads. Thomas completed a BSc in Chemistry from Plymouth University. He is currently gaining further experience at APS of air quality and odour assessments for planning as well as learning to complete air quality assessments for environmental permitting and indoor air quality.

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- Odour Modelling
- Odour Management

- Transport Schemes
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Air Quality Policy/Legislation Context: Nuneaton and Bedworth Borough Plan Review

Client: Nuneaton and Bedworth Borough Council **Reference:** APS_L1007A_C1-1 **Date Published:** 18 July 2023

Rev.	Date	Description	Prepared	Reviewed	Authorised
01	18/07/2023	Issued	EJ	KL	AC

C1. Introduction

C1.1. Air Pollution Services (APS), part of KALACO Group Ltd, has been commissioned by Nuneaton and Bedworth Borough Council (the 'Client') (NBBC) to assess the air quality impacts associated with the proposed housing and employment allocations set out in the emerging Borough Plan within the administrative boundary of Nuneaton and Bedworth Borough Council.

C1.2. This section sets out the relevant air quality legislation (Section C2). National planning context (Section C3) and local context (Section C4) which are material considerations in determining local plan development allocations.

C2. Air Quality Legislation

C2.1. Relevant Air Quality Legislation is set out in Table 1.

Table 1: Relevant Air Quality Legislation

Legislation	Text
The Environment Act 1995 Air Quality Regulations 2000 (SI 2000/98) Air Quality (England) (Amendment) Regulations 2002 (SI 2002/3043)	Part IV of The Environment Act requires the Government to produce an Air Quality Strategy. This must include standards and objectives for the protection of human health and ecosystems. It also sets out the requirements of the Local Air Quality Management (LAQM) regime. LAQM requires every authority to carry out regular reviews and assessments of air quality in its area to identify whether the air quality objectives (AQOs) have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an Air Quality Management Area (AQMA) and prepare an action plan which identifies appropriate measures to be introduced in pursuit of the objectives. The latest Air Quality Strategy was published in 2023 (Defra, 2023). It includes a list of pollutant limits (also known as AQOs) for use by local authorities when considering human health. These AQOs were incorporated into English legislation by the 200 and 2002 Regulations. The Strategy also sets out the $PM_{2.5}$ targets and interim targets set under the Environment Act 2021 (see below) and critical levels for the protection of ecosystems. The 2023 Strategy is a framework for local authorities which sets out a series of local and national actions that the government intend to facilitate.

Table 1: Relevant Air Quality Legislation

Legislation	Text
	The AQOs are policy targets often expressed as a maximum ambient concentration, for a specific averaging period, not to be exceeded, either without exception or with a permitted number of exceedances, within a specified timescale. To protect ecosystems critical levels and critical loads have been derived for different habitats. Exceedance of these values are used as an indication of the risk to the ecosystem. Critical loads are values of pollutants deposited onto a habitat below which significant effects do not occur. Critical levels are the concentrations of pollutants above which direct adverse effects on vegetation or ecosystems may occur.
Air Quality Standards Regulations 2010 (SI 210/1001) The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 (SI 2020/1313)	In additional to the AQOs, the European Union (EU) has set limit and target values for the protection of human health and critical levels for the protection of ecosystems. These were transposed into UK legislation by the 2010 Regulations. The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 reduced the EU annual mean limit value for particulate matter ($PM_{2.5}$) from 25 to 20 µg/m^3. Like the AQOs, the limit values, target values and critical levels are set for individual pollutants and are made up of a concentration value, an averaging time over which it is to be measured, the number of exceedances allowed per year (if any) and a date by which it must be achieved. Some pollutants have more than one value covering different dates or averaging times.
Environment Act 2021 Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 (SI 2023/96)	This Act requires the Secretary of State to set a long-term target (defined as no less than 15 years after the date on which the target was set) to reduce people's exposure to $PM_{2.5}$. It also enables the Secretary of State to set other air quality targets, including for other air pollutants. The targets are an annual mean of 10 µg/m^3 by 2040 together with a 35% exposure reduction target by 2040 compared to 2018. The 2023 Regulations set these targets in legislation. The Secretary of State must prepare an Environmental Improvement Programme (EIP) and produce an annual report on the implementation of the EIP, including progress towards meeting the targets. Every five years the EIP must be reviewed. The current EIP was published in 2023 (HM Government, 2023). This includes two interim targets to be achieved by the end of January 2028. These are an annual mean of 12 µg/m^3 and an exposure reduction target of 22% compared to 2018.

Table notes: All legislation cited is available at legislation.gov.uk The Statutory Instrument (SI) number for Regulations is given in brackets.

C3. National Planning Policy, Strategies and Action Plans

Planning Policy

National Planning Policy Framework

C3.1. The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities & Local Government, 2021) sets out planning policy for England. It includes advice on when air quality should be a material consideration in development control decisions. Relevant sections are set out in Table 2.

Table 2: Relevant National Planning Policy Framework Policies

Paragraph number	Text
55	*"Local planning authorities should consider whether otherwise unacceptable development could be made acceptable through the use of conditions or planning obligations. Planning obligations should only be used where it is not possible to address unacceptable impacts through a planning condition".*
174	*"Planning policies and decisions should contribute to and enhance the natural and local environment by: preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water*

	or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality".
180	*"When determining planning applications, local planning authorities should apply the following principles:* *a) if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;* *b) development on land within or outside a Site of Special Scientific Interest, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of Sites of Special Scientific Interest;* *c) development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists; and* *d) development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to improve biodiversity in and around developments should be integrated as part of their design, especially where this can secure measurable net gains for biodiversity or enhance public access to nature where this is appropriate".*
185	*"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development".*
186	*"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".*
188	*"The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities".*
Table notes: -	

The Planning Practice Guidance

C3.2. The NPPF is supported by Planning Practice Guidance on air quality (Ministry of Housing, Communities & Local Government , 2019). The most relevant sections are set out in Table 3.

Table 3: Relevant Sections of the Planning Practice Guidance on Air Quality

Paragraph number	Text
Paragraph 001 Reference ID: 32-001-20191101	What air quality considerations does planning need to address? *"The Department for Environment, Food and Rural Affairs carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with Limit Values. It is important that the potential impact of new development on air quality is taken into account in planning where the national assessment indicates that relevant limits have*

	been exceeded or are near the limit, or where the need for emissions reductions has been identified."
Paragraph: 002 Reference ID: 32-002-20191101	What is the role of plan-making with regard to air quality? *"It is important to take into account air quality management areas, Clean Air Zones and other areas including sensitive habitats or designated sites of importance for biodiversity where there could be specific requirements or limitations on new development because of air quality".*
Paragraph: 005 Reference ID: 32-005-20191101	When could air quality considerations be relevant to the development management process? *"Whether 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 have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity.* *Where air quality is a relevant consideration the local planning authority may need to establish:* *the 'baseline' local air quality, including what would happen to air quality in the absence of the development;* *whether the proposed development could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity); and* *whether occupiers or users of the development could experience poor living conditions or health due to poor air quality".*
Paragraph 006, Reference 32-006-20191101 (revision date 01.11.2019),	What specific issues may need to be considered in determining a planning application: *"Considerations that may be relevant to determining a planning application include whether the development would:* *Lead to changes (including any potential reductions) in vehicle-related emissions in the immediate vicinity of the proposed development or further afield. This could be through the provision of electric vehicle charging infrastructure; altering the level of traffic congestion;* *significantly changing traffic volumes, vehicle speeds or both; and significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; could add to turnover in a large car park; or involve construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more;* *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; biomass boilers or biomass-fuelled Combined Heat and Power plant; centralised boilers or plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area; or extraction systems (including chimneys) which require approval or permits under pollution control legislation;* *Expose people to harmful concentrations of air pollutants, including dust. This could be by building new homes, schools, workplaces or other development in places with poor air quality;* *Give rise to potentially unacceptable impacts (such as dust) during construction for nearby sensitive locations; and* *Have a potential adverse effect on biodiversity, especially where it would affect sites designated for their biodiversity value."*
Paragraph: 007 Reference ID: 32-007-20191101	How detailed does an air quality assessment need to be? *"Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific".*
Paragraph: 008 Reference ID: 32-008-20191101	How can an impact on air quality be mitigated? *"Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact. It is important that local*

	planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented".
Table notes: -	

Relevant Government Strategies

C3.3. The Government has also published a number of strategies and plans which relate to air quality. The most relevant strategies and plans are set out in Table 4.

Table 4: Government Strategies

Strategy	Relevant Information
Air Quality Strategy for England (Defra, 2023)	This document fulfils the statutory requirement of the Environment Act 1995, as amended by the Environment Act 2021, to publish an Air Quality Strategy setting out air quality standards, objectives, and measures for improving ambient air quality every 5 years. It sets out a framework to enable local authorities to deliver for their communities and contribute to the government's long-term air quality goals.
Environmental Improvement Plan (HM Government, 2023)	The Environment Act 2021 requires the Secretary of State to produce and update every five years an Environmental Improvement Plan (EIP). The 2023 EIP replaces the first EIP published in 2019. (HM Government, 2019). Goal 2 of the plan is 'clean air'. It sets out the government's interim targets for $PM_{2.5,}$ emission reduction commitments, and measures to reduce emissions from domestic solid fuel combustion and ammonia (NH_3) emissions from farming. The Government will also consult on an extension to the North Sea Emission Control Area to cover the Irish Sea and encourage local authorities to improve air quality more quickly.
Transport Decarbonisation Plan (Department for Transport , 2021)	This document sets out the Government's commitments to decarbonise all forms of transport including freight transport. For road transport the commitments are: • End the sale of new petrol and diesel cars and vans from 2030 • All new cars and vans must be 100% zero emission at the tailpipe from 2035 • All new two/three wheeled powered vehicles to be fully zero emission from 2035 • End the sale of all non-zero emission HGVs from 2040.
Clean Air Strategy (Defra, 2019a)	The strategy focuses on reducing emissions of nitrogen oxides (NOx), ammonia (NH_3), particulate matter (PM), non-methane volatile organic compounds (NMVOCs) and sulphur dioxide (SO_2). For particulate matter the emission reduction targets are 30% by 2020, and by 46% by 2030 and for NOx 55% by 2020 and 735 by 2030 all from a 2005 baseline. The strategy includes actions to reduce emissions from transport (including road, maritime, rail, aviation and NRMM, homes, farming and industry.
The Ten Point Plan for a Green Industrial Revolution (HM Government, 2020)	This sets out how the UK intends to achieve its vision for a cleaner, healthier, net zero carbon future. The focus is on the following ten points: • Point 1 Advancing Offshore Wind • Point 2 Driving the Growth of Low Carbon Hydrogen • Point 3 Delivering New and Advanced Nuclear Power • Point 4 Accelerating the Shift to Zero Emission Vehicles • Point 5 Green Public Transport, Cycling and Walking • Point 6 Jet Zero and Green Ships • Point 7 Greener Buildings • Point 8 Investing in Carbon Capture, Usage and Storage • Point 9 Protecting Our Natural Environment Point 10 Green Finance and Innovation
National Air Quality Plan. (Defra and Department for Transport, 2017)	Defra and the Department for Transport's plans describe how the UK will comply with the annual mean Nitrogen Dioxide (NO_2) limit values. Alongside a package of national measures, the Plan requires those English Local Authorities (or the GLA in the case of London Authorities) that are predicted to have exceedances of the limit values beyond 2020 to

and (Defra and Department for Transport, 2018)	produce local plans by December 2018. These plans must have measures to achieve the statutory limit values within the shortest possible time and may include the implementation of a charging Clean Air Zone (CAZ).
Table notes: -	

C4. Local Action Plans

Local Air Quality Action Plan

C4.1. Nuneaton and Bedworth Borough Council has declared two Air Quality Management Areas, Leicester Road Gyratory and Midland Road/ Corporation Street, for exceedances of the annual mean NO_2 Air Quality Objective. The Air Quality Action Plan (NBBC, 2021) outlines the action the Council will take to improve air quality from 2022. The main areas for action proposed by the plan cover:

- Support and collaborate with Warwickshire County Council on traffic;
- Management measures directly impacting Midland Road;
- Promotion of behaviour change away from single occupancy private vehicle use;
- Promotion of the use of alternatively fuelled vehicles;
- Developing policies to support better air quality; and
- controlling domestic emissions.

C5. Glossary

APS	Air Pollution Services
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objective
EIP	Environmental Improvement Programme
EU	European Union
LAQM	Local Air Quality Management
NBBC	Nuneaton and Bedworth Borough Council
NH_3	Ammonia
NMVOC	Non-Methane Volatile Organic Compound
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides
NPPF	National Planning Policy Framework
PM_{10}	Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter

$PM_{2.5}$	Small airborne particles, more specifically particulate matter less than 2.5 micrometres in aerodynamic diameter
SO_2	Sulphur Dioxide

C6. References

Defra. (2019a). Clean Air Strategy.

Defra. (2023, April 28). The Air Quality Strategy for England: Framework for local authority delivery. Retrieved from gov.uk: https://www.gov.uk/government/publications/the-air-quality-strategy-for-england/air-quality-strategy-framework-for-local-authority-delivery

Defra and Department for Transport. (2017). UK plan for tackling roadside nitrogen dioxide concentrations.

Defra and Department for Transport. (2018). Supplement to the UK plan for tackling roadside nitrogen dioxide concentrations .

Department for Transport . (2021). Decarbonising Transport: a Better, Greener Britain.

HM Government. (2019). A Green Future: Our 25 Year Plan to Improve the Environment.

HM Government. (2020). The Ten Point Plan for a Green Industrial Revolution.

HM Government. (2023). Environmental Improvement Plan 2023: First revision of the 25 Year Environment Plan.

Ministry of Housing, Communities & Local Government . (2019). Planning Practice Guidance .

Ministry of Housing, Communities & Local Government. (2021). National Planning Policy Framework.

NBBC. (2021). Nuneaton and Bedworth Air Quality Action Plan.

Air Quality Baseline: Nuneaton and Bedworth Borough Plan Review

Client: Nuneaton and Bedworth Borough Council **Reference:** APS_L1007A_D1-1 **Date Published:** 31 July 2023

Rev.	Date	Description	Prepared	Reviewed	Authorised
01	17/07/2023	Issued	EJ	AC	KL
02	31/07/2023	Minor edits to text	EJ	AC	AC

D1. Introduction

D1.1. Air Pollution Services (APS), part of KALACO Group Ltd, has been commissioned by Nuneaton and Bedworth Borough Council (the 'Client') (NBBC) to assess the air quality impacts associated with the proposed housing and employment allocations set out in the emerging Borough Plan within the administrative boundary of Nuneaton and Bedworth Borough Council.

D1.2. This document sets out the air quality baseline conditions including the methodology (Section D2), air quality zones (Section D3), concentrations of nitrogen dioxide (NO_2) (Section D4), other sources of air pollution (Section D5), the overall baseline conditions (Section D6), and a glossary of useful terms used within the assessment (Section D6.3).

D2. Methodology

D2.1. A baseline air quality review was undertaken to determine the existing air quality in the vicinity of the site. This desk-top study was undertaken using the following sources:

- Aerial photography from Google Satellite.
- Information on existing air quality has been obtained by collating the results of monitoring carried out by the local authority and where available other monitoring networks. This covers both the application site (if there is any) and the surrounding area, the latter being used to provide context to the assessment.
- Industrial and waste management sources that may affect the area have been identified using the UK Pollutant Release and Transfer Register (PRTR) (Defra, 2022). Local sources have also been identified through examination of maps and the Council's Air Quality Review and Assessment reports (NBBC, 2021).
- Background concentrations of NO_2 have been defined using the national pollution maps published by Defra (2023a). These cover the whole of the country on a 1x1 km^2 grid of average concentrations.

- Predicted roadside concentrations of NO_2 in the study area have been identified using the maps of roadside concentrations published by Defra (2022b) as part of its 2017 Air Quality Plan for the baseline year 2015 and for the future years 2017 to 2030. These maps are used by the UK Government, to report exceedances of the Limit Value (LV).
- Predicted concentrations based on the dispersion modelling exercise (see appended document APS_L1007A_E1-1) carried out to support this assessment, which includes predictions of NO_2 in the local area in 2031 and 2039 based on the 'Reference' transport scenarios.

D3. Air Quality Zones

D3.1. There are no declared Clean Air Zones (CAZ), Air Quality Focus Areas (AQFAs), Low Emission Zones (LEZs), Ultra Low Emission Zones (ULEZs), or Non-Road Mobile Machinery (NRMM) Zones within the study area.

AQMAs

D3.2. NBBC has declared two Air Quality Management Areas (AQMAs) for exceedances of the annual mean NO_2 AQO (NBBC, 2021). The Leicester Road Gyratory AQMA was declared in 2007 and the Midland Road/Corporation Street AQMA was declared in 2009. The locations of the AQMAs are shown in Figure 1.

Figure 1: Location of NBBC's AQMAs

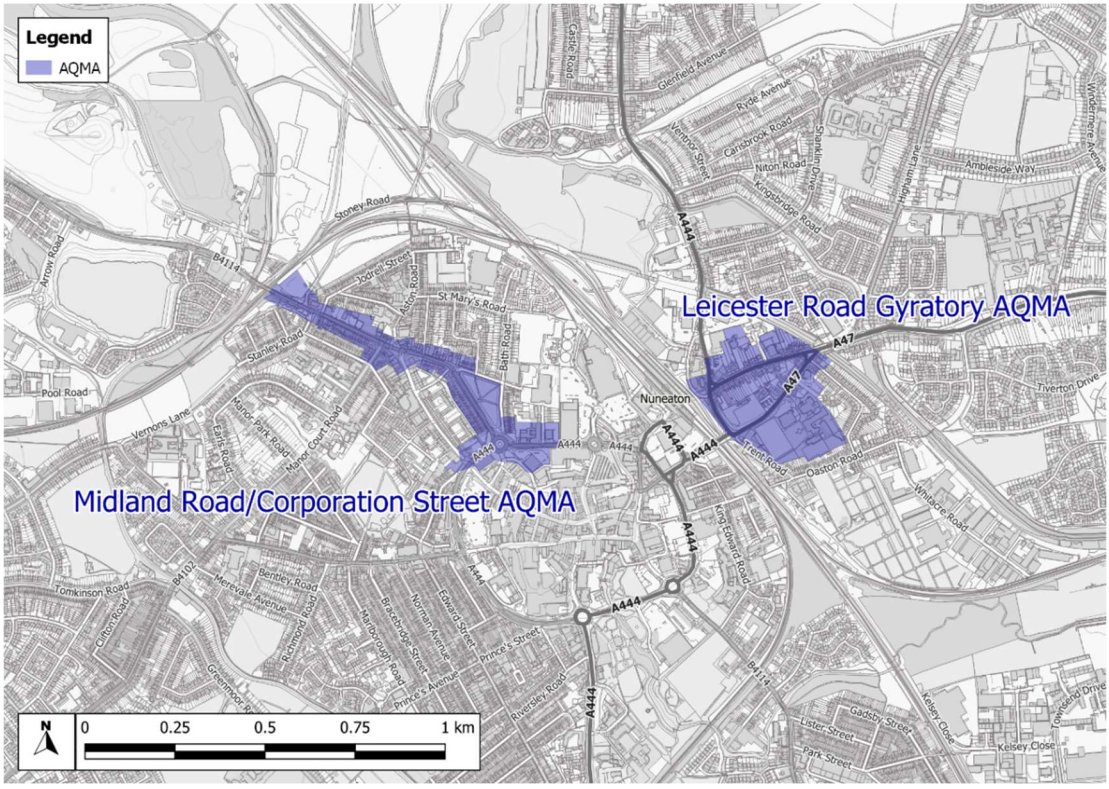

Figure notes: Contains OS data © Crown copyright and database right (2023).

D4. Nitrogen Dioxide

Measurements

Monitoring Surveys

D4.1. NBBC measures NO_2 concentrations at many locations across the borough using many passive monitors (diffusion tubes). Data for 2016 to 2020 have been taken from the annual status report for 2021 (NBBC, 2021).

D4.2. National Government measures concentrations of NO_2 at monitoring sites across the UK, as part of the Automatic Urban and Rural Network (AURN) regime. There are no National Government monitoring sites that measures NO_2 concentrations within the Borough.

D4.3. The locations of the monitoring sites are shown in Figure 2, with zoomed in views of those within and close to the AQMAs in Nuneaton and Coventry shown in Figure 3 and Figure 4 respectively.

D4.4. The air quality data for 2020 and 2021 are not considered representative of typical conditions at the monitoring stations due to restrictions associated with the COVID-19 pandemic. 2021 and 2022 data were not available at the time of completing this review.

Figure 2: Relevant Monitoring Sites

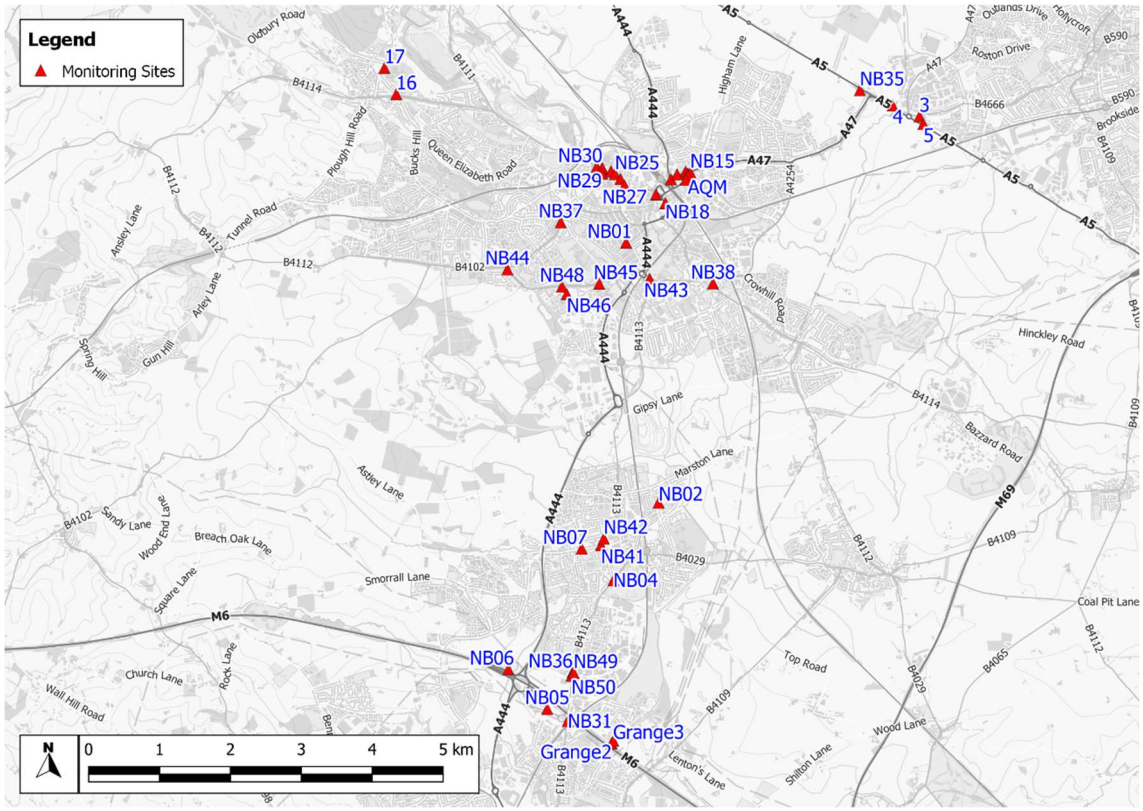

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Figure 3: Relevant Monitoring Sites within and close to the AQMAs in Nuneaton

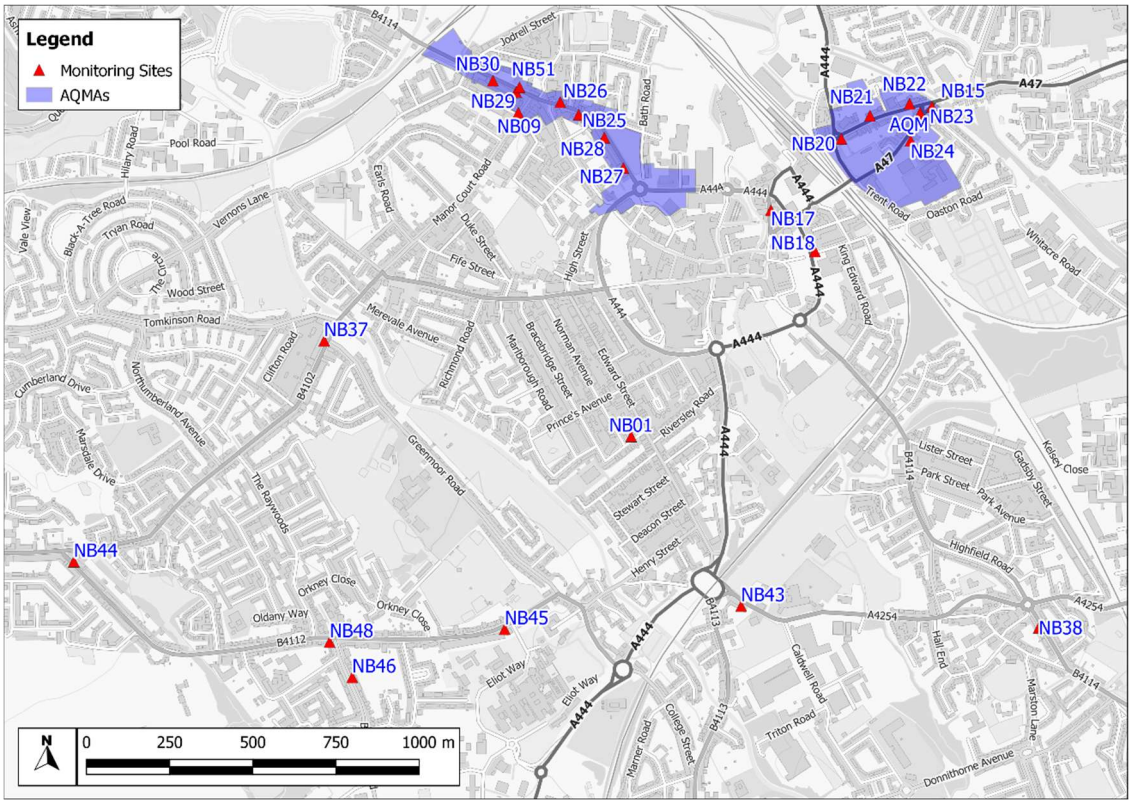

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Figure 4: Relevant Monitoring Sites within and close to the AQMA in Coventry

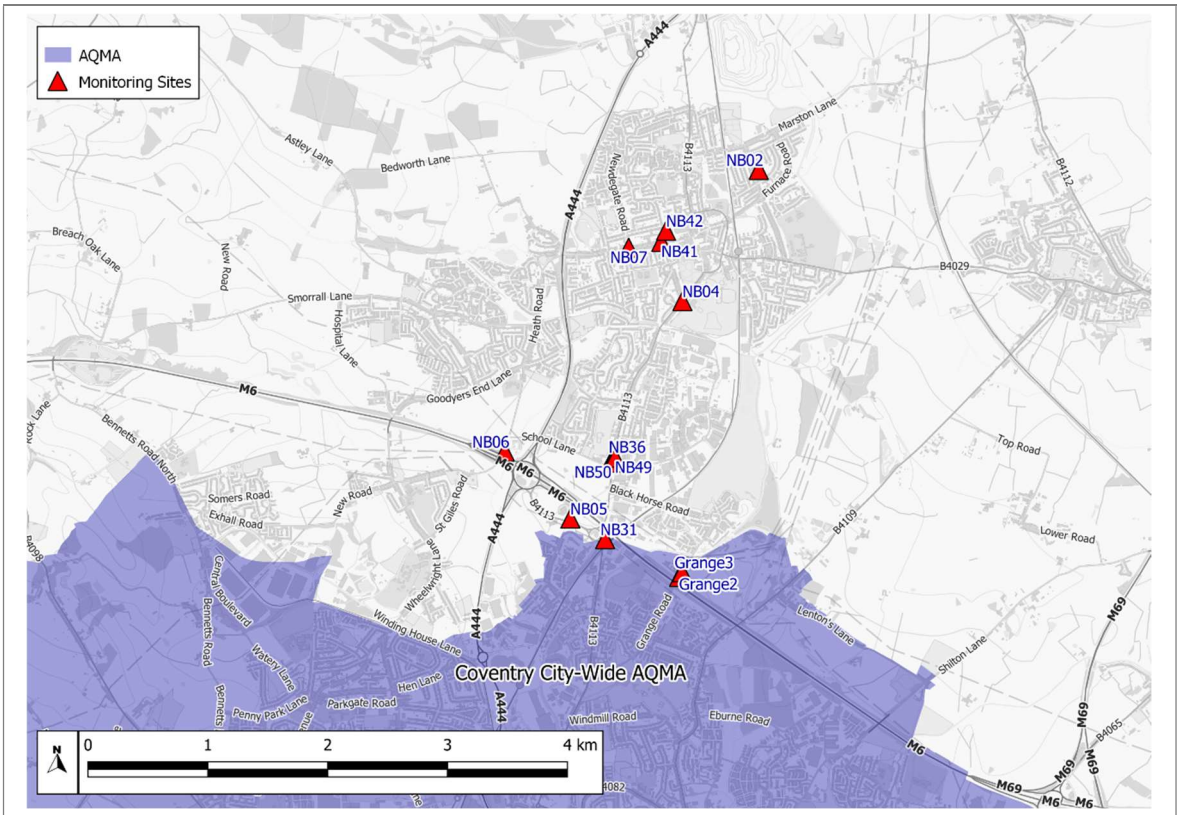

Figure notes: Contains OS data © Crown copyright and database right (2023).

Annual Mean

D4.5. Measured annual mean NO_2 concentrations for monitoring sites within the Borough are presented in Table 1. Measured NO_2 concentrations only exceeded the annual mean AQO level of 40 µg/m^3 at two of these monitoring sites (NB29 and NB30) between the years 2016 – 2019. These monitoring sites are both locations within the Midland Road/Corporation Street AQMA.

Table 1: Measured NO_2 Concentrations (µg/m^3)

Monitoring Site – Site Name (Type)	Distance from Road (m)	2016	2017	2018	2019	2020 [c]
AQM – AQ Monitor, Leicester Road (Roadside)	4.2	30.4	30.6	29.9	30.2	24.5
NB01 – 42 Norman Avenue (Urban Background)	7.2	20.4	19.2	18.5	19.3	14.6
NB02 – 5 Conifer Close (Urban Background)	54.8	19.2	19.2	18.1	18.9	14.3
NB04 – Leisure Ctr 72 Coventry Road (Suburban)	3.6	34.7	34.3	30.9	30.1	26.2
NB06 – Tudor Ct Bowling Green Ln (Roadside)	0.9	34.9	25.7	32.0	31.0	25.1
NB07 – 115 Newtown Rd Bedworth (Roadside)	4.4	31.9	27.5	32.1	30.9	26.0
NB09 – Church, Manor Ct Rd (Roadside)	2.2	30.3	27.4	28.5	29.9	22.8
NB15 – Bridge Grove, Leicester Rd (Roadside)	1.4	29.8	23.7	29.2	26.9	21.7
NB17 – Balti Hut, 41 Bond Gate (Roadside)	1.3	32.5	30.9	29.3	28.4	21.5
NB18 – Wheat St (Roadside)	4.0	32.8	26.3	32.9	31.6	24.9

NB20 – 17 Old Hinckley Rd (Roadside)	6.9	28.5	27.2	27.7	26.8	21.3
NB21 – 36 Old Hinckley Rd (Roadside)	8.6	30.0	29.6	27.9	27.0	22.2
NB22 – 58 Old Hinckley Rd (Roadside)	8.8	24.9	25.2	24.9	24.8	18.4
NB23 – 46 Leicester Rd Nuneaton (Roadside)	4.5	32.9	33.3	31.2	31.0	24.4
NB24 – Lodge, 31 Leicester Rd (Roadside)	11.0	24.5	24.3	24.4	23.9	18.0
NB25 – 25 Central Avenue (Roadside)	6.4	32.2	32.1	31.1	30.5	24.0
NB26 – 26 Central Avenue (Roadside)	4.6	31.4	29.5	29.8	28.5	22.9
NB28 – 138 Corporation St (Roadside)	4.7	36.7	37.2	35.2	35.7	28.5
NB29 – 16 Midland Road (Roadside)	4.0	**43.8**	**44.6**	**41.0**	**41.0**	33.7
NB30 – 52 Midland Road (Roadside)	3.8	40.0	39.3	**41.1**	**42.4**	33.0
NB31 – 376 Longford Road (Roadside)	12.7	34.3	32.1	30.2	29.1	23.5
NB35 – 60 Watling St (Roadside)	11.7	24.8	23.2	22.9	23.0	16.7
NB36 – 78 Coventry Rd Exhall (Roadside)	2.3	37.6	36.8	33.8	33.4	26.6
NB37 – 19 Croft Road Nuneaton (Roadside)	5.8	33.0	31.9	31.3	32.3	24.8
NB38 – 115 Highfield Rd (Roadside)	7.2	30.5	30.0	28.9	27.4	22.2
NB41 – 11 Newtown Rd (Salon) (Roadside)	4.8	31.2	32.8	32.4	30.5	24.9
NB42 – 18 George Street Bedworth (Roadside)	8.3	28.1	26.2	25.0	26.7	20.5
NB43 – 43 Hanover Glebe (Roadside)	11.6	26.9	26.3	26.7	25.0	18.6
NB44 – 503 Heath End Rd (Roadside)	2.3	30.5	27.1	30.0	29.2	22.5
NB45 – 80 Heath End Rd (Roadside)	2.5	29.6	28.1	34.8	32.6	26.6
NB46 – 30 Bermuda Rd (Roadside)	9.2	19.8	18.7	19.8	18.1	13.8
NB47 – 6 The Bridleway (Roadside)	4.6	18.9	18.6	19.1	18.0	14.4
NB48 – 288 Heath End Rd (Roadside)	8.5	25.2	25.6	23.2	22.7	18.3
NB49 – Co-op Coventry Rd (Roadside)	4.2	n/a	32.4	29.2	29.1	23.7
NB50 – 66 Coventry Rd Exhall (Roadside)	8.3	n/a	32.7	30.6	30.9	25.3
NB51 – Abbey Green School (Roadside)	5.0	n/a	26.3	26.5	27.4	19.7
NB52 – Bridge St, Mower Shop (Roadside)	7.2	n/a	n/a	n/a	32.1	26.2
AQO		**40**				
LV [b]		**40**				

Table notes:

a. Concentrations above the AQO are presented in bold. These do not necessary represent relevant exposure nor exceedances of the AQO.

b. Reporting of LV exceedances is only carried out based on approved reference monitoring and at relevant reporting locations. Therefore, while the value is included, the monitoring presented is unlikely to comply with the requirements for LV reporting and assessment.

c. Air quality monitoring carried out includes periods of national travel restrictions due to the Covid-19 pandemic; measured concentrations are therefore not likely to be representative of typical conditions.

D4.6. There are no clear trends in the monitoring data. Long-term trends of annual mean concentrations require at least five years of data. However, the COVID-19 pandemic has potentially skewed the more recent data. Prior to 2020, measured concentrations may be demonstrating a slight reduction in annual mean NO_2 concentrations at some monitoring stations, although NB30 has increased slightly over the same period (see Figure 5). The overall reduction is likely to be due to continued

improvement in vehicle technologies; concentrations are expected to decline further into the future.

Figure 5: Measured NO_2 Concentrations between 2016 and 2020

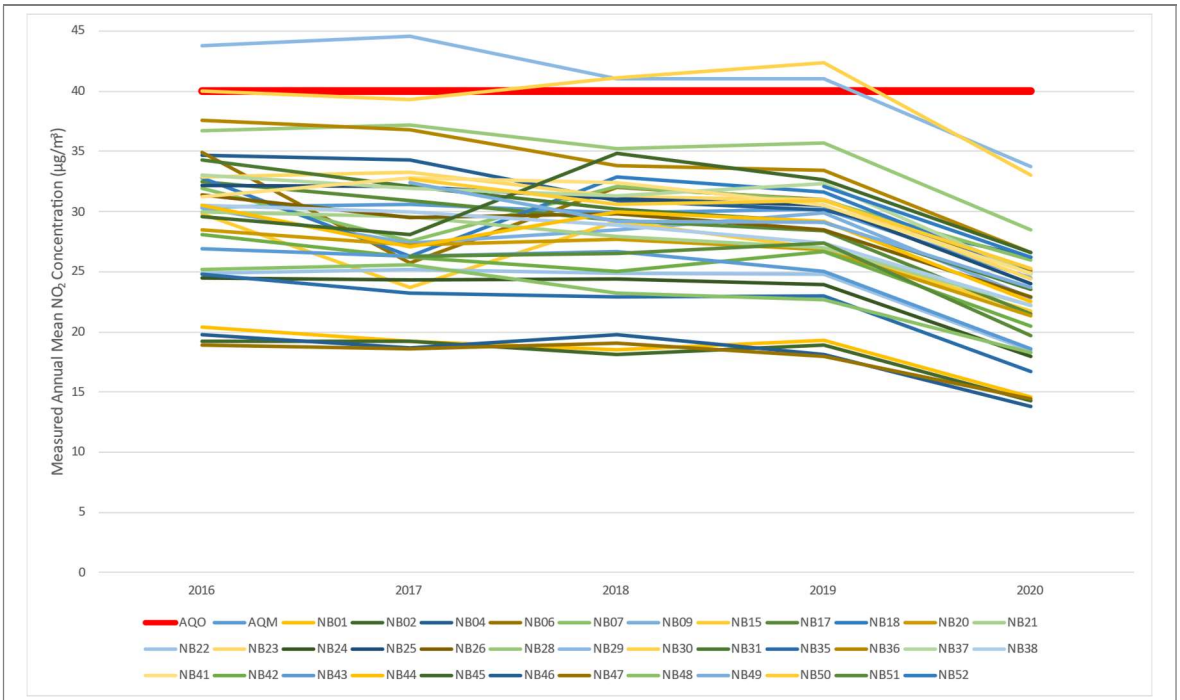

Figure notes:
a. 2020 data should be treated with caution.

Short-term Mean

D4.7. NBBC does not conduct automatic monitoring of NO_2 and thus has not published short-term mean concentrations.

Predicted Concentrations

Defra Predicted Background Mapped Concentrations

D4.8. Ambient background concentrations of NO_2 have been defined using the national pollution maps published by Defra (Defra, 2023a). These cover the whole of the country on a 1 km^2 grid for each year from 2018 until 2030.

D4.9. Concentrations for 2023 and 2030 have been extracted from the grid cells which cover the Borough and are shown in Figure 6 and Figure 7. All predicted background concentrations are well below the AQOs and LV in 2023 and 2030, as shown in Table 2. It is therefore considered likely that ambient background concentrations will be below the AQOs and LVs in 2031 and 2039.

Table 2: Defra Predicted Background Mapped NO_2 Concentrations (µg/m^3)

Year	Borough
2023	9.5 – 24.0
2030	7.1 – 15.9
AQO	**40**
LV	**40**
Table notes: -	

Figure 6: Defra Predicted Background NO_2 Concentrations in 2023

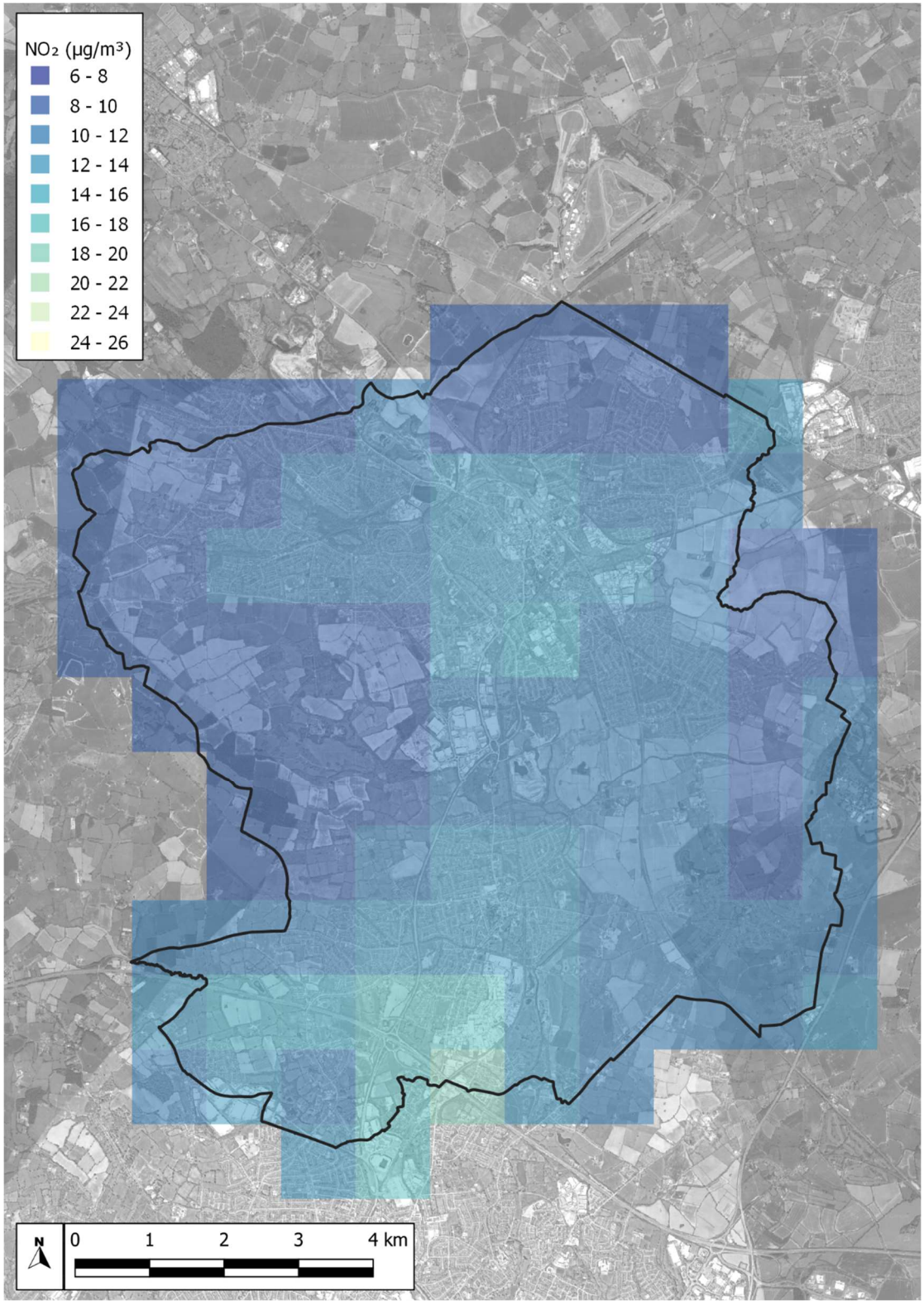

Figure notes: Imagery © 2023 Google, Map data © 2023

Figure 7: Defra Predicted Background NO_2 Concentrations in 2030

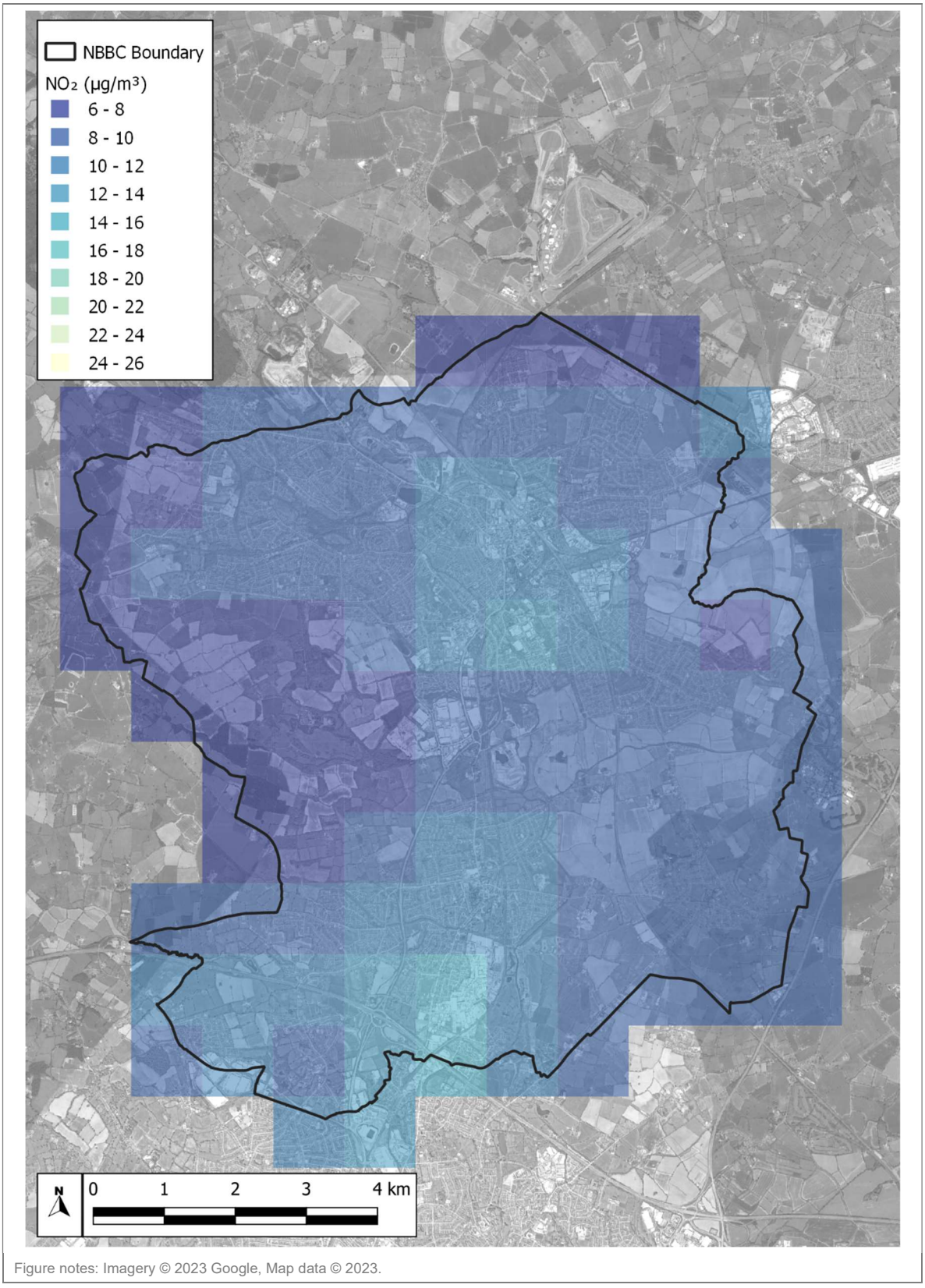

Figure notes: Imagery © 2023 Google, Map data © 2023.

Defra Predicted Roadside Concentrations

D4.10. Defra has predicted roadside concentrations of NO_2 for the main roads in the UK (Defra, 2022b) for the years 2017 to 2030 as part of Defra's commitment to report exceedances of the LVs. Predicted

roadside concentrations for roads assessed by Defra within the borough are set out in Table 3 for the current year of 2023 and the future year of 2030 (latest available) and shown in Figure 8 and Figure 9.

D4.11. Defra's predicted roadside concentrations are below the LVs for all roads assessed by Defra in NBBC in both 2023 and 2030. It is therefore considered likely that concentrations will also be below the LVs in 2031 and 2039.

D4.12. It should also be noted that it is widely accepted that in many locations in the UK Defra's modelling has underpredicted roadside concentrations when compared with local monitoring and these Defra roadside estimates should be treated with caution.

Table 3: Defra Predicted Roadside NO_2 Concentrations ($\mu g/m^3$)

Road (Census ID)	2023	2030
18002	18.3	13.6
18004	15.1	12.7
18005	21.1	15.7
26136	27.7	20.5
28045	18.0	13.7
38098	21.2	15.8
46524	22.4	16.5
47184	24.0	17.5
48081	24.4	18.0
48410	23.9	18.0
57202	21.8	16.2
57203	21.1	15.8
57208	26.9	19.9
58142	24.3	18.2
70239	23.7	27.7
73319	32.1	23.3
73742	26.1	19.4
77301	17.3	13.3
LV	40	
Table notes:		

Figure 8: PCM Modelled Annual Mean NO_2 Concentrations for 2023 within NBBC

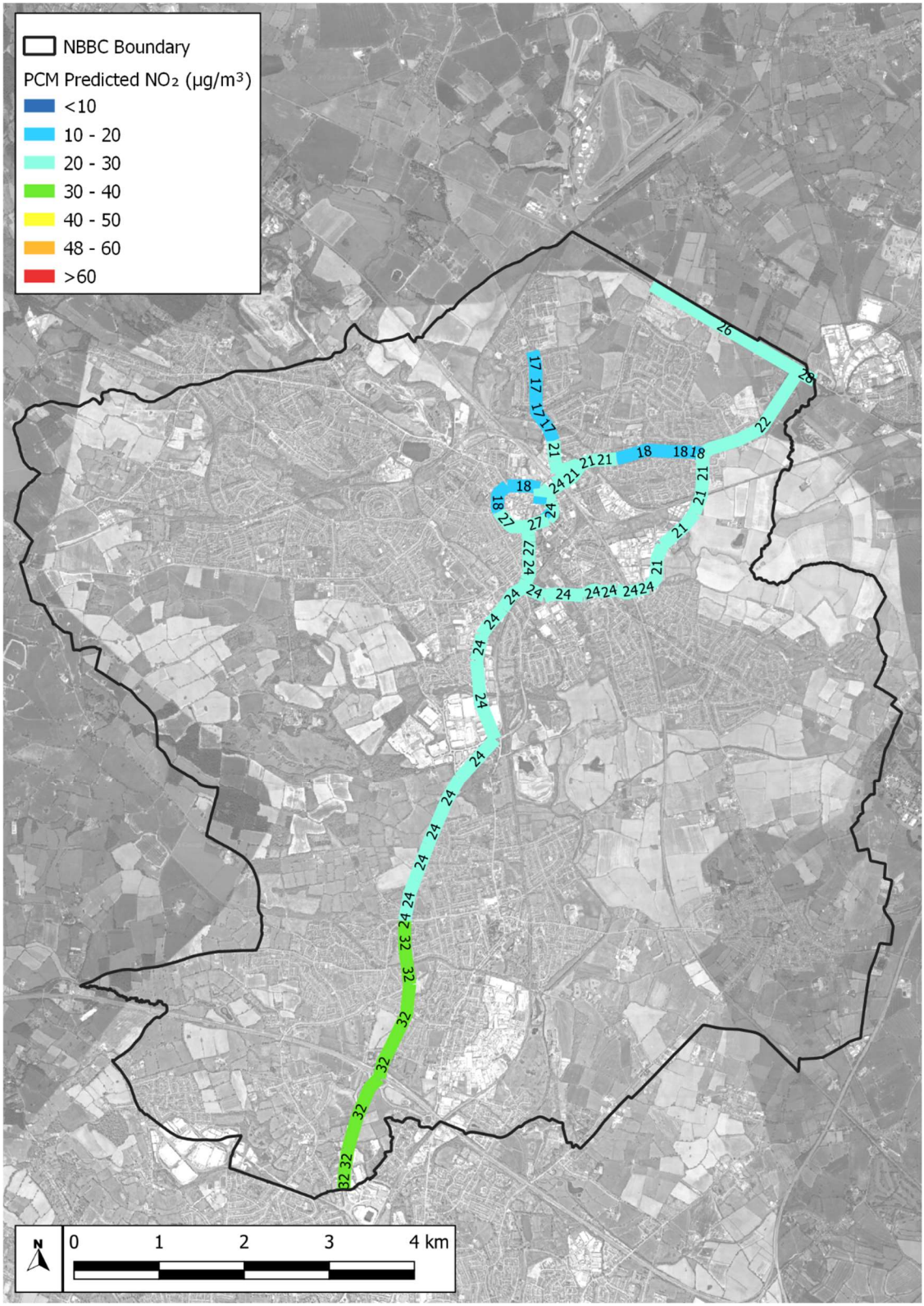

Figure notes: Imagery © 2023 Google, Map data © 2023.

Figure 9: PCM Modelled Annual Mean NO_2 Concentrations for 2030 within NBBC

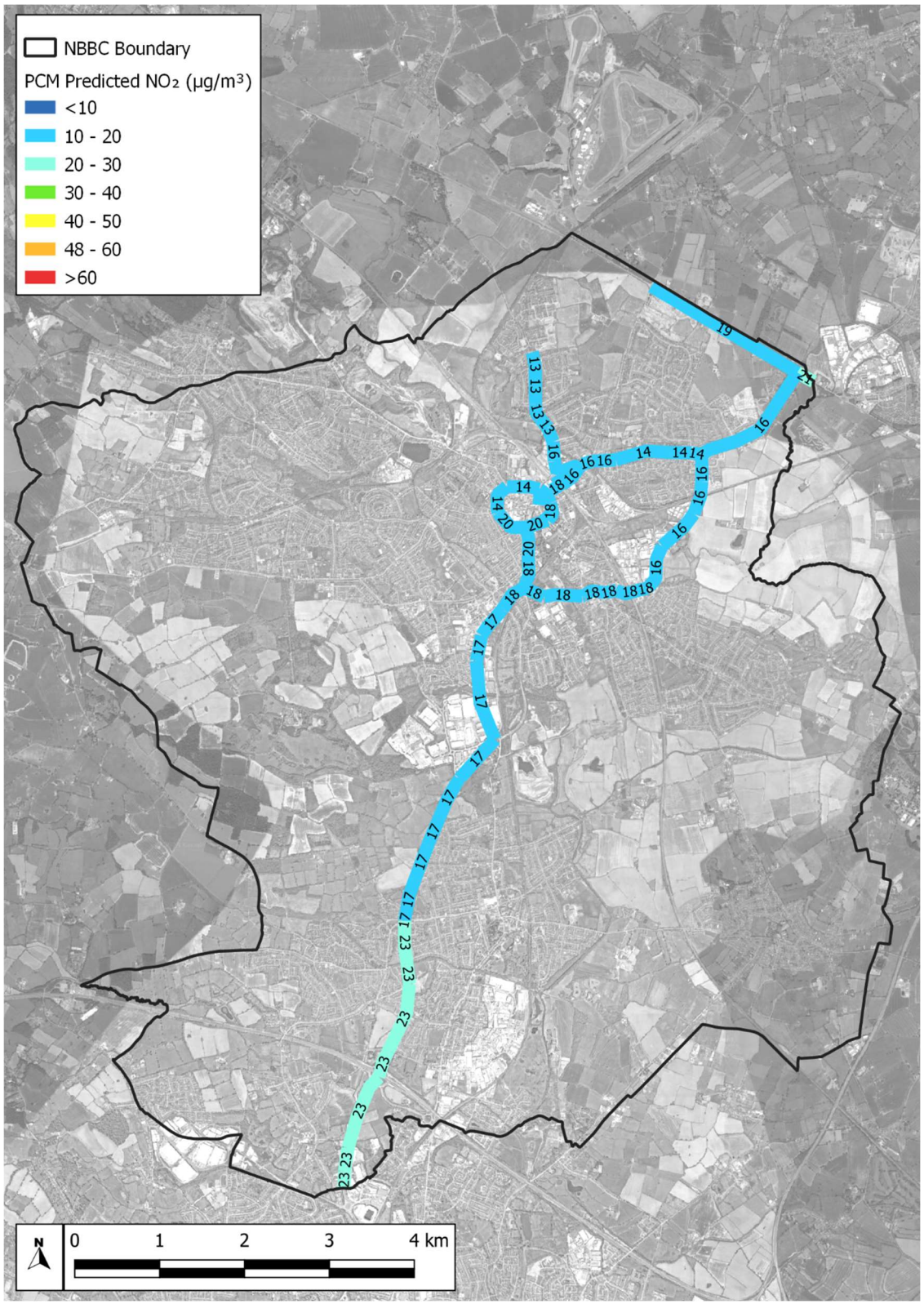

Figure notes: Imagery © 2023 Google, Map data © 2023.

Study Specific Dispersion Modelling

D4.13. This assessment has included a dispersion modelling exercise (see appended document APS_L1007A_E1-1) which includes predictions of NO_2 in the borough and Coventry City Council's

(CCC's) AQMA. The assessment is based on traffic data provided as part of the Strategic Transport Assessment (Vectos microsim, 2023) for the emerging Borough Plan. The predicted annual mean baseline ('Reference' scenario) NO_2 concentrations in 2019, 2031 and 2039 are presented in Figure 10, Figure 13 and Figure 16, respectively. Zoomed views of these for areas covering the AQMAs in Nuneaton and presented in Figure 11, Figure 14, and Figure 17, respectively, and for the AQMA in Coventry in Figure 12, Figure 15 and Figure 18.

Figure 10: Predicted Annual Mean NO_2 Baseline Concentrations in 2019 (Reference Scenario)

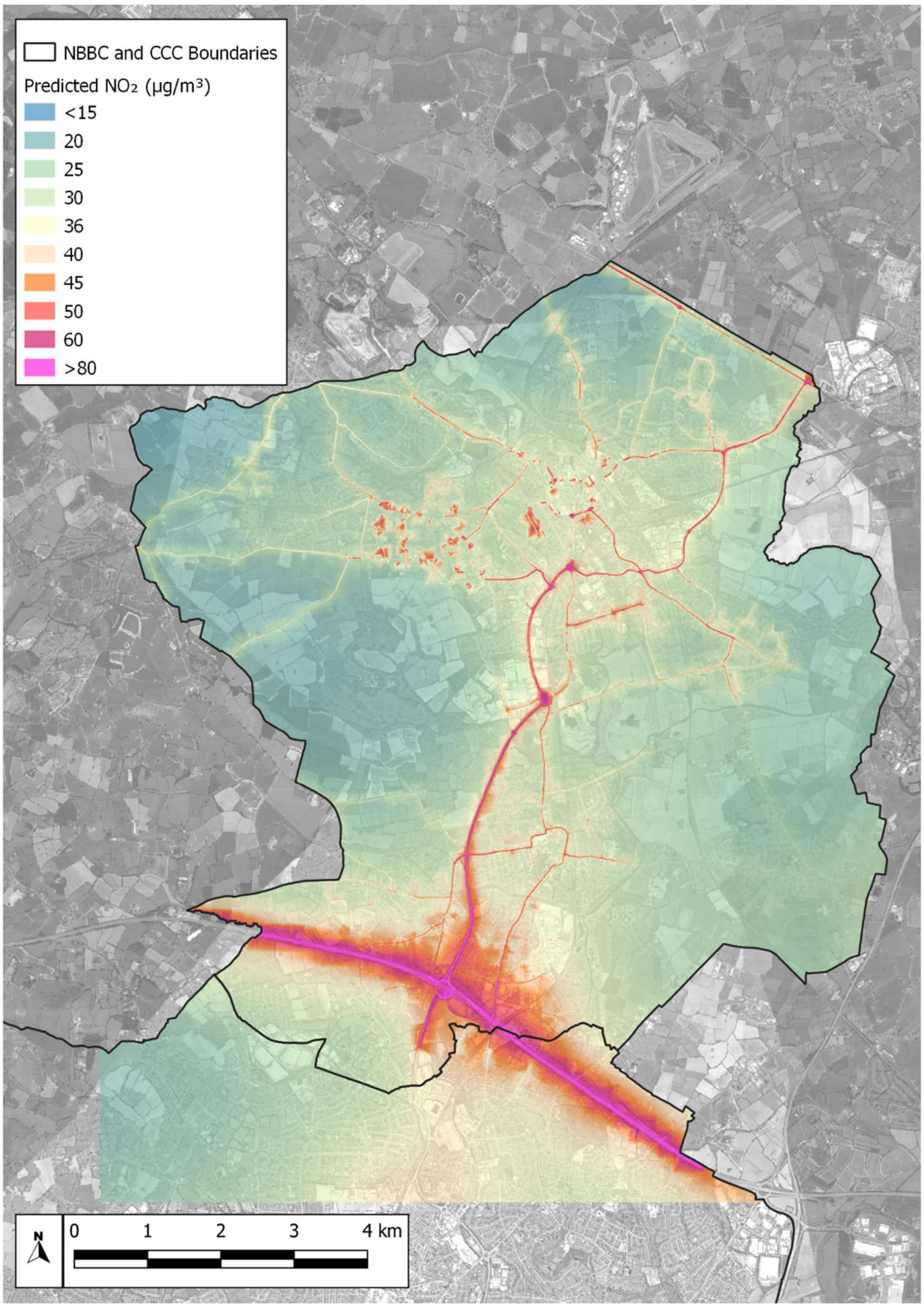

Figure notes: Imagery © 2023 Google, Map Data © 2023.

Figure 11: Predicted Annual Mean NO_2 Baseline Concentrations in 2019 (Reference Scenario) within and close to the Nuneaton AQMAs

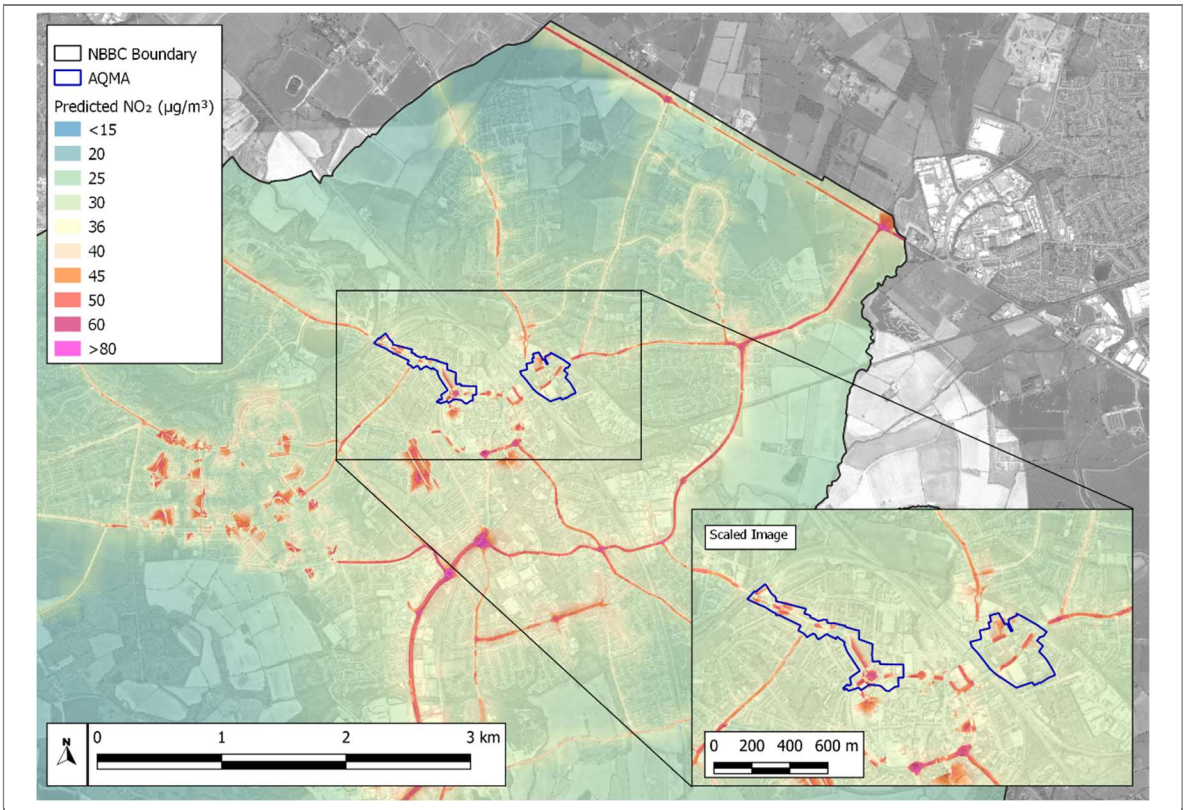

Figure notes: Imagery © 2023 Google, Map Data © 2023.

Figure 12: Predicted Annual Mean NO_2 Baseline Concentrations in 2019 (Reference Scenario) within and close to the Coventry AQMA

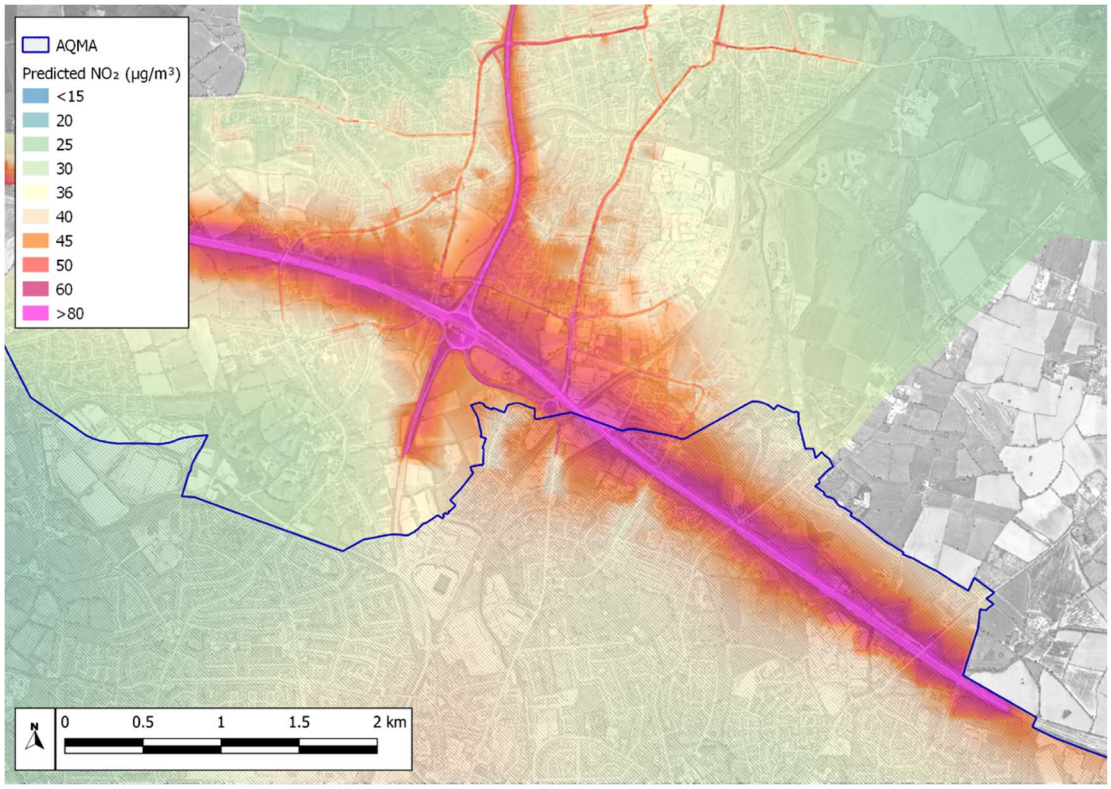

Figure notes: Imagery © 2023 Google, Map Data © 2023.

Figure 13: Predicted Annual Mean NO_2 Baseline Concentrations in 2031 (Reference Scenario)

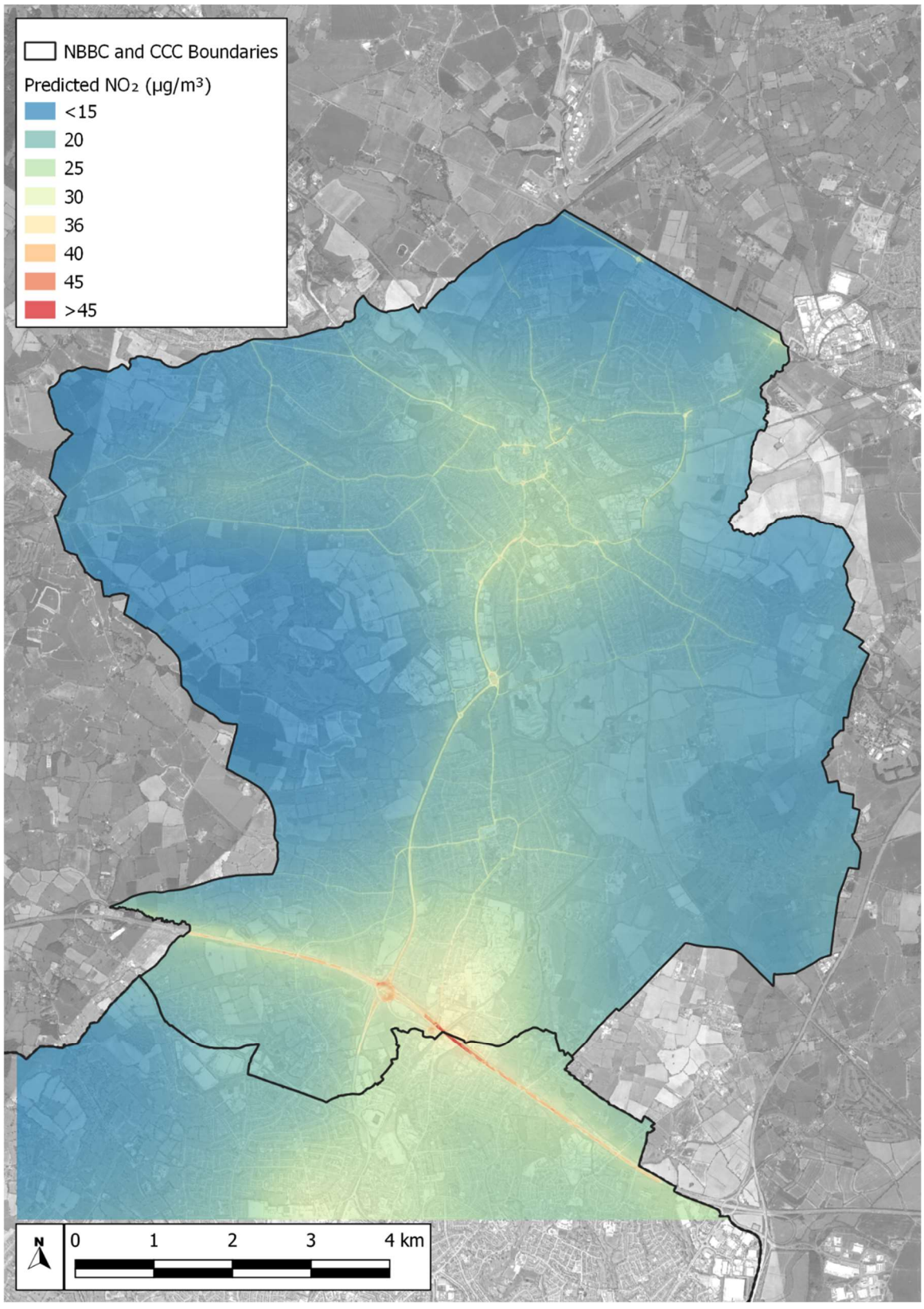

Figure notes: Imagery © 2023 Google, Map Data © 2023.

Figure 14: Predicted Annual Mean NO_2 Baseline Concentrations in 2031 (Reference Scenario) within and close to the AQMAs in Nuneaton

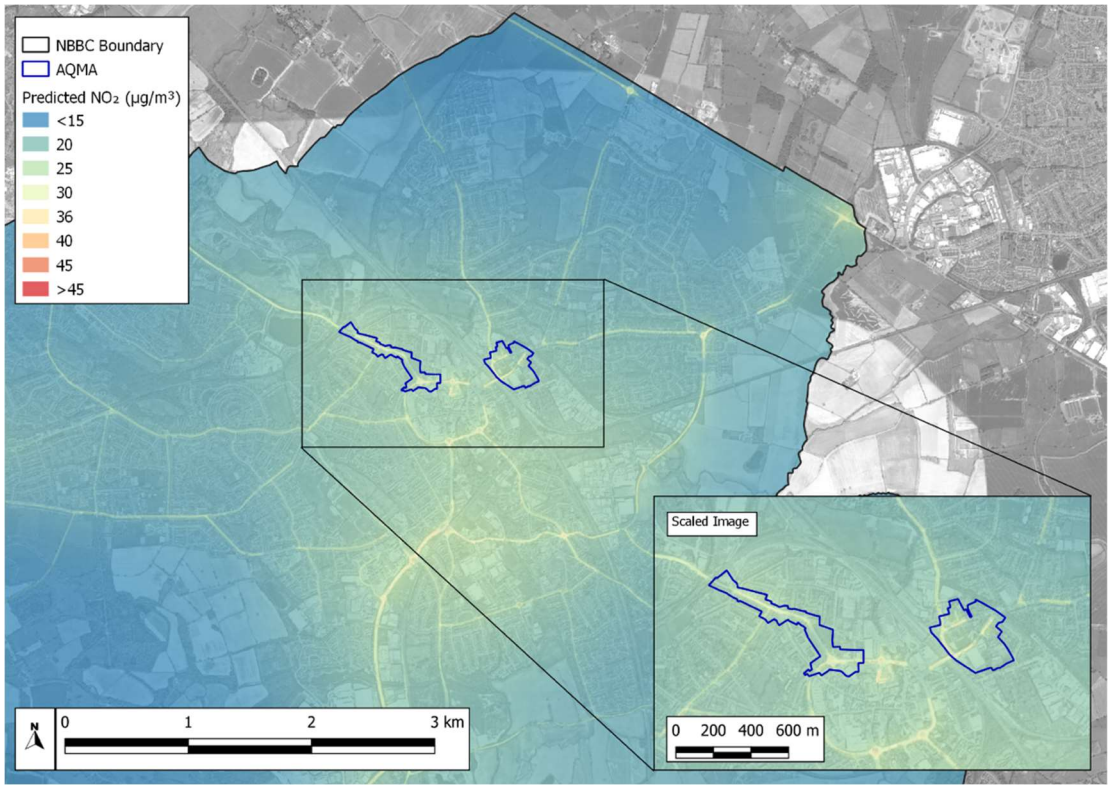

Figure notes: Imagery © 2023 Google, Map Data © 2023.

Figure 15: Predicted Annual Mean NO_2 Baseline Concentrations in 2031 (Reference Scenario) within and close to the AQMA in Coventry

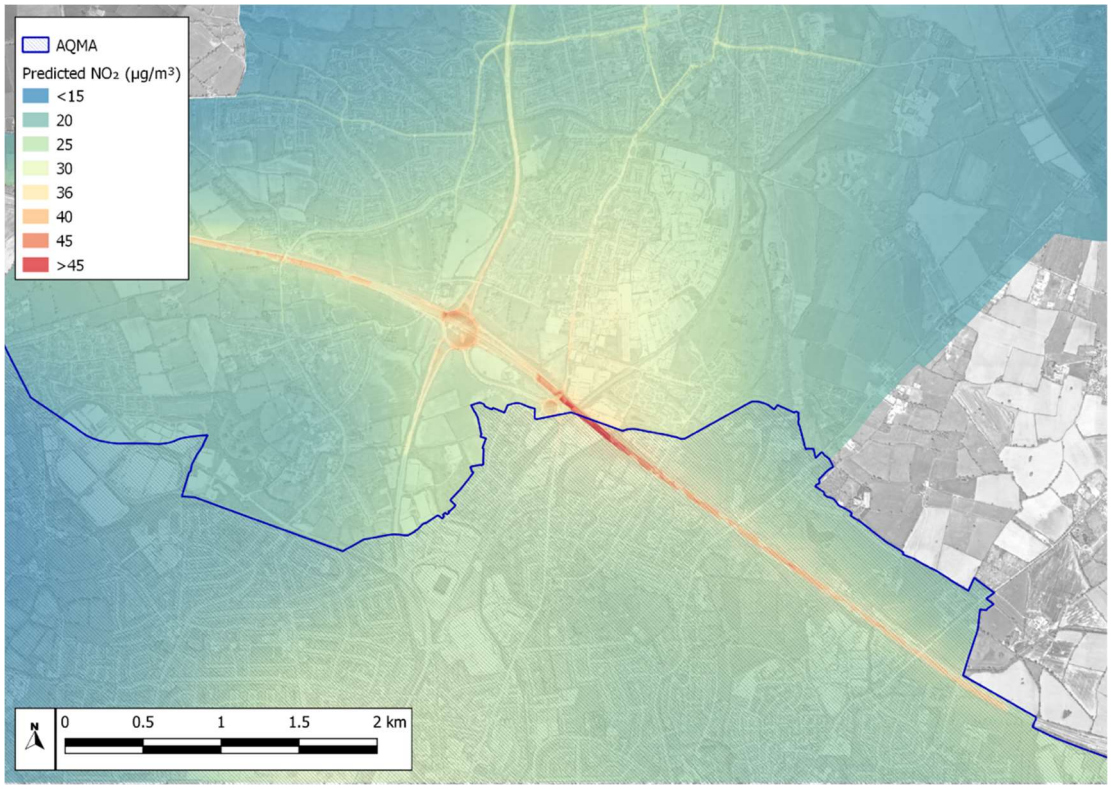

Figure notes: Imagery © 2023 Google, Map Data © 2023.

Figure 16: Predicted Annual Mean NO_2 Baseline Concentrations in 2039 (Reference Scenario)

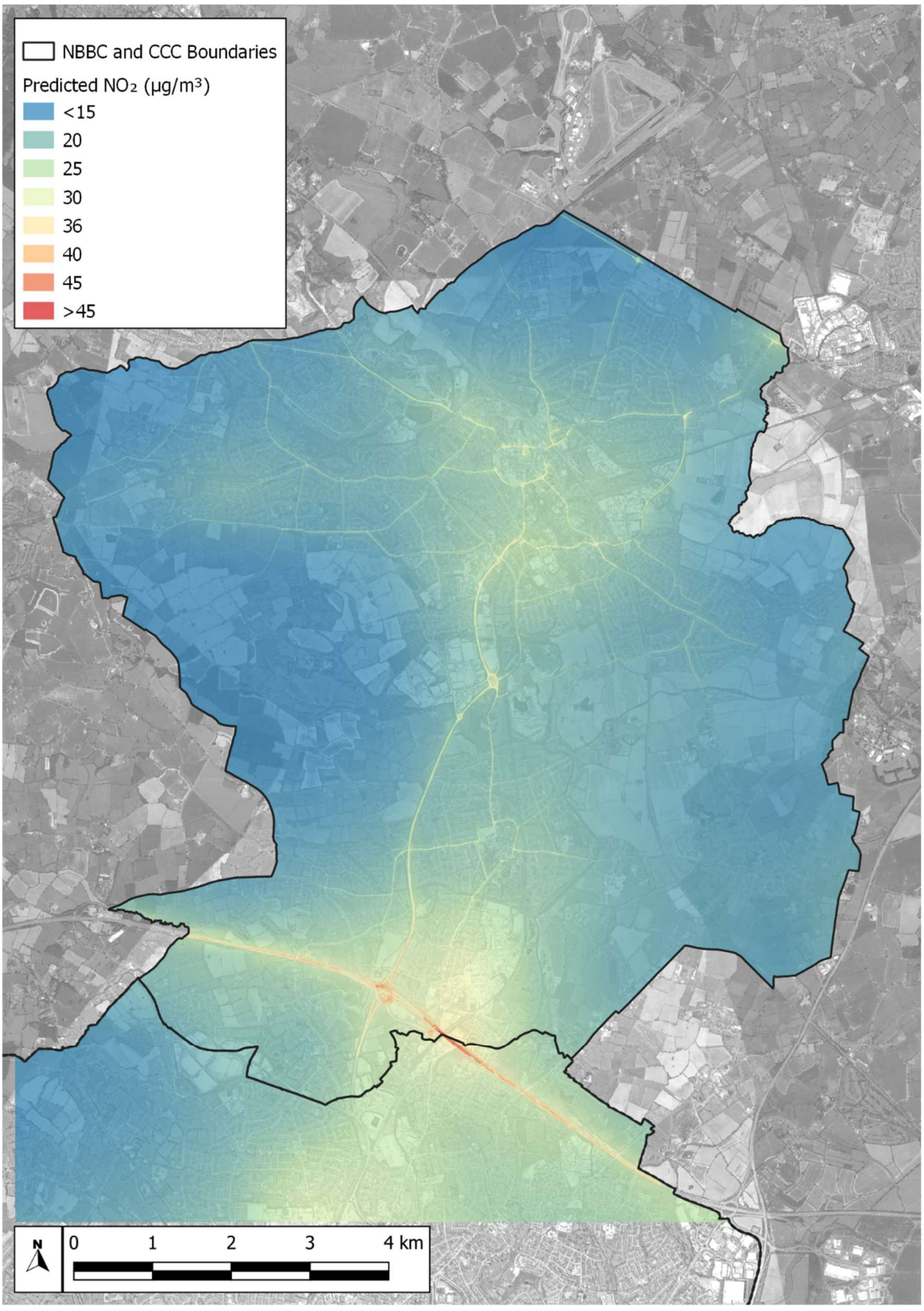

Figure notes: Imagery © 2023 Google, Map Data © 2023.

Figure 17: Predicted Annual Mean NO_2 Baseline Concentrations in 2039 (Reference Scenario) within and close to the AQMAs in Nuneaton

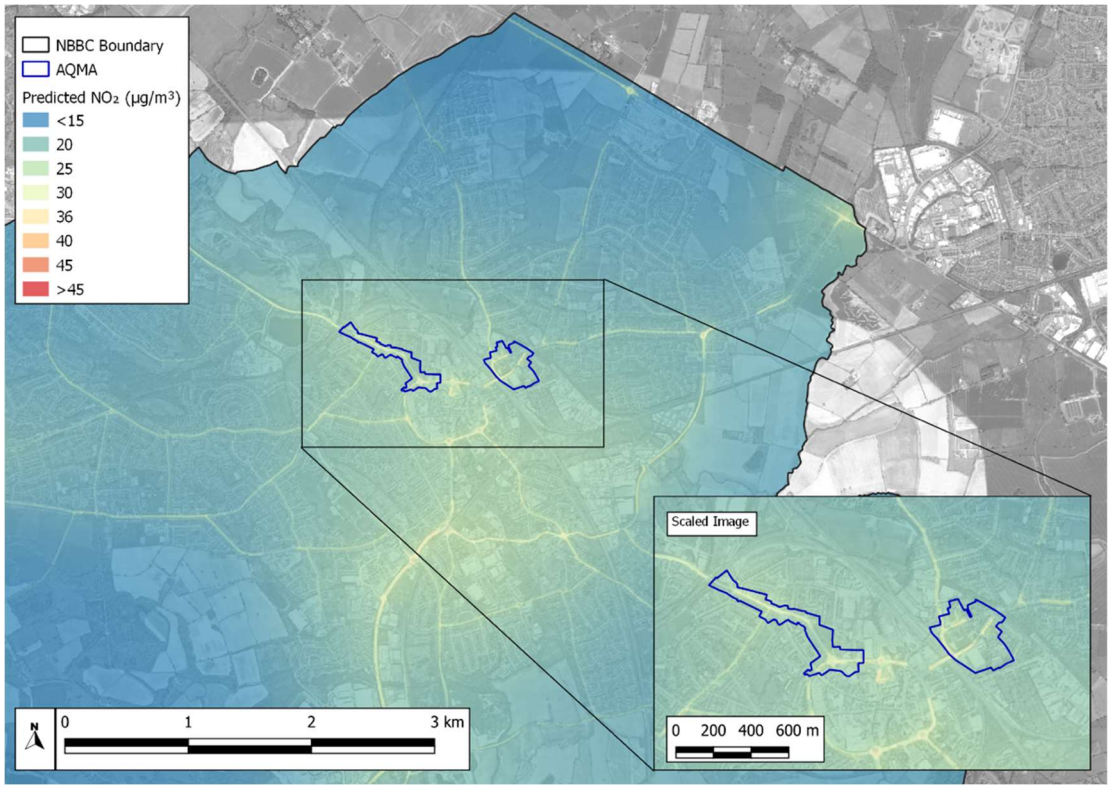

Figure notes: Imagery © 2023 Google, Map Data © 2023.

Figure 18: Predicted Annual Mean NO_2 Baseline Concentrations in 2039 (Reference Scenario) within and close to the AQMA in Coventry

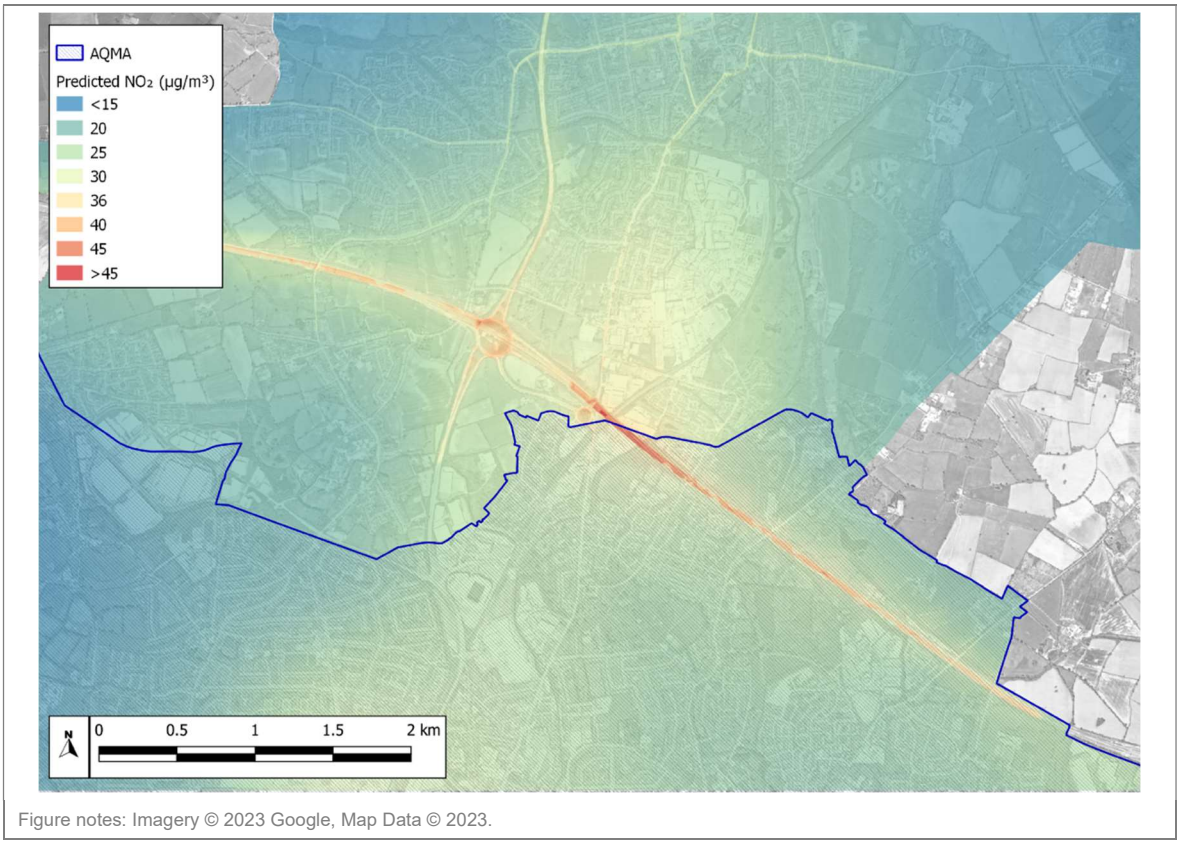

Figure notes: Imagery © 2023 Google, Map Data © 2023.

Air Quality Objective Compliance

D4.14. The predicted concentrations demonstrate that there were likely exceedances of the AQOs in 2019, which is consistent with measured concentrations undertaken by NBBC.

D4.15. By 2031, concentrations are predicted to be significantly lower due to the Government's assumed reduction in emissions from vehicles (as more lower emission vehicles are adopted) and cleaner technologies for other pollution sources come through. This includes the end of the sale of petrol and diesel cars by 2030. Between 2031 and 2039 predicted concentrations continue to reduce but only marginally. There are no exceedances predicted in 2031 or 2039.

Limit Value Compliance

D4.16. There are several relevant locations within Nuneaton where the LV is predicted to be non-complaint in 2019.

D4.17. In 2031 and 2039, there are no predicted exceedances of the LV at relevant locations for compliance reporting.

D5. Other Sources of Air Pollution

Permitted Facilities

D5.1. Defra and the Devolved Administrations maintain a database of sites which are at risk of contributing significantly to pollutant concentrations, called the UK Pollutant Release and Transfer

Register (Defra, 2022). A search of the 2020 database has not identified any regulated facilities within the NBBC boundary.

Railways

D5.2. There are several railway lines within the borough, including the Cross-Country line from Birmingham to Leicester, the Avanti West Coast and London Northwestern Railway, from Milton Keynes and London Euston, and the West Midlands Railway connecting Nuneaton and Coventry. Both passenger and freight locomotives travel along these railway lines. These locomotives are diesel fuelled and release emissions of NOx and NO_2 from the combustion of fuel. Defra's predicted background concentrations include contributions from railway locomotives and thus the emissions from these railways are already accounted for above. However, it is important to note that Defra's concentrations are 1 km^2 averages and there may thus be elevated concentrations in close proximity to the railway lines.

Commercial and Domestic Combustion Plant

D5.3. There may also be elevated concentrations at locations in close proximity to exhaust extracts of commercial and domestic combustion plant (such as gas-fired boiler flues, domestic fireplaces, combined heat and power plant, etc.), which release NOx and NO_2 as part of the combustion process. Defra's predicted background concentrations include contributions from commercial and domestic sources and thus the emissions from these may already be accounted for.

D6. Overall Baseline Conditions

Air Quality Objectives

D6.1. Measured annual mean NO_2 concentrations within the borough exceeded the AQO at two locations in 2019 (16 and 52 Midland Road). No other exceedances were recorded within the borough, but predicted concentrations demonstrate there were likely to be other locations in exceedance throughout the borough.

D6.2. By 2031, concentrations are predicted to be significantly lower due to the Government's assumed reduction in emissions from vehicles (as more lower emission vehicles are adopted) and cleaner technologies for other pollution sources come through. This includes the end of the sale of petrol and diesel cars by 2030. Between 2031 and 2039 predicted concentrations continue to reduce but only marginally. There are no exceedances predicted in 2031 or 2039.

Limit Value Compliance

D6.3. There are several relevant locations within Nuneaton where the LV is predicted to be non-complaint in 2019.

D6.4. Defra has predicted there to be no exceedances in 2023 or 2030.

D6.5. In 2031 and 2039, there are no predicted exceedances of the LV at relevant locations for compliance reporting.

D7. Glossary

Air Quality Standards	Concentrations recorded over a given time period, which are considered to be acceptable in terms of what is scientifically known about the effects of each pollutant on health and on the environment.
An exceedance	A period of time (defined for each standard) where the concentration is higher than that set out in the Standard.
An objective	The target date on which exceedances of a Standard must not exceed a specified number.
APS	Air Pollution Services
AQFA	Air Quality Focus Area
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AURN	Automatic Urban and Rural Network
CAZ	Clean Air Zone
CCC	Coventry City Council
LAQM	Local Air Quality Management
LEZ	Low Emission Zone
Limit Values (LVs)	Legally binding parameters that must not be exceeded. Limit values are set for individual pollutants and are made up of a concentration value, an averaging time over which it is to be measured, the number of exceedances allowed per year, if any, and a date by which it must be achieved. Some pollutants have more than one limit value covering different endpoints or averaging times.
NBBC	Nuneaton and Bedworth Borough Council
NO_2	Nitrogen dioxide
NRMM	Non-Road Mobile Machinery
PRTR	Pollutant Release and Transfer Register
ULEZ	Ultra Low Emission Zone
$\mu g/m^3$	Microgrammes per cubic metre

D8. References

Defra. (2022). UK Pollutant Release and Transfer Register (PRTR) data sets. Retrieved from https://prtr.defra.gov.uk/registry-dataset

Defra. (2022b). 2019 NO2 projections data (2017 reference year). Retrieved from UK AIR Air Information Resource: https://uk-air.defra.gov.uk/library/no2ten/2019-no2-projections-from-2017-data

Defra. (2023a). Background Mapping data for local authorities. Retrieved from UK AIR Air Information Resource: https://uk-air.defra.gov.uk/data/laqm-background-home

NBBC. (2021). Nuneaton & Bedworth 2021 Air Quality Annual Status Report (ASR).

NBBC. (2021). Nuneaton and Bedworth Air Quality Action Plan .

NBBC. (2021). Nuneaton and Bedworth Annual Air Quality Status Report .

Vectos microsim. (2023). STA - Nuneaton and Bedworth Borough Plan 2023, Nuneaton and Bedworth Borough Council, Strategic Transport Assessment, VM225433 - NBBC STA Update 2023.

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Dispersion Modelling Approach: Nuneaton and Bedworth Borough Plan Review

Client: Nuneaton & Bedworth Borough Council **Reference:** APS_L1007A_E1-1 **Date Published:** 31 July 2023

Rev.	Date	Description	Prepared	Reviewed	Authorised
01	18/07/2023	Issued	TW/EJ	AC	AC
02	31/07/2023	Minor edits to text	EJ	AC	AC

E1. Introduction

E1.1. Air Pollution Services (APS), part of KALACO Group Ltd, has been commissioned by Nuneaton and Bedworth Borough Council (the 'Client') (NBBC) to assess the air quality impacts of development associated with the emerging Borough Plan, particularly the impacts upon the Air Quality Management Areas (AQMAs) within Nuneaton and Coventry.

E1.2. To carry out the assessment a detailed dispersion modelling study has been completed. Details of the study are presented in this document and includes a modelling overview (Section E2), description of the model used (Section E3), modelled receptors (Section E4), meteorology and surface characteristics used (Section E5), roads modelling (Section E6), post processing of the model outputs (Section E7) and uncertainties and limitations (Section E8), as well as a glossary of terms (Section E9) and a list of references (Section E10).

Location Context

E1.3. The location of the borough is presented in Figure 1 for context.

Figure 1: Location of NBBC's Boundary and Relevant AQMAs

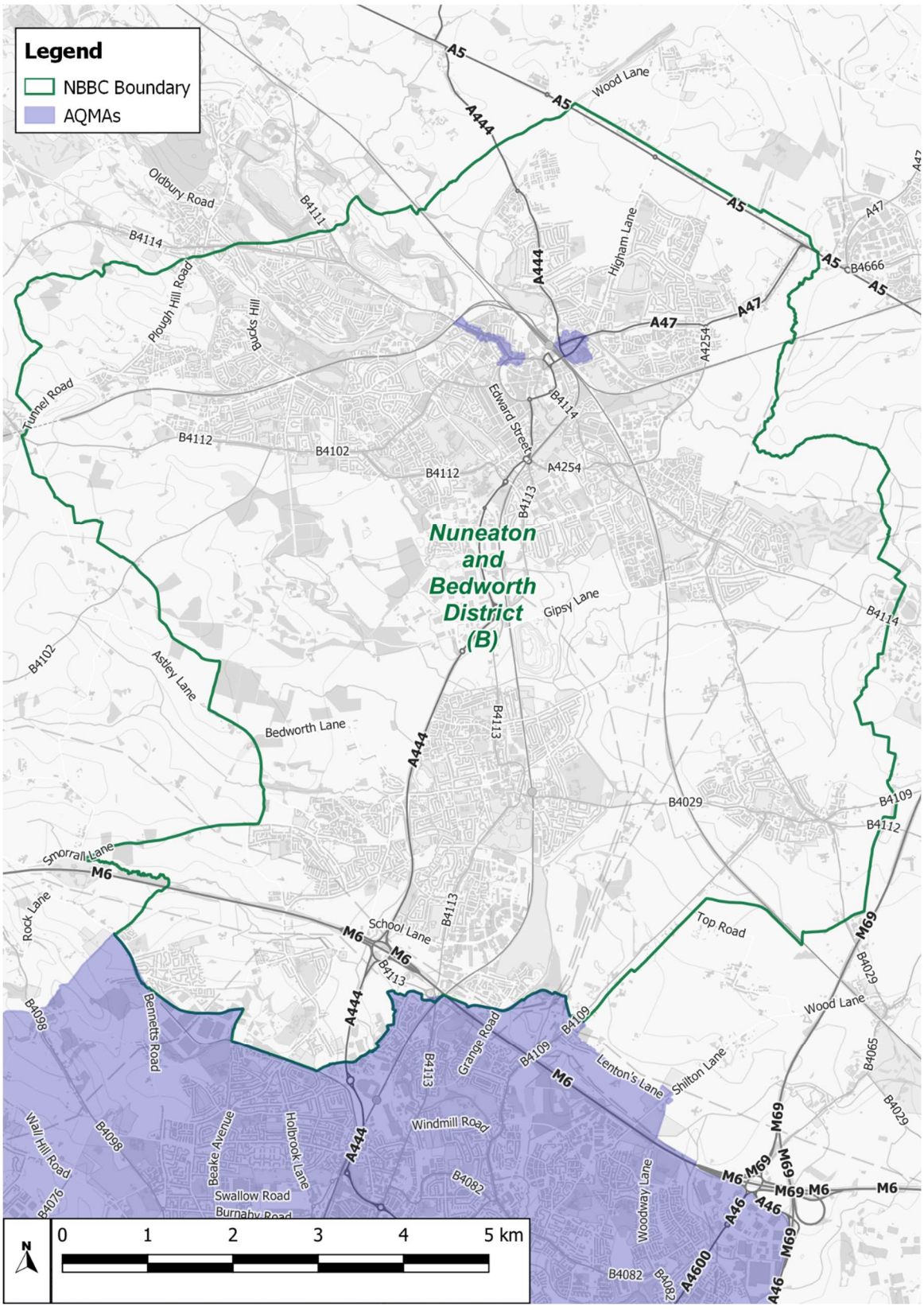

Figure notes: Contains OS data © Crown copyright and database right (2023).

E2. Modelling Overview

E2.1. Concentrations of nitrogen dioxide (NO_2) have been predicted for:

- the baseline year of 2019 (latest year with relevant monitoring data with which to verify the modelling);
- the future years of 2031 and 2039 – reference case. These scenarios are used as the benchmark against which the 2031 NBBC Borough Plan scenarios are compared. They include the unplanned growth informed by national forecasts but do not include the NBBC Plan sites or associated infrastructure;
- the future years of 2031 and 2039 – 'Do Something' scenario. Reference case with the addition of Borough Plan sites, including Highway mitigation identified as necessary and essential to address and alleviate notable transport issues; and
- the future year 2039 – 'Do Something' scenario with Mode Shift. The 2039 Do Something scenario with mode shift targets incorporated into traffic demands. Further details of the mode shift targets are set in the strategic transport assessment.

E2.2. The year 2019 is selected to represent the existing conditions because it is the latest year with monitoring data which is unaffected by the COVID-19 pandemic and therefore the model can be appropriately verified.

E3. The Model

E3.1. Concentration contributions associated with road traffic have been predicted across the local area using the ADMS-roads atmospheric dispersion model (v5.0.0.1). ADMS-Roads was developed and validated by Cambridge Environmental Research consultants (CERC). The model is used extensively throughout the UK for regulatory compliance purposes and Local Air Quality Management (LAQM) and is accepted as an appropriate tool by local authorities and the Environment Agency (EA).

E4. Modelled Receptors

E4.1. The model output locations are often referred to as receptors, although in some cases the locations may not represent locations of relevant exposure. For ease, this study uses the phrase receptor to represent the modelled output locations.

E4.2. Annual mean concentrations of NO_2 have been predicted using the ADMS-Roads dispersion model (v5.0.0.1) across a hybrid grid of receptors, covering a 11 km x 16 km area including the entire borough as well as parts of the neighbouring districts (such as the Coventry AQMA). The hybrid grid comprises a 200 m x 200 m cartesian grid and transects at varied distances along the roads (typical distances are from 10 m to 100 m) with receptors located at distances of 3.5 m, 5 m, 8 m, and 13 m from the road centreline.

E4.3. The receptors have been modelled at a height of 1.5 m above ground level. The extent of this modelled grid defines the 'Study Area'. These receptor locations are shown in Figure 2, Figure 3 and Figure 4.

Figure 2: Gridded Receptor locations within the Study Area

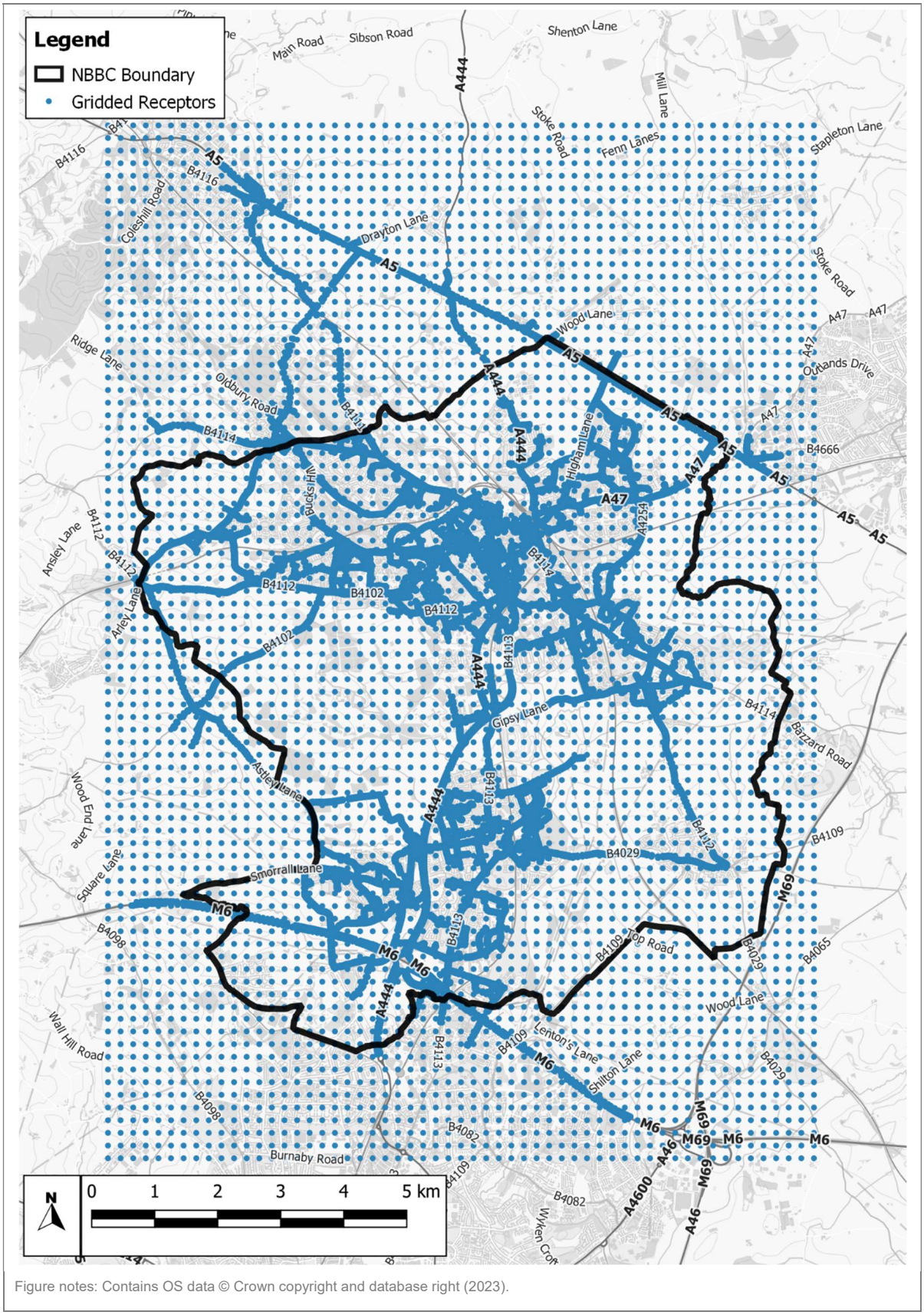

Figure notes: Contains OS data © Crown copyright and database right (2023).

Figure 3: Gridded Receptor locations within the Nuneaton AQMAs

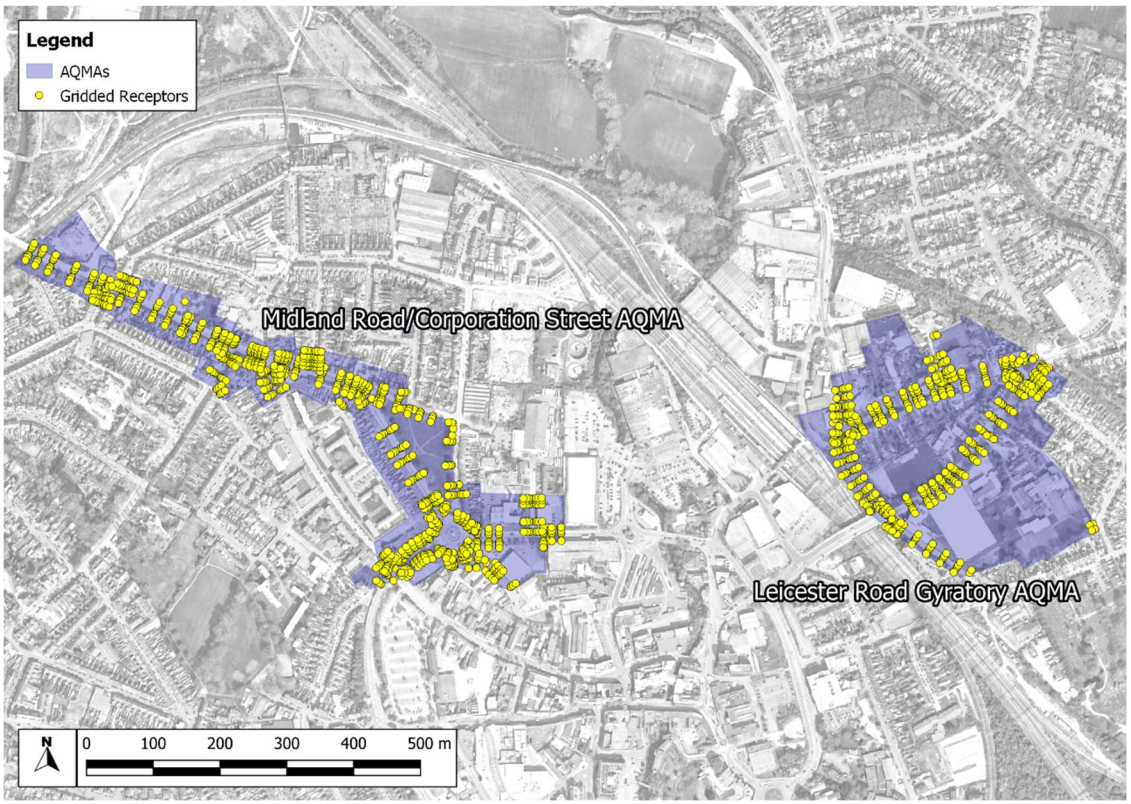

Figure notes: Imagery © 2023 Google, Map data © 2023.

Figure 4: Gridded Receptor locations within the Coventry AQMA

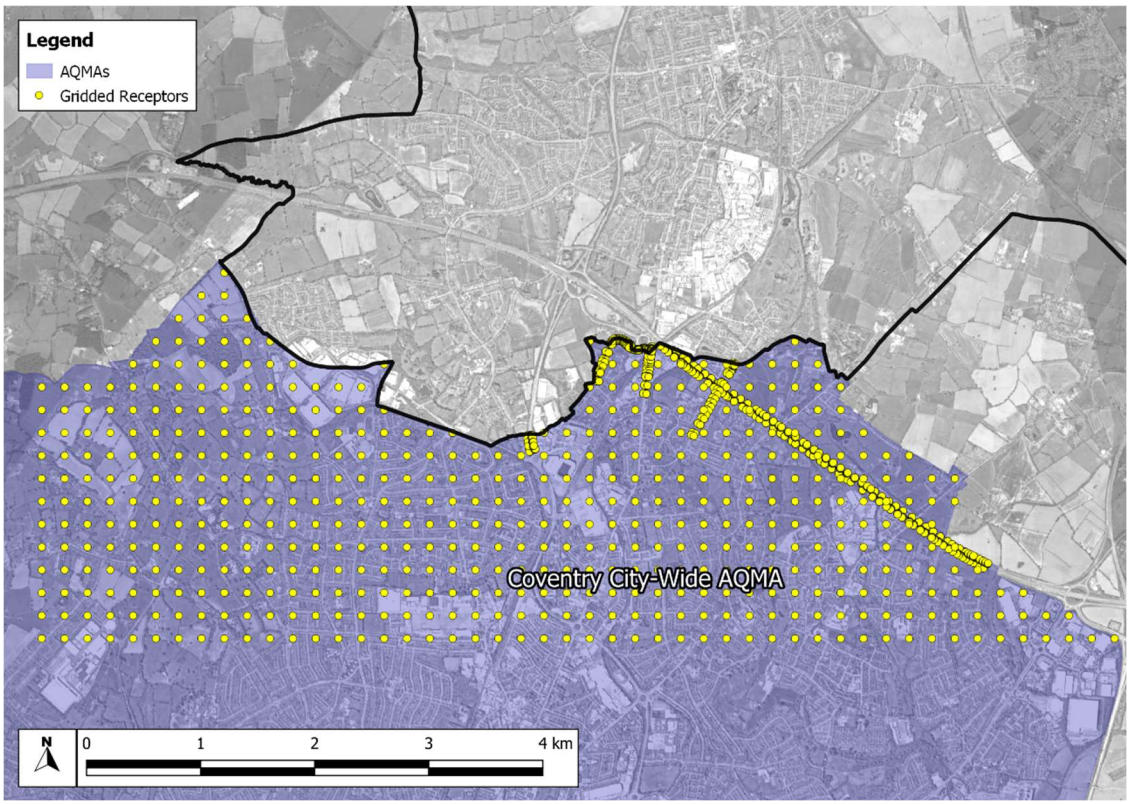

Figure notes: Imagery © 2023 Google, Map data © 2023.

E5. Meteorology and surface characteristics

Meteorology

E5.1. The dispersion model includes a meteorological pre-processor developed by the UK Met Office to calculate values of meteorological parameters in the boundary-layer. The pre-processor requires a set of meteorological parameters on an hour-by-hour basis: wind speed, wind direction, temperature and cloud cover.

E5.2. There are a number of sites in the UK where this data is measured and recorded, and it is considered that Coventry Coundon is an appropriate observational site to use for this assessment, based on the location of the Study Area and the proximity of the observation site. The study area is a flat lying location therefore there is not likely to be significant influence from hills on the meteorological conditions. The study area is also located approximately 100 km from the coast so coastal effects on meteorological conditions are not likely to be significant in the study area. Theoretically, the observed meteorological data typically represents measurements at a height of approximately 10 m above ground level.

E5.3. Wind roses showing the frequency of wind speeds and directions for the observation site for the years of 2015 to 2019 are shown in Figure 5. Meteorological data for 2019 has been used for the modelling study, which enables comparison of predicted concentrations with locally measured concentrations from 2019 for the validation of the model. Figure 5 demonstrates that this meteorological year is representative of typical conditions.

Figure 5: Windrose of Wind Speed and Direction for Each Year from 2015 (Top Left) to 2019 (Bottom Right) of Observational data at Coventry Coundon

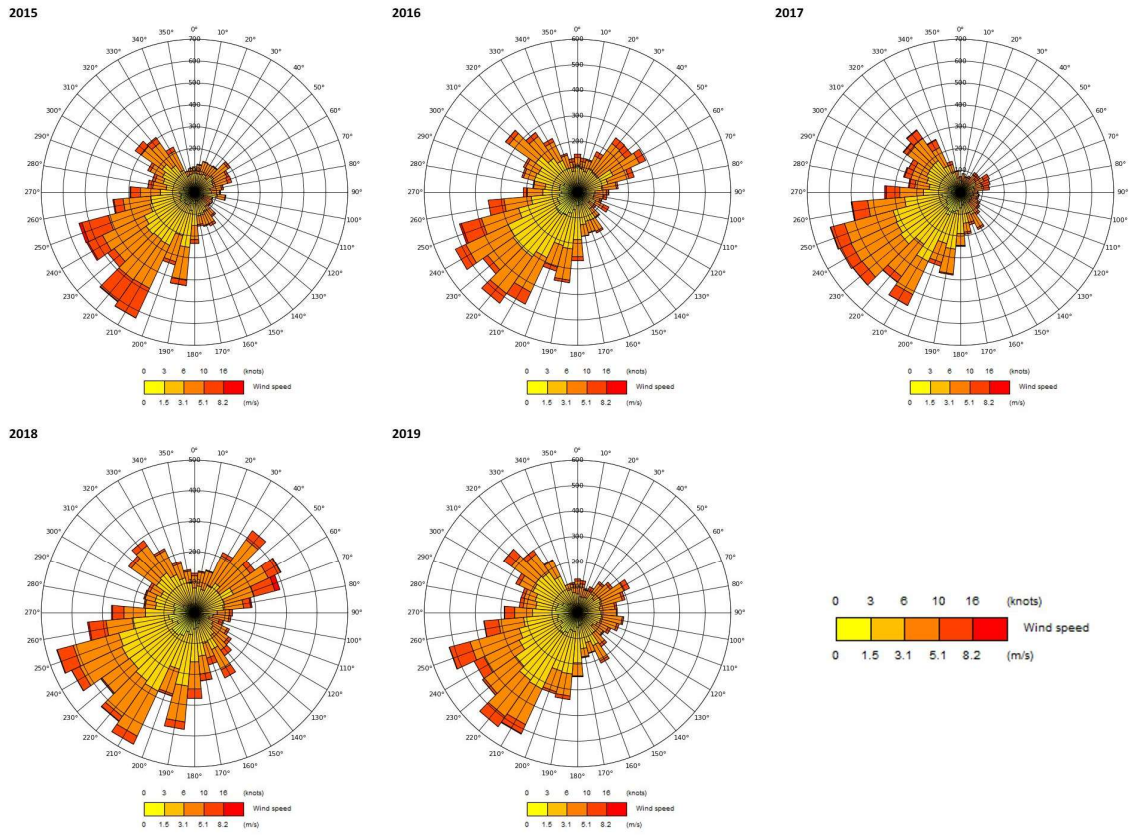

Figure notes: -

Surface Characteristics

E5.4. In addition to the meteorological data, the model requires values to be set for a number of meteorological related parameters, for both the area the meteorological data represents and the dispersion site the Study Area. Land-use and surface characteristics have an important influence in determining turbulent fluxes and, hence, the stability of the boundary layer and atmospheric dispersion. Details of the parameter values used in the modelling are provided in Table 1 below.

E5.5. Surface roughness length used within the model represents the aerodynamic effects of surface friction and is defined as the height at which the extrapolated surface layer wind profile tends to zero. This value is an important parameter used by the built-in meteorological pre-processor of ADMS to interpret the vertical profile of wind speed and estimate friction velocities which are, in turn, used to define heat and momentum fluxes and, consequently, the degree of turbulent mixing. Surface roughness values for different land-use classifications have been specified. Accounting for differences between the area the data represents, and the Study Area is essential. Due to the size of the model domain, a variable surface roughness file has been used within the model based on the spatially variable land-uses and the equivalent roughness values from the dataset. Figure 6 shows the values used across the modelled domain. Surface roughness has been calculated based on land-use up to 1,000 m from both the meteorological station and the centre of the Study Area, and is an inverse distance weighted geometric mean.

Figure 6: Modelled Surface Roughness

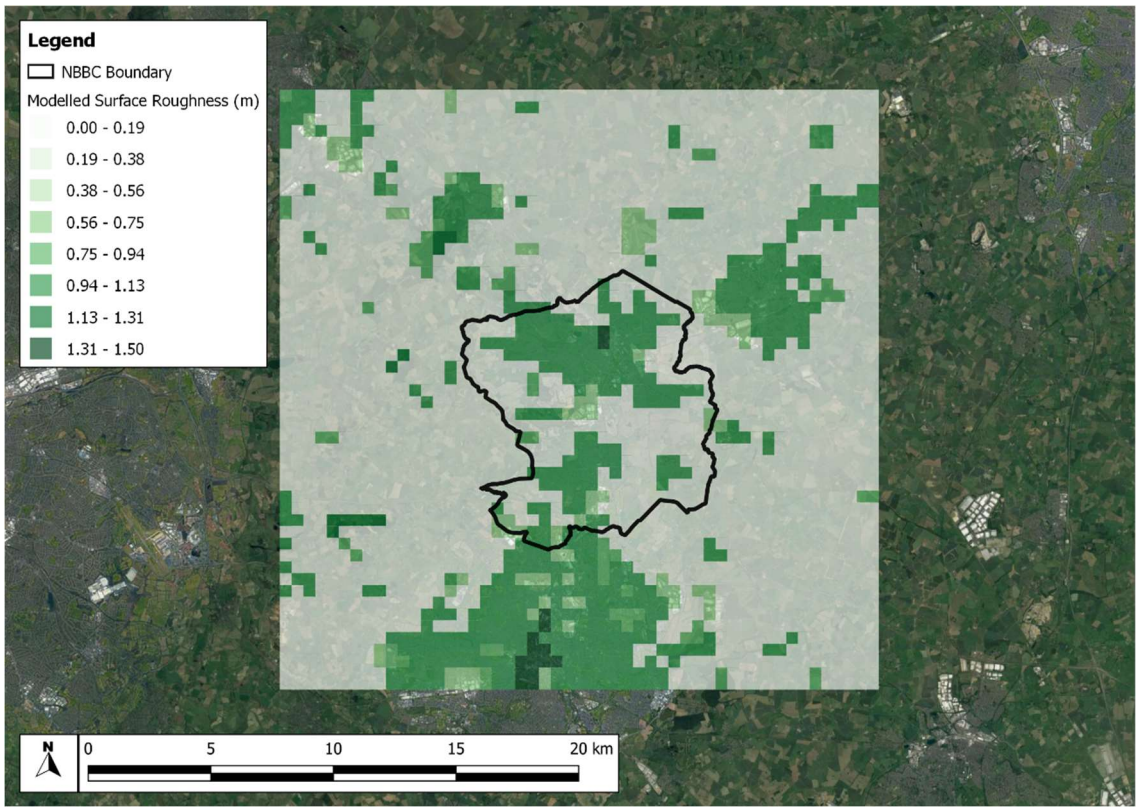

Figure notes: Imagery © 2023 Google, Map data © 2023.

E5.6. The surface albedo is the ratio of reflected to incident shortwave solar radiation at the surface of the earth. This varies depending on the land use, and thus area-weighted average albedos have been derived for the meteorological data area and the dispersion site study area and used in the models. Albedo values have been associated with the different land uses. For this project Albedo has been calculated based on land-use up to 5,000 m from the centre point (both the centre of the Study Area and the observation site) and is an arithmetic mean. The mean includes an inverse distance weighting for distances over 1,000 m.

E5.7. The Priestley-Taylor parameter is a parameter representing the surface moisture available for evaporation. A Priestley-Taylor parameter of 1 has been set in the model.

E5.8. The CERC user guide explains that *"the Monin-Obukhov length provides a measure of the stability of the atmosphere. In very stable conditions in a rural area its value would typically be 2 to 20 m. In urban areas, there is a significant amount of heat generated from buildings and traffic, which warms the air above the town/city".* For large urban areas this is known as the urban heat island. It has the effect of preventing the atmosphere from ever becoming very stable. Minimum Monin-Obukhov length can be defined in the model to account for the urban heat island effect which is not represented by the meteorological data. The minimum Monin-Obukhov ratio is calculated based on land-use up to 5,000 m from the centre point (both the centre of study area (dispersion site) and the observation site) and is a geometric mean. The mean includes an inverse distance weighting for distances over 1,000 m.

Table 1: Meteorological Parameters Values used in the Model

Parameter	Dispersion Site Value	Meteorological Site Value
Latitude (°)	52.511	n/a
Surface roughness (m)	n/a [a]	0.394
Surface albedo	0.204	0.209
Minimum Monin-Obukhov length (m)	24.349	24.627
Priestley-Taylor parameter	1	1

Table notes:
a. This value has not been utilised in the model since a variable surface roughness file has been used instead.

Processed Meteorological Data

E5.9. The meteorological parameters alter the meteorological data inputted into the model to reflect conditions at the dispersion site (the Study Area). For example, if the dispersion site has a higher surface roughness value than the observational meteorological site, then the model will reduce the wind speed at the dispersion site to reflect this. Figure 7 shows the unprocessed and processed meteorological data of frequency of wind speeds and directions in 2019. The wind conditions are similar at both locations, with the dispersion site experiencing marginally lower wind speeds (due to the area being more urban with buildings causing the surface to be rougher causing the wind to slow down).

Figure 7: Windrose of Wind Speed and Direction for 2019 of Observational data at Coventry Coundon for the unprocessed meteorological data (Left) and the processed meteorological data (Right)

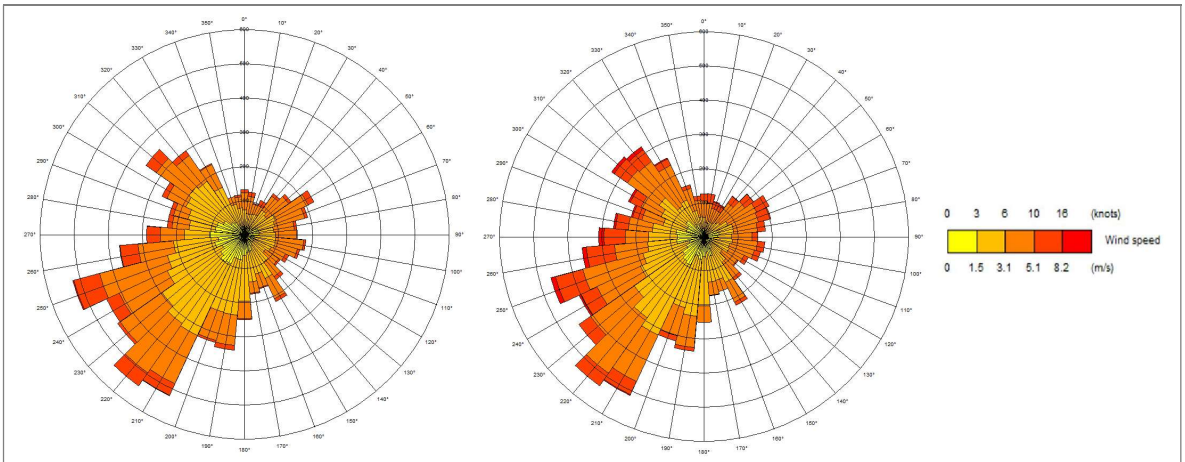

Figure notes: -

E6. Roads Modelling

Traffic Flows

E6.1. Annual average daily traffic data (AADT) and the percentage of heavy-duty vehicles (HDVs) was provided for roads within the study area by Vectos microsim on behalf of NBBC. This included traffic data for the years of 2016, 2028, 2031 and 2039. For the purposes of modelling Vectos microsim advised that 2019 traffic flows could be assumed the same as 2016 flows. The future year traffic data was provided both with and without additional traffic generated by development associated

with the emerging Borough Plan. Further details of traffic flows are set out in the Strategic Transport Assessment (Vectos microsim, 2023). The modelled road links which the traffic data are associated to are shown in Figure 8, Figure 9 and Figure 10.

Figure 8: Modelled Road Links

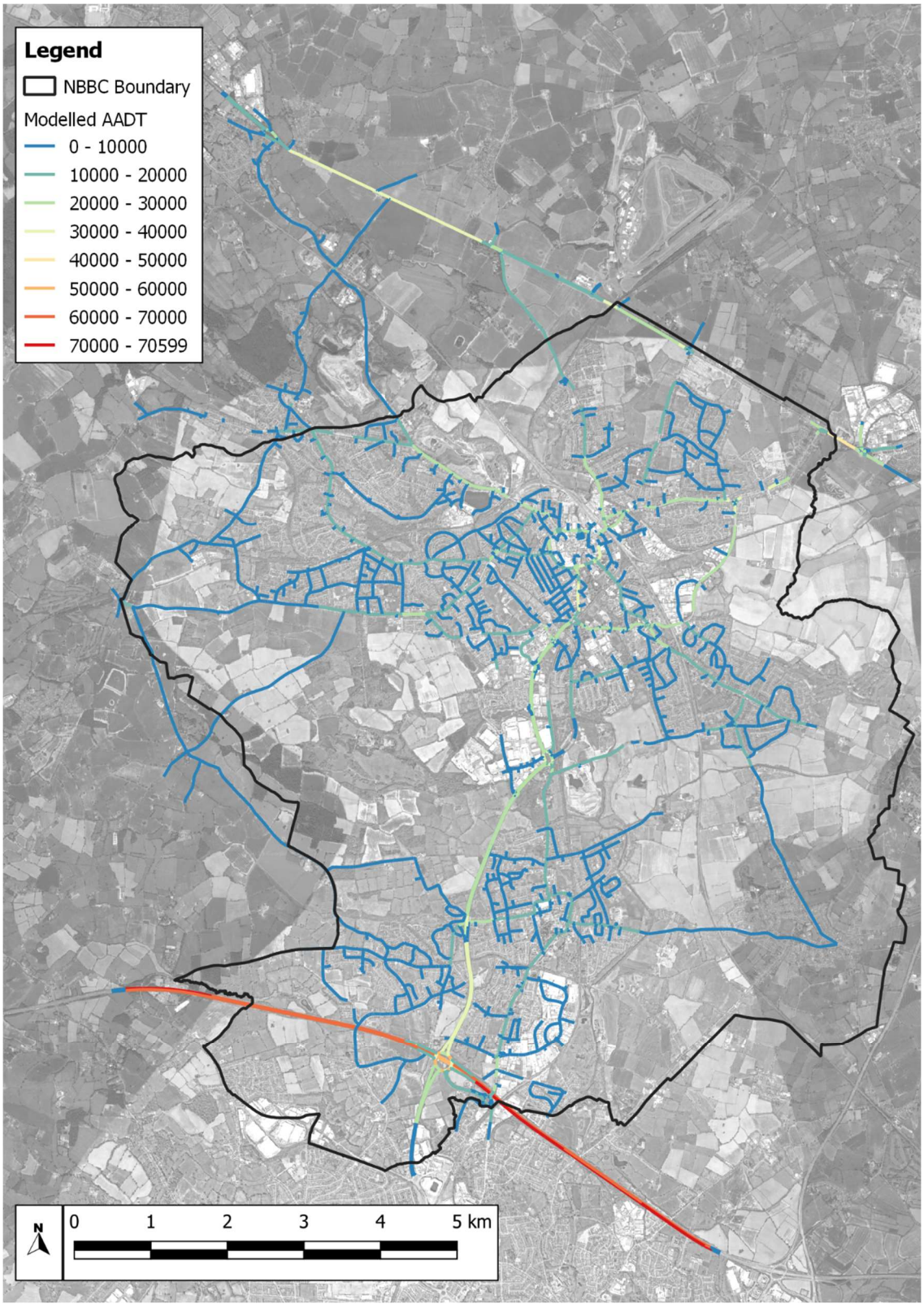

Figure notes: Imagery © 2023 Google, Map data © 2023.

Figure 9: Modelled Road Links within and close to the AQMAs in Nuneaton

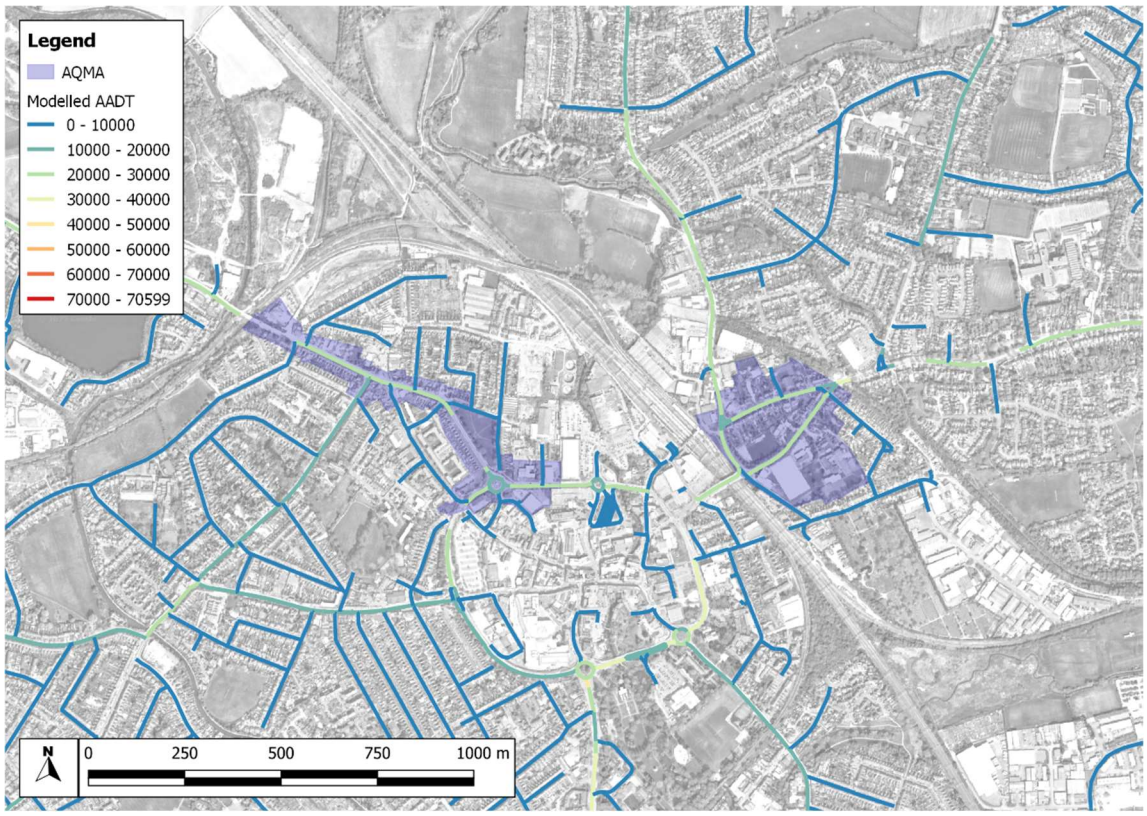

Figure notes: Imagery © 2023 Google, Map data © 2023.

Figure 10: Modelled Road Links within and close to the AQMA in Coventry

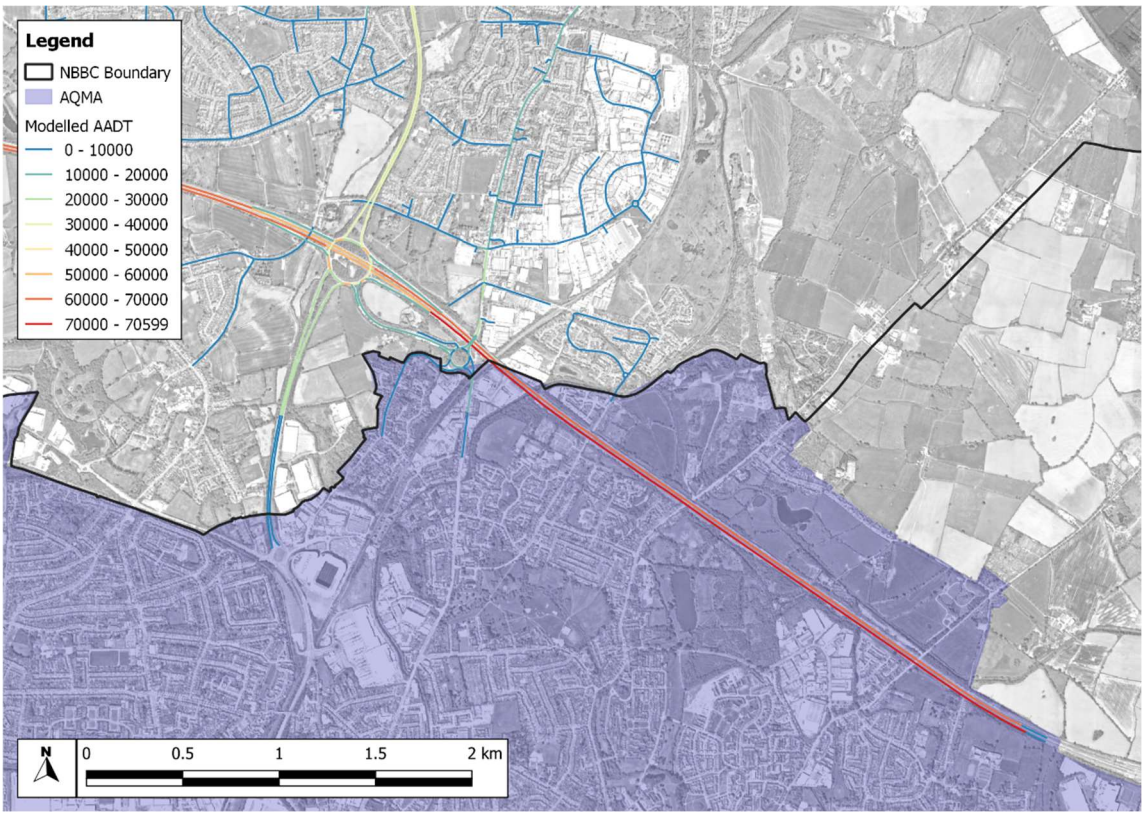

Figure notes: Imagery © 2023 Google, Map data © 2023

Time-Based Profiles

E6.2. Vehicle emissions vary over time depending on the volume of traffic, this includes hourly, daily and seasonal variations. Diurnal (hourly) traffic flow profiles have been taken from the Department of Transport's (DfT) national statistics (DfT, 2020) and used in the model to adjust the emissions for each hour of the year for all roads modelled. The diurnal traffic flow profiles are shown in Figure 11.

Figure 11: Urban diurnal profile for each day of the week used in the model, where the factor is the value that the average daily emissions are multiplied by in the model

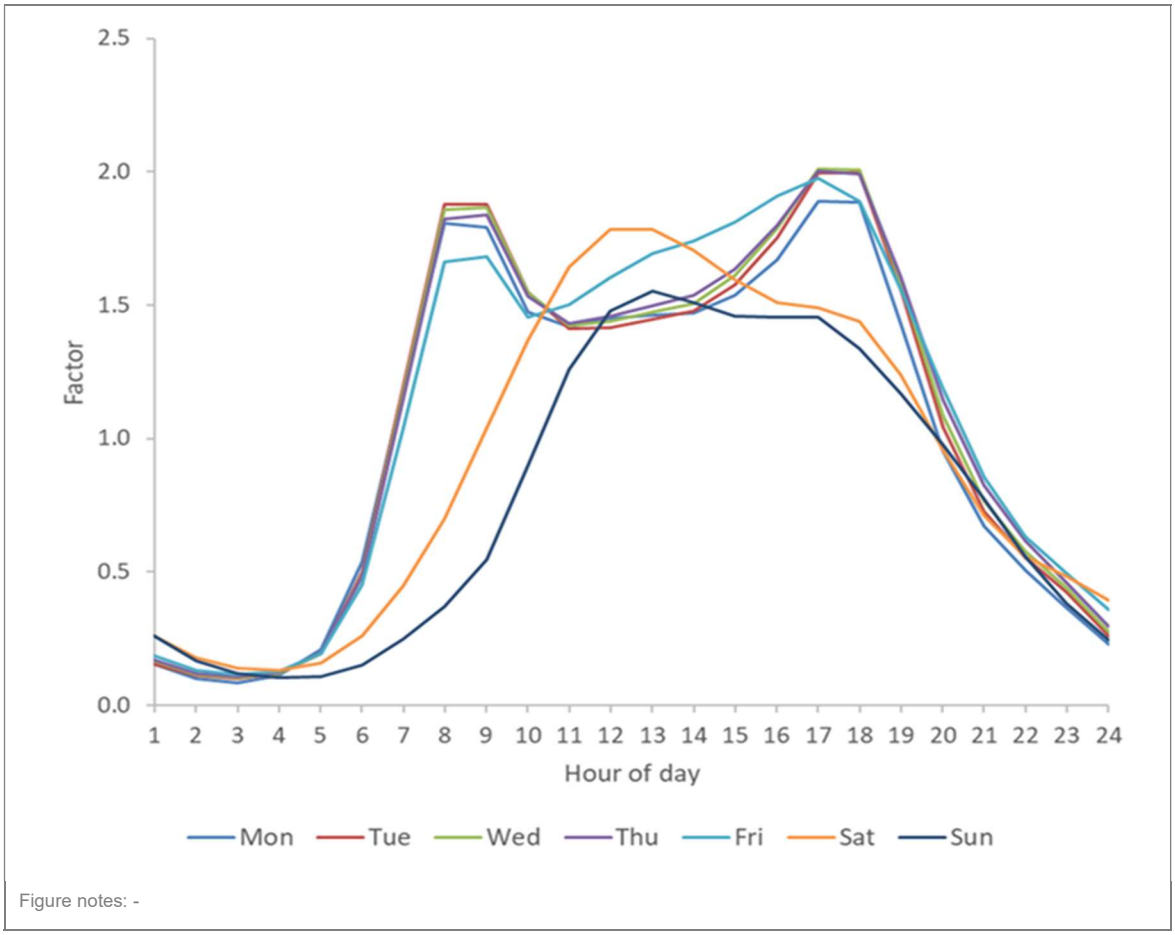

Figure notes: -

Modelled Roads

E6.3. The road geometries, widths, and heights included in the dispersion model have been aligned with data from Google Satellite and Ordinance Survey maps, which included carefully considering relative distances from the roads to receptors and monitoring sites. The modelled road links and speeds are shown in Figure 12 and Figure 13.

Figure 12 :Modelled Road Links and Speeds

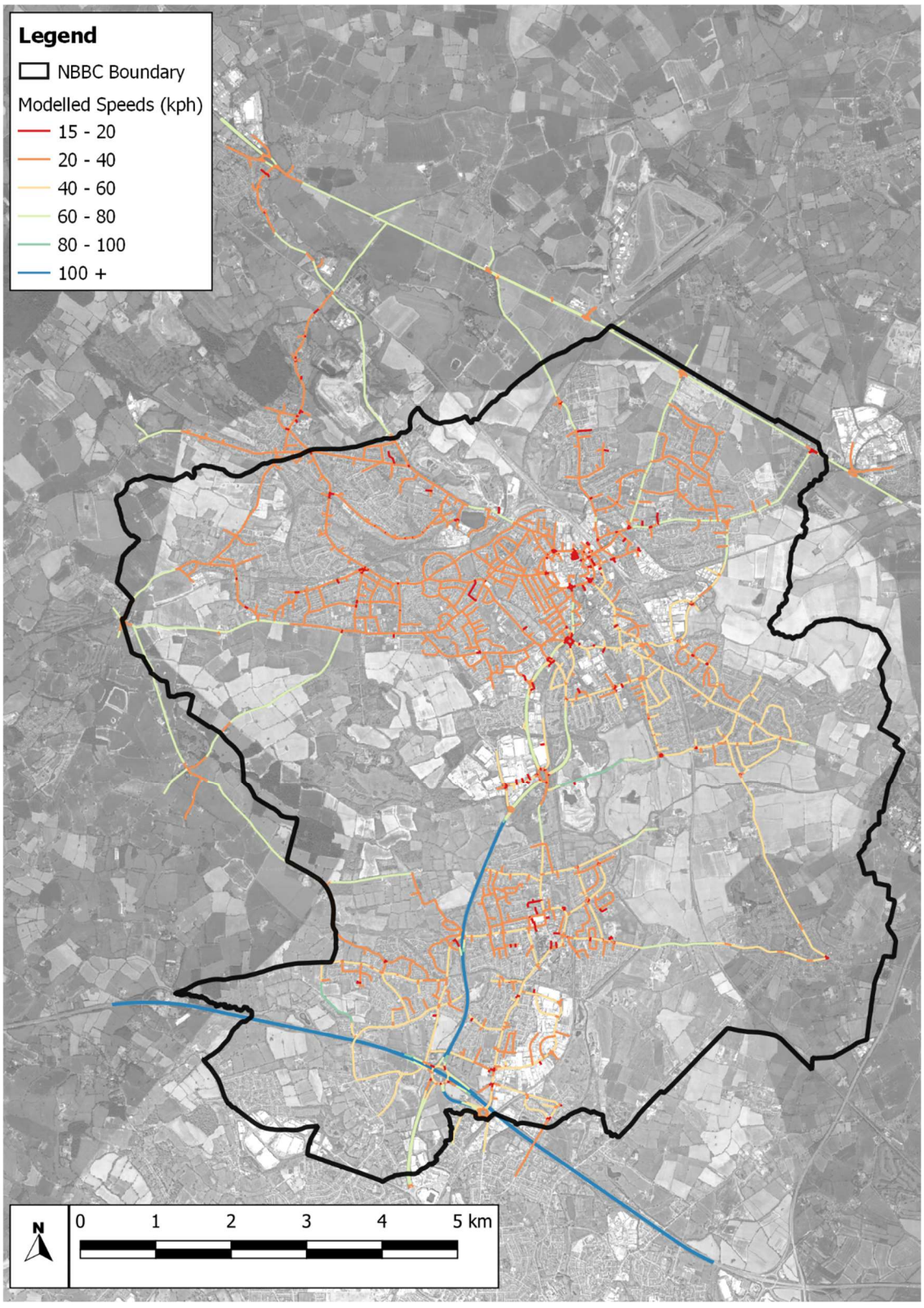

Figure notes: Imagery © 2023 Google, Map data © 2023.

Figure 13: Modelled Road Links and Speeds within and close to the AQMAs in Nuneaton

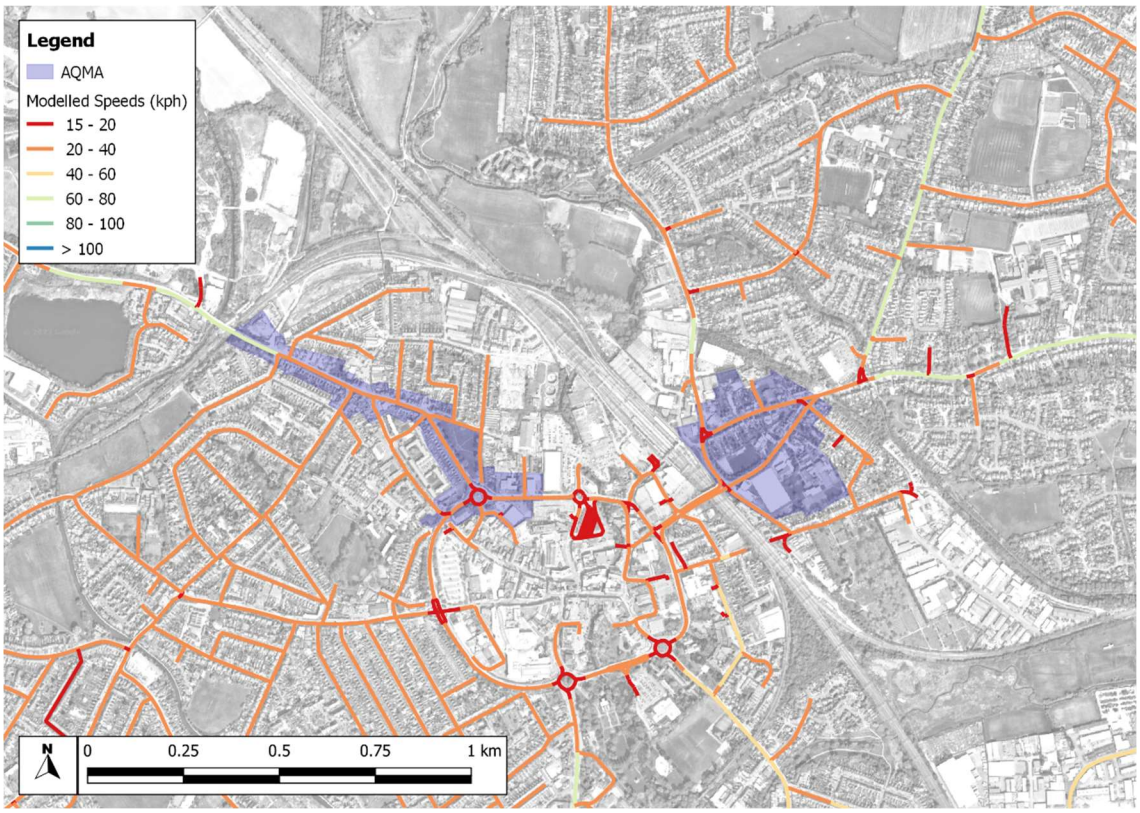

Figure notes: Imagery © 2023 Google, Map data © 2023.

Figure 14 :Modelled Road Links and Speeds within and close to the AQMA in Coventry

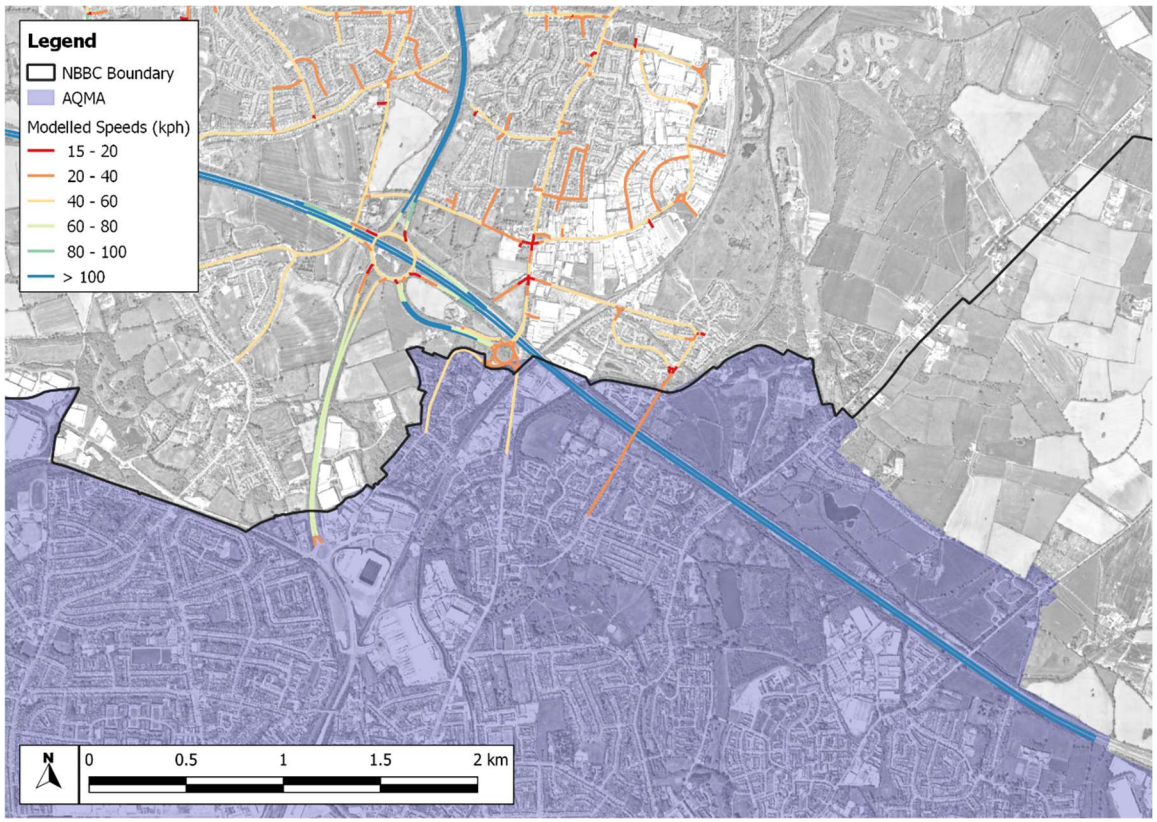

Figure notes: Imagery © 2023 Google, Map data © 2023.

Vehicle Speeds

E6.4. Average vehicle speeds for roads within the study area have been provided by Vectos microsim on behalf of NBBC. Where appropriate, the vehicle speeds have been reduced to take account of slower speeds at junctions, queuing, regularly parking of vehicles along roads and narrowing of lanes. The modelled road links and speeds are shown in Figure 12 and Figure 13 above.

Modelled Road Gradients

E6.5. The road gradients included when calculating emissions have been derived from LIDAR data obtained from the Environment Agency hosted on Defra Data Services Platform (Defra, 2023). The gradients have been carefully reviewed to ensure that any anomalies introduced by bridges, flyovers, etc., have been corrected for in the gradients used in the modelling. These gradients have been taken into account when calculating emissions.

Figure 15: Modelled Road Gradients

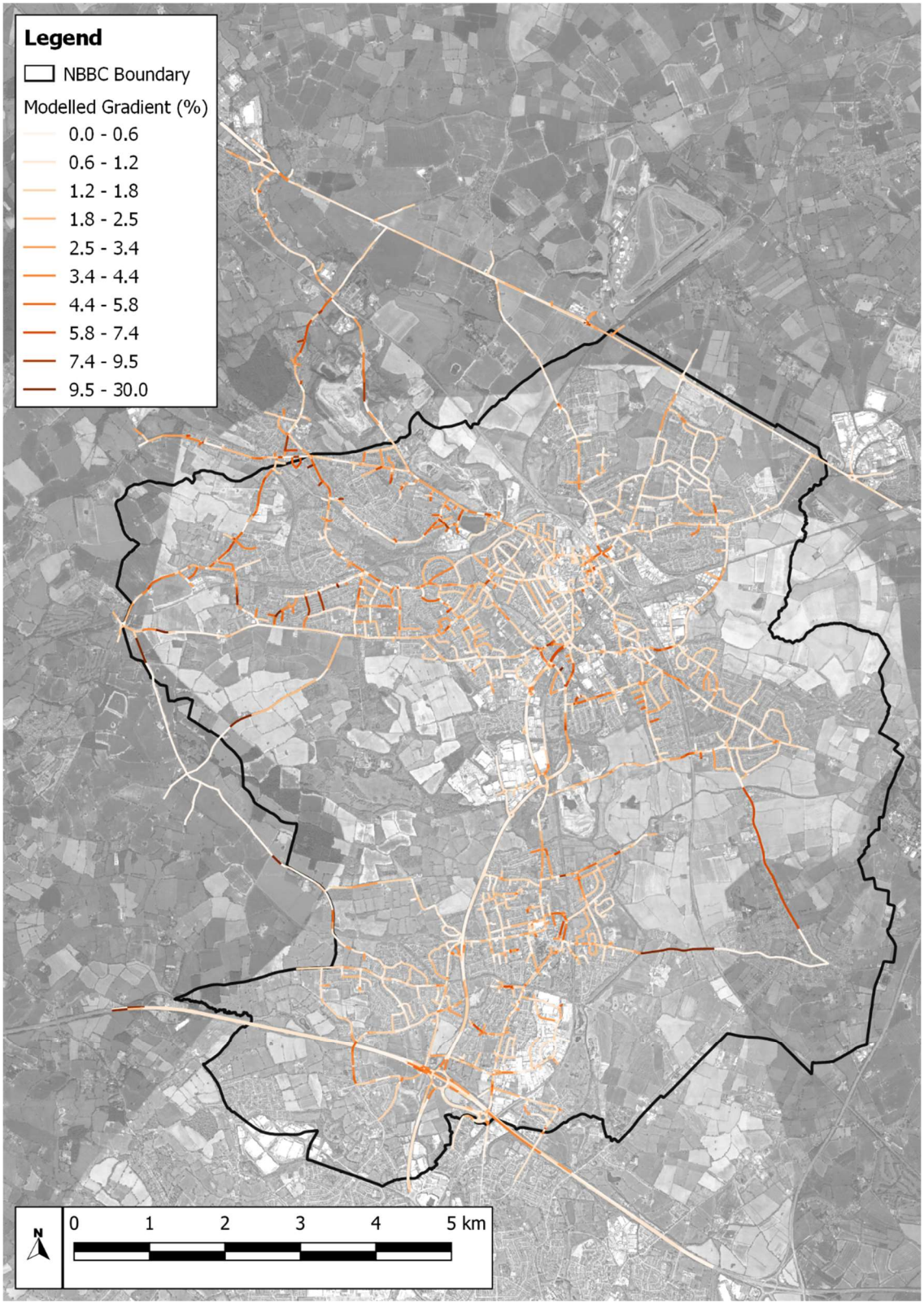

Figure notes: Contains OS data © Crown copyright and database right (2023).

Vehicle Emissions

E6.6. Emissions of road-NOx (i.e. the contribution from vehicles using roads), road-PM_{10} and road-$PM_{2.5}$ have been derived from the latest version of Defra's Emissions Factor Toolkit (EFT) (v11.0) using the traffic data and gradients set in this document. The EFT is based on the COPERT 5 (Computer Programme to calculate Emissions from Road Transport) vehicle emission model and provides speed-average based emission rates. The EFT provides vehicle emission rates for the years 2017-2030; future years are based on a range of factors, such as expected vehicle fleet release dates, anticipated improvements in emission reduction technologies, expected uptake rates of different vehicles based on government policies, etc. It is, therefore, possible that the expected future emission rates in the EFT may differ from reality.

E6.7. As a result of the pandemic, the vehicle fleet turnover in the UK has been slower than expected due to the COVID-19 pandemic. New vehicle sales were reduced, with higher rates of private vehicle owners retaining their existing vehicles, leading to predicted reductions in emissions not materialising. However, electric vehicles have increased over the same period, accounting for more than one in ten new car registrations in 2020 and a 90% increase of plug-in hybrid cars, albeit much low numbers of new vehicles were sold. While there may be some uncertainty in the EFT's emission factors, overall, they are considered to be broadly representative.

Fraction of Primary NO_2

E6.8. In addition to emission rates, the fraction of primary NO_2 (f-NO_2) has been obtained from the EFT. This represents the amount of nitrogen dioxide (NO_2) released from vehicle exhausts, before any further chemical reactions in the atmosphere, which becomes an important variable when post-processing the model predictions. In order to obtain the f-NO_2 value at each receptor location, the nitrous oxide (NOx) emission rates have been multiplied by f-NO_2 values to derive NO_2 emission rates. These NO_2 emissions have been included in the model and primary NO_2 concentrations have been predicted at the receptors. The predicted NOx concentrations have been divided by the predicted primary NO_2 concentrations to calculate the f-NO_2 values at the receptor locations. The f-NO_2 values have been used in the model post-processing.

Wake Effects

E6.9. As vehicles travel along a road a wake is left behind the vehicles as air in the path of travel is forced around the vehicle. The wake can be considered the turbulence induced by the movement of the vehicle, which affects the dispersion of pollution away from roads. The AADT traffic flows have been entered into the ADMS-roads dispersion modelling in order to account for vehicle wake effects which will vary on each link depending on the proportion of large vehicles to small vehicles.

Modelled Street Canyons

E6.10. Most roads in the Study Area are enclosed by buildings and vegetation, leading to restricted dispersion of pollution away from the roads and higher concentrations close to the roads. This is known as a 'street canyon' effect. These roads have therefore been modelled as asymmetric street canyons using the Advanced Street Canyon Module, within the ADMS-Roads model, accounting for the fraction of 'covered' canyons. The roads included in the dispersion model have been carefully reviewed using data from Google Satellite and Google StreetView to identify street canyon effects, which included carefully considering relative heights of modelled street canyons to receptor and

monitoring heights. Where dispersion may be affected, canyons have been included to account for this. The street canyon widths modelled at the Nuneaton AQMAs are shown in Figure 16.

Figure 16: Modelled Street Canyons

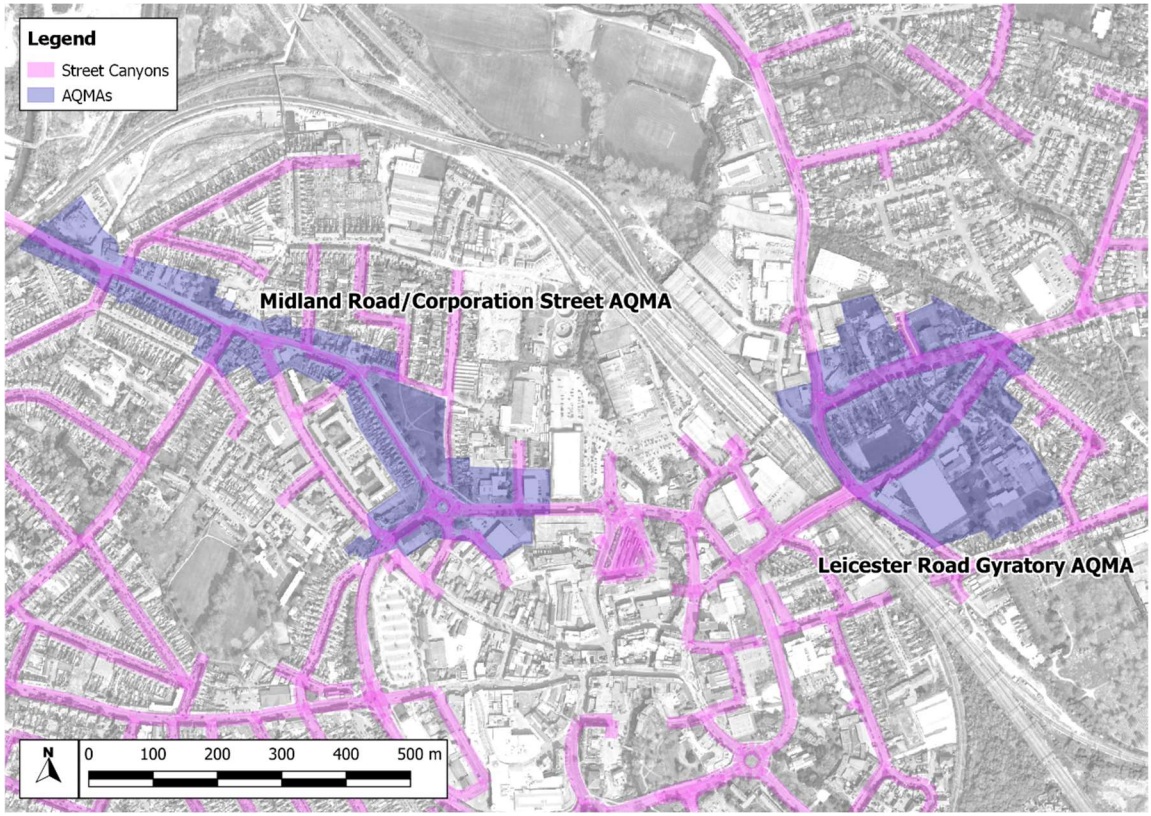

Figure notes: Imagery © 2023 Google, Map data © 2023.

Model Performance

E6.11. The modelling will inherently have some uncertainties and may not reflect real conditions in the local area. An important part of modelling is reviewing the model results carefully and checking the model setup parameters and input data to minimise uncertainties.

E6.12. LAQM.TG22 (Defra, 2022), provides local authorities with advice on good practice for modelling air quality. This advice is widely applied for air quality assessments of proposed developments, although it is specifically aimed at local authority's duties to review and assess air quality. LAQM.TG22 states that model verification, defined as a comparison of modelled results with monitoring results at relevant locations, is necessary (paragraph 7.550).

E6.13. There are many reasons why there may be a difference between modelled and monitored concentrations and LAQM.TG22 states *"Model verification is the process by which these and other uncertainties are investigated and where possible minimized"* (paragraph 7.552). It provides a list of the factors that may explain the differences including meteorological data, source activity data (e.g. data flow and speed), emission factors, model input parameters such as roughness length, and monitoring data.

E6.14. The advice in LAQM.TG22 is generic for all dispersion models. ADMS has been shown to predict concentrations well given sufficiently accurate data inputs.

E6.15. It is important to review the results of the modelling carefully and check the model setup parameters and input data. Once reasonable effects have been made to reduce the uncertainties of input data for a model, further comparison of modelled and monitored results should be undertaken. Where discrepancies remain, consideration may be given to adjusting the model.

E6.16. Using good modelling techniques provides confidence that the model is performing as well as possible everywhere in the modelling area in the base year, not just at the monitoring locations. Modelling is often an iterative process that involves improving the model setup and evaluating the impact on model performance. The same principles need to be applied to the entire modelling study area to ensure the model performs well throughout the study area.

E6.17. All reasonable efforts have been made to improve the model inputs. The model has gone through several modelling iterations to consider whether to performance of the modelled inputs can be improved. Improvements are based on comparison with the measured concentrations at specific monitoring locations and where improvements have been made, they have been applied as a holistic approach with systematic updates to the entire model study area to ensure that the model is not performing well exclusively at the monitoring locations. Iterations to the model can include changes in streetscape parameters, widths of road links, the heights of receptors and examining traffic data to improve the model performance using a systematic approach. Ultimately providing a model representative of the modelling area.

E6.18. A final model verification exercise has been undertaken to determine whether there are any final discrepancies and to derive a factor with which to adjust the predicted concentrations from the model so that they match local conditions as closely as possible.

E6.19. A good model performance is considered to be where:

- The comparison between the modelled and measured road NOx should be on average, less than a factor of two; and
- The final modelled and measured NO_2 root mean square error (RMSE) should be less than two $\mu g/m^3$.

E6.20. Where this is not the case and all reasonable efforts have been made to improve the model, it is then considered likely that the error is due to a fundamental input such as the raw traffic data. In these situations, it is considered important that the assessment should then account for the greater uncertainty in the analysis of the results.

Final Model Verification

E6.21. A final model verification exercise has been undertaken, following the guidance set out by Defra in Box 7.17 and Box 7.18 of LAQM.TG22 (Defra, 2022).

E6.22. Concentrations of road-NOx and primary NO_2 have been predicted for the year of 2019 using the ADMS-roads dispersion model at the majority of monitoring sites (35) within the Study Area. Predictions have been made at the heights of the monitor inlets.

NO_2

E6.23. Initially, the measured NO_2 concentrations at the monitoring sites were inputted into Defra's NOx to NO_2 Calculator, along with the background NO_2 concentrations and f-NO_2 values, in order to

obtain 'measured' road-NOx concentrations at the monitoring sites. The primary NO_2 emission factor (f-NO_2) at each monitoring site was calculated by taking the ratio of predicted primary NO_2 concentration to predicted road-NOx concentration.

E6.24. The predicted road-NOx concentrations have been compared to the 'measured' road-NOx concentrations and NOx factor calculated for each monitor, see Table 2.

Table 2: Measured and Modelled NOx Comparison

Monitor	Measured NO_2	Background NO_2	Predicted f-NO_2	Measured Road-NOx	Modelled Road-NOx	NOx Factor
3	23.1	13.8	0.21	19.1	9.5	1.22
4	21.1	13.9	0.16	15.1	13.7	1.01
5	21.7	13.6	0.18	16.9	10.4	1.14
16	28.2	10.2	0.80	23.3	11.7	1.47
AQM	30.2	13.7	0.67	23.2	26.7	0.90
NB04	30.1	13.7	0.64	23.4	20.6	1.05
NB07	30.9	13.2	0.76	23.3	25.4	0.93
NB09	29.9	14.0	0.77	20.8	20.0	1.01
NB17	28.4	14.4	0.93	16.7	12.8	1.13
NB18	31.6	14.6	0.82	21.4	14.2	1.22
NB20	26.8	14.0	0.47	21.0	15.4	1.12
NB21	27	13.8	0.57	20.0	24.4	0.88
NB22	24.8	13.6	0.49	18.1	19.9	0.93
NB23	31	13.6	0.64	24.9	24.9	0.98
NB24	23.9	13.8	0.49	16.3	19.4	0.90
NB25	30.5	14.0	0.67	23.1	25.9	0.92
NB26	28.5	14.0	0.53	22.6	18.7	1.07
NB27	36	14.0	0.73	29.3	30.5	0.96
NB28	35.7	14.0	0.75	28.5	30.3	0.94
NB29	41	14.0	0.67	37.5	31.6	1.09
NB30	42.4	14.0	0.66	39.5	32.3	1.11
NB31	29.1	16.0	0.38	23.4	25.6	0.94
NB36	33.4	16.3	0.49	27.6	23.1	1.07
NB37	32.3	12.7	0.59	29.2	24.7	1.07
NB38	27.4	14.1	0.49	21.5	21.3	0.98
NB41	30.5	13.4	0.61	25.1	24.5	0.99
NB42	26.7	13.3	0.48	21.7	16.7	1.11
NB43	25	15.2	0.25	19.4	11.5	1.16
NB44	29.2	10.9	0.66	25.9	23.4	1.04
NB45	32.6	14.1	0.68	25.7	32.2	0.85
NB46	18.1	12.8	0.45	8.8	4.2	1.17
NB48	22.7	12.6	0.31	18.9	8.7	1.29

NB49	29.1	16.4	0.51	20.2	23.6	0.91
NB50	30.9	16.2	0.33	27.6	18.7	1.15
NB51	27.4	14.0	0.50	21.5	22.3	0.96
Table notes: -						

E6.25. Table 3 demonstrates that the overall the model is marginally underpredicting at most monitoring sites. The comparison of road-NOx concentrations to 'measured' road-NOx concentrations is presented in Figure 17. An adjustment factor of 1.059 has been derived from the equation of the linear trend line that has been fitted through zero. Since the model unpredicted concentrations marginally, the predicted road-NOx concentrations have been adjusted with the adjustment factor to uplift the values to broadly match those measured at the monitoring sites. This is illustrated in Figure 18, which shows a comparison of the measured NO_2 concentrations and the total (i.e. road plus background) predicted NO_2 concentrations. Statistics of this comparison are given in Table 3, which demonstrate that the predicted NO_2 concentrations have an insignificant fractional bias (~0), and an acceptable root mean square error (RMSE<10).

Figure 17: Comparison of predicted road-NOx to 'measured' road-NOx

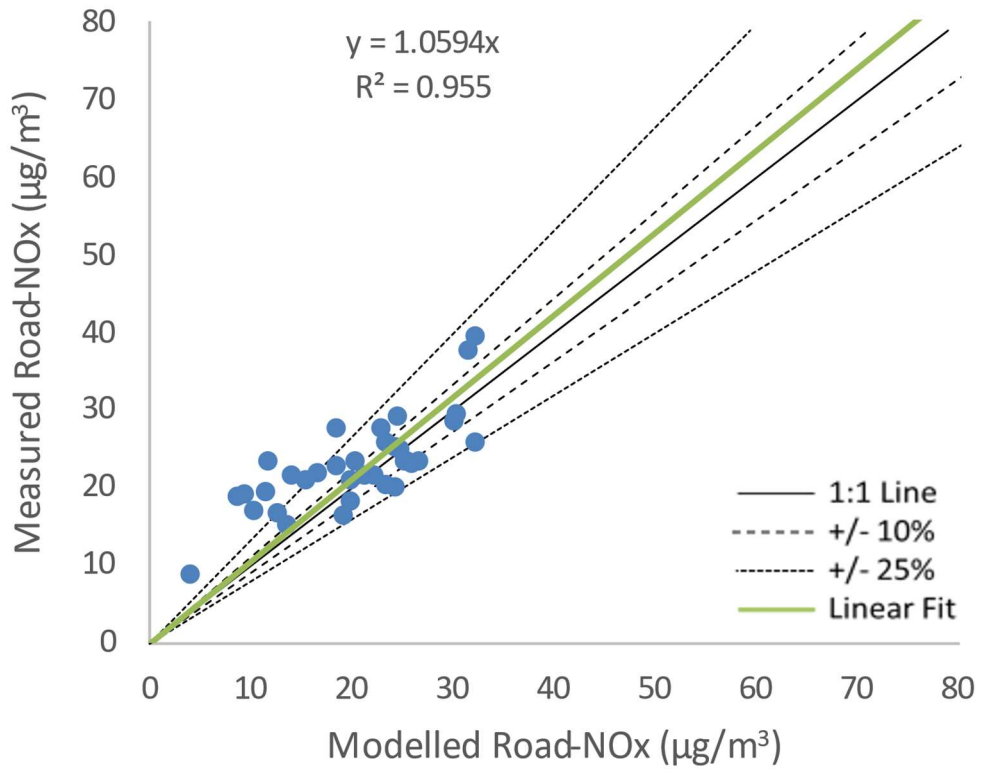

Figure Notes: -

Figure 18: Comparison of predicted NO_2 to 'measured' NO_2

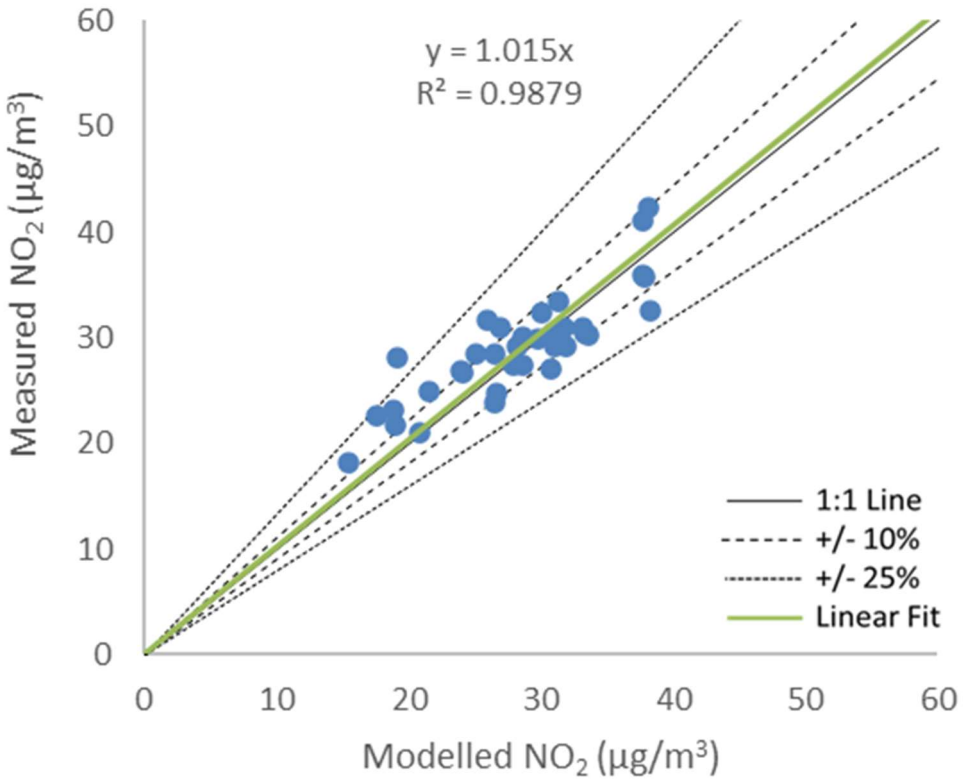

Figure Notes: -

Table 3: Correlation Coefficient, RMSE, and Fractional Bias

Statistic	NO_2
Correlation Coefficient (r) [a]	0.855
Root Mean Squared Error (RMSE) [b]	3.276
Fractional Bias (FB) [c]	0.029

Table Notes:

a This is used to measure the linear relationship between predicted and measured concentrations. A value of zero means no relationship and a value of 1 means absolute relationship (ideal value).

b RMSE is used to define the average error or uncertainty in the model. The ideal value for NO^2 is zero, and a value within 10% of the objective (i.e., 4 µg/m^3) is general acceptable although models should always be improved where possible even where the value is less than 10% of the objective. If the value is greater than 25% of the objective (i.e., 10 µg/m^3) then it is recommended that the model be revisited (this only applies to NO_2).

c This is used to identify if the model shows a systematic tendency to over or under predict. FB values range between -2 and +2 and has an ideal value of zero. Negative values indicate a model over-prediction and positive values indicate a model under-prediction.

E7. Post Processing

E7.1. Concentrations of road-NOx and primary NO_2 have been predicted at each receptor using the ADMS-Roads model. The primary NO_2 emission factor (f-NO_2) at each receptor has been calculated by taking the ratio of predicted primary NO_2 concentration to road-NOx concentration.

E7.2. The f-NO_2 values along with the adjusted modelled road-NOx concentrations and background NO_2 concentrations have been inputted into Defra's NOx to NO_2 calculator (v8.1) in order to obtain predicted road-NO_2 concentrations at each receptor. This tool has been run assuming the traffic is described as 'All Other Urban UK traffic', which is considered appropriate for the traffic associated

with Nuneaton and Bedworth. It should be noted, however, that receptor specific f-NO_2 values have been used in the NOx to NO_2 calculated, which supersede the traffic selection.

E7.3. The road-NO_2 concentrations have then been added to the background NO_2 concentrations to obtain total NO_2 concentrations at the receptors. Similarly, the adjusted road-PM_{10} and road-$PM_{2.5}$ concentrations have been added to the background PM_{10} and $PM_{2.5}$ concentrations to obtain total $PM_{2.5}$ and PM_{10} concentrations at the receptors.

E8. Uncertainty and limitations

E8.1. There are inherent uncertainties associated with the traffic data, however the Transport Consultant for the project has reviewed the traffic data available and provided the appropriate AADT information. The data did not include any breakdown of vehicle type, which introduces uncertainties, but information on HDVs, a key parameter, was obtained from DfT counts of local roads to help minimise uncertainties.

E8.2. The emission factors also involve a considerable amount of uncertainty. Emissions from the EFT are link averages and do not explicitly take account of acceleration or deceleration. Modelled speeds have been adjusted to account for this where possible. Future year vehicle emission rates are also based on a range of factors, such as expected vehicle fleet release dates, anticipated improvements in emission reduction technologies, expected uptake rates of different vehicles based on government policies, etc. It is therefore possible that the expected future emission rates in the EFT may differ from reality. Historically, evidence had suggested that Defra's EFT exaggerated reductions in NOx emissions as expectations of reductions from diesel vehicles were included which were not seen in practice. However, analyses of recent NOx measurements now provide evidence that vehicle controls are working and as a result Defra's EFT (v11.0) is the current best reflection of the rate of reductions into the future. The unknown of the future traffic fleet composition (built into the EFT) remain uncertain. In the absence of officially published alternative emissions, the approach of this assessment has been to utilise the EFT as recommended by Defra in the LAQM.TG(22) guidance (Defra, 2022). This assessment has been based on 2019 emission factors which negate the uncertainty of the rate of future improvements in emissions.

E8.3. The model itself is based on assumptions of a range of parameters, including road geometries, road widths, street canyons and meteorological related parameters. There is uncertainty in all these parameters, but the modelling has been setup in a robust way based on professional experience to best represent the conditions. One of the main uncertainties in the model is meteorological data; this has been based on measurements made at a representative meteorological station, and although meteorological conditions will remain similar, it is entirely likely that meteorological conditions will vary in subsequent years and lead to marginally different concentrations.

E8.4. The ambient background concentrations are also uncertain. While these are provided by Defra, the 1x1 km resolution is coarse, and the maps do not include all sources of pollution. Given the urban fringe location of the proposed development, it is considered likely that the background maps for this area are likely to be reasonable. To minimise uncertainty in the spatial resolution of the maps, the background concentrations have been interpolated to each receptor; essentially smoothing out the coarseness of the maps.

E8.5. Evidence (Grange, S, et al., 2017) suggests that the f-NO_2 has been decreasing in recent years, which is not accounted for within Defra's EFT or NOx to NO_2 Calculator. If lower f-NO_2 values were assumed, then the predicted concentrations would likely be slightly lower throughout the development and local area. Until more detailed scientific analysis is undertaken to understand the full extent of why f-NO_2 is decreasing and how it will behave in the future, it remains an uncertainty.

E8.6. A model verification exercise has been undertaken to adjust the predicted concentrations from the model so that they match local conditions as best as possible. This has adjusted concentrations to match average conditions; some locations will remain underpredicted and some overpredicted.

E8.7. This report does not consider the impacts of air quality on the health implications associated with COVID-19, as there remains too much uncertainty at this stage to consider this explicitly. In addition, the potential long-term implications of the pandemic on transport practices have not been considered, as it is too uncertain at this stage.

E8.8. Although there is uncertainty associated with air quality modelling, the predictions made by this assessment have been carried out in a robust manner in order to minimise uncertainties where possible; the approach has been to use reasonable worst-case assumptions.

E9. Glossary

AADT	Annual Average Daily Traffic flow
APS	Air Pollution Services
AQMA	Air Quality Management Area
CERC	Cambridge Environmental Research Consultants
COPERT 5	Computer Programme to Calculate Emissions from Road Transport
DfT	Department for Transport
EA	Environment Agency
EFT	Emissions Factors Toolkits
EPUK	Environmental Protection UK
f-NO_2	Fraction of nitrogen dioxide
HDV	Heavy Duty Vehicles
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
NBBC	Nuneaton and Bedworth Borough Council
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides
RMSE	Root Mean Squared Error
µg/m^3	Microgrammes per cubic metre

E10. References

Defra. (2022). *Local Air Quality Management Technical Guidance (TG22)*. Retrieved from https://laqm.defra.gov.uk/technical-guidance/

Defra. (2023). *Defra Survey Data Download*. Retrieved from https://environment.data.gov.uk/DefraDataDownload/?Mode=survey

DfT. (2020). *Road Traffic Statistics (TRA)*. Retrieved from https://roadtraffic.dft.gov.uk/#6/55.254/-6.064/basemap-regions-countpoints

Grange, S, et al. (2017). Lower vehicular primary emissions of NO2 in Europe than assumed in policy projections. *Nature GeoScience*(ISSN 1752-0908), pp 914-920.

Vectos microsim. (2023). *STA - Nuneaton and Bedworth Borough Plan 2023, Nuneaton and Bedworth Borough Council, Strategic Transport Assessment, VM225433 - NBBC STA Update 2023.*

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Air Quality at Locations of Human Health Exposure: Nuneaton and Bedworth Borough Plan Review

Client: Nuneaton and Bedworth Borough Council **Reference:** APS_L1007A_G1-1 **Date Published:** 17 July 2023

Rev.	Date	Description	Prepared	Reviewed	Authorised
01	17/07/2023	Issued	EJ	AC	KL

G1. Introduction

G1.1. Air Pollution Services (APS), part of KALACO Group Ltd, has been commissioned by Nuneaton and Bedworth Borough Council (the 'Client') (NBBC) to assess the air quality impacts associated with the proposed housing and employment allocations set out in the emerging Borough Plan within the administrative boundary of Nuneaton and Bedworth Borough Council.

Location Context

G1.2. NBBC has investigated air quality within the administrative area as part of its responsibilities under the Local Air Quality Management (LAQM) regime. NBBC has declared two Air Quality Management Areas (AQMAs) for exceedances of the annual mean NO_2 (AQOs) (NBBC, 2021). The Leicester Road Gyratory AQMA was declared in 2007 and the Midland Road/Corporation Street AQMA was declared in 2009. To the south of the borough, Coventry City Council (CCC) have also declared an AQMA.

G2. Methodology

Guidance

G2.1. The assessment has been carried out using approaches set out in the following guidance.

Guidance on Land-Use Planning & Development Control: Planning For Air Quality

G2.2. Environmental Protection UK (EPUK) in partnership with The Institute of Air Quality Management (IAQM) have produced guidance on Land-Use Planning & Development Control: Planning For Air Quality (EPUK/IAQM, 2017). EPUK and IAQM have produced this guidance to ensure that air quality is adequately considered in the land-use planning and development control processes. It provides a means of reaching sound decisions, having regard to the air quality implications of development proposals and provides guidance on how air quality considerations of individual schemes may be

considered within the development control process, by suggesting a framework for the assessment of the impacts of developments on local air quality.

LAQM Technical Guidance

G2.3. Defra and the devolved administrations have published a guidance document on Local Air Quality Management (LAQM) - Local Air Quality Management Technical Guidance (LAQM.TG22) (Defra, 2022). This document is designed to support local authorities in carrying out their duties under the Environment Act 1995, the Environment (England) Order 2002, and subsequent regulations including the Environment Act 2021. LAQM is the statutory process by which local authorities monitor, assess, and take action to improve local air quality. The Technical Guidance provides tools, approaches and technical information related to air quality.

Approach Overview

G2.4. Standard practice is to assess the impacts of a proposed development on local air quality in relation to human health exposure, using the EPUK and IAQM guidance on Land-Use Planning & Development Control: Planning For Air Quality (2017).

G2.5. The EPUK and IAQM guidance provides a staged approach to considering air quality assessments:

- Stage 1) Initial screening
- Stage 2) Detailed screening
- Stage 3) Simple or Detailed assessment

G2.6. The approach includes elements of professional judgement.

Impacts of the Development on the Local Area

G2.7. Table 6.1 of the EPUK and IAQM guidance (2017) provides the Stage 1 screening criteria. The approach first considers the size and parking provision of a development; if the development is residential and is for fewer than ten homes or covers less than 0.5 ha, or is non-residential and will provide less than 1000 m^2 of floor space or cover a site area of less than 1 ha, and will provide ten or fewer parking spaces, then there is no need to progress to a Stage 2 and in general there is no need to consider the impacts of the development on the local area.

Stage 2 Screening Criteria

G2.8. The guidance provides example criteria and states the following in relation to the criteria:

"They are intended to function as a sensitive "trigger" for initiating an assessment in cases where there is a possibility of significant effects arising on local air quality. This possibility will, self-evidently, not be realised in many cases. The criteria should not be applied rigidly; in some instances, it may be appropriate to amend them on the basis of professional judgement, bearing in mind that the objective is to identify situations where there is a possibility of a significant effect on local air quality".

G2.9. The guidance notes that consideration should still be given to the potential impacts of neighbouring sources on the site, even if assessment of impacts of the development on the surrounding area is screened out.

Road Traffic Assessments

G2.10. The second stage then compares the changes in vehicle flows on local roads that a development will lead to against specified screening criteria. Where these criteria are exceeded, a detailed assessment is required, although the guidance advises that *"the criteria provided are precautionary and should be treated as indicative",* and *"it may be appropriate to amend them on the basis of professional judgement".*

G2.11. The criteria relating to road traffic are:

- A change of LDV flows of:
  - more than 100 AADT within or adjacent to an AQMA
  - more than 500 AADT elsewhere.
- A change of HDV flows of:
  - more than 25 AADT within or adjacent to an AQMA
  - more than 100 AADT elsewhere.
- Where roads are realigned near to sensitive receptors and the change in alignment is 5 m or more and the road is within an AQMA. Applies to junctions that cause traffic to significantly change vehicle acceleration/deceleration, e.g. traffic lights, or roundabouts.
- Where bus flows will change by:
  - more than 25 AADT within or adjacent to an AQMA
  - more than 100 AADT elsewhere.

Simple or Detailed Assessments

G2.12. Where an air quality assessment is identified as being required, then this may take the form of either a Simple Assessment or a Detailed Assessment. It is not uncommon for assessments to utilise detailed dispersion models to predict pollutant concentrations and impacts on local air quality (Detailed Assessment), however, it should be noted that exceeding a screening criterion in Table 6.2 of the guidance does not automatically lead to the requirement for a Detailed Assessment and the use of professional judgement and sufficient evidence can be considered appropriate at times (Simple Assessment).

G2.13. The guidance also outlines what the content of the air quality assessment should include, and this has been adhered to in the production of this report.

G2.14. Given the nature of the evidence required, a detailed assessment has been carried out.

Criteria for this Assessment

G2.15. The human-health related air quality assessment levels (AQALs), which comprise of Air Quality Objectives (AQOs) and Limit Values (LVs), for England for the pollutants relevant to this project are detailed in Table 1.

Table 1: Air Quality Objectives and Limit Values

Pollutant	Time Period	Source of AQAL [a]	Concentration, and the number of exceedances allowed per year (Percentile if applies)	Date AQAL to be Achieved From and Maintained After
Human Health				
Nitrogen Dioxide (NO_2)	1-hour Mean	AQO / LV	200 µg/m^3 not to be exceeded more than 18 times a year (99.79th percentile)	31st December 2005 / 1st January 2010
	Annual Mean	AQO / LV	40 µg/m^3	31st December 2005 / 1st January 2010

Table notes:
a. AQOs are from the Air Quality Strategy and LVs are from the Air Quality Standards Regulations.

Relevant exposure

G2.16. The locations of relevant exposure for AQOs and LVs are set out in Table 2.

Table 2: Locations of relevant exposure

Receptor Locations	Relevant exposure
AQO	The annual mean AQO applies at locations where members of the public might be regularly exposed, such as building façades of residential properties, schools, hospitals, and care homes. The 24-hour mean AQO applies at the annual mean locations of exposure as well as at hotels and residential gardens. The 1-hour mean AQO applies at the annual mean locations of exposure and at hotels, residential gardens and any outdoor location where members of the public might reasonably be expected to spend one hour or longer, such as busy pavements, outdoor bus stations and locations with outdoor seating. Places of work like factories or offices are not considered places where members of the public might be regularly exposed and therefore the AQO's do not apply at these locations.
LV	In accordance with Article 2(1), Annex III, Part A, paragraph 2 of Directive 2008/50/EC detailed locations where compliance with the LVs does not need to be assessed: *"Compliance with the limit values directed at the protection of human health shall not be assessed at the following locations:* *a) Any locations situated within areas where members of the public do not have access and there is no fixed habitation;* *b) In accordance with Article 2(1), on factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply; and* *c) On the carriageway of roads; and on the central reservation of roads except where there is normally pedestrian access to the central reservation".* The government models compliance with the Directive at locations 4 m from the kerbside, 2 m high, more than 25 m from major road junctions and adjacent to at least 100 m of road length where the LVs apply.

Table notes: -

Describing Impacts and Defining Significance

Long-term (Annual Mean) Impacts on Air Quality at Locations of Human Health Exposure

G2.17. The approach set out in the EPUK and IAQM guidance provides a method for describing the impacts on local air quality arising from development.

G2.18. Impact descriptors for individual receptors are used which expresses the magnitude of incremental change as a proportion of a relevant AQAL and then examining this change in the context of the new total concentration and its relationship with the assessment criterion. Table 3 sets out the matrix for determining the impact descriptor for annual mean concentrations at individual receptors, based on Table 6.3 in the EPUK and IAQM guidance document (EPUK/IAQM, 2017).

Table 3: Annual Mean Impact Descriptors for Individual Receptors

Annual Mean Concentration with Proposed Development (µg/m³)	% Change in Concentration relative to the AQO (µg/m³)			
	1	2-5	6-10	>10
75% or less of AQO	Negligible	Negligible	Slight	Moderate
76-94% of AQO	Negligible	Slight	Moderate	Moderate
95-102% of AQO	Slight	Moderate	Moderate	Substantial
103-109% of AQO	Moderate	Moderate	Substantial	Substantial
110% or more of AQO	Moderate	Substantial	Substantial	Substantial
Table notes: -				

Short-term (24-hour, 8-hour, 1-hour and 15-minute mean) Impacts on Human Health

G2.19. Previous research carried out on behalf of Defra and the devolved administrations identified that, where road traffic is the dominant pollutant source, exceedances of the 1-hour mean NO_2 AQO are unlikely to occur where the annual mean is below 60 µg/m³ (Defra, 2021). Where annual mean concentrations are below these levels the short-term impacts are considered negligible.

G2.20. When considering the total concentration, impacts are considered negligible where the AQAL is not breached.

Planning Significance

G2.21. The approach developed by EPUK and IAQM (2017) has been used. The guidance is that the assessment of significance should be based on professional judgement, with the overall air quality impact of the development described as either 'significant' or 'not significant'.

G2.22. If none of the criteria in Stage 1 and 2 are met, then there should be no requirement to carry out an air quality assessment for the impact of the development on the local area, and the impacts can be considered as having a not significant effect.

G2.23. Where the impacts are negligible the overall significance is judged to be 'not significant'.

G2.24. Where a Simple or Detailed assessment is carried out, in drawing the determination of significance, the following factors should be taken account of:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to any impacts;
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts;
- the potential for cumulative impacts. In such circumstances, several impacts that are described as "slight" individually could, taken together, be regarded as having a significant effect for the purposes of air quality management in an area, especially where it is proving difficult to reduce concentrations of a pollutant. Conversely, a "moderate" or "substantial"

impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health; and

- the judgement on significance relates to the consequences of the impacts; i.e. will they have an effect on human health that could be considered as significant? In the majority of cases, the impacts from an individual development will be insufficiently large to result in measurable changes in health outcomes that could be regarded as significant by health care professionals.

G2.25. The guidance is clear that other factors may be relevant in individual cases.

Assessment Approach - Compliance with the Limit Values

G2.26. There is no magnitude of change in relation to compliance with the limit values. Good practice in relation to the Limit Value assessment is to consider whether the Proposed Facility delays compliance with or causes a breach. The effect is based on whether any location which would be used for compliance reporting is impacted. A delay is judged to be significant.

G3. Air Quality Impacts

G3.1. The potential air quality impacts of vehicle emissions from development associated with the emerging Borough Plan are discussed in this section, considering both the suitability of the proposed allocated development sites for residential use with respect to regulated air quality thresholds and the impacts of traffic associated with these sites upon air quality at existing locations of sensitive exposure.

Air Quality Suitability at Proposed Allocated Development Sites

G3.2. The predicted concentrations of NO_2 with the borough for the 'Do Something' scenario for the years of 2031 and 2039 are presented in Figure 1 and Figure 4 respectively. Figure 7 presents the concentrations for the 'Do Something' with Mode Shift scenario. Zoomed views of these for areas covering the AQMAs in Nuneaton are presented in Figure 2, Figure 5 and Figure 8, respectively, and for the AQMA in Coventry in Figure 3, Figure 6 and Figure 9.

Figure 1: Predicted Annual Mean NO_2 Concentrations in 2031 'Do Something' scenario

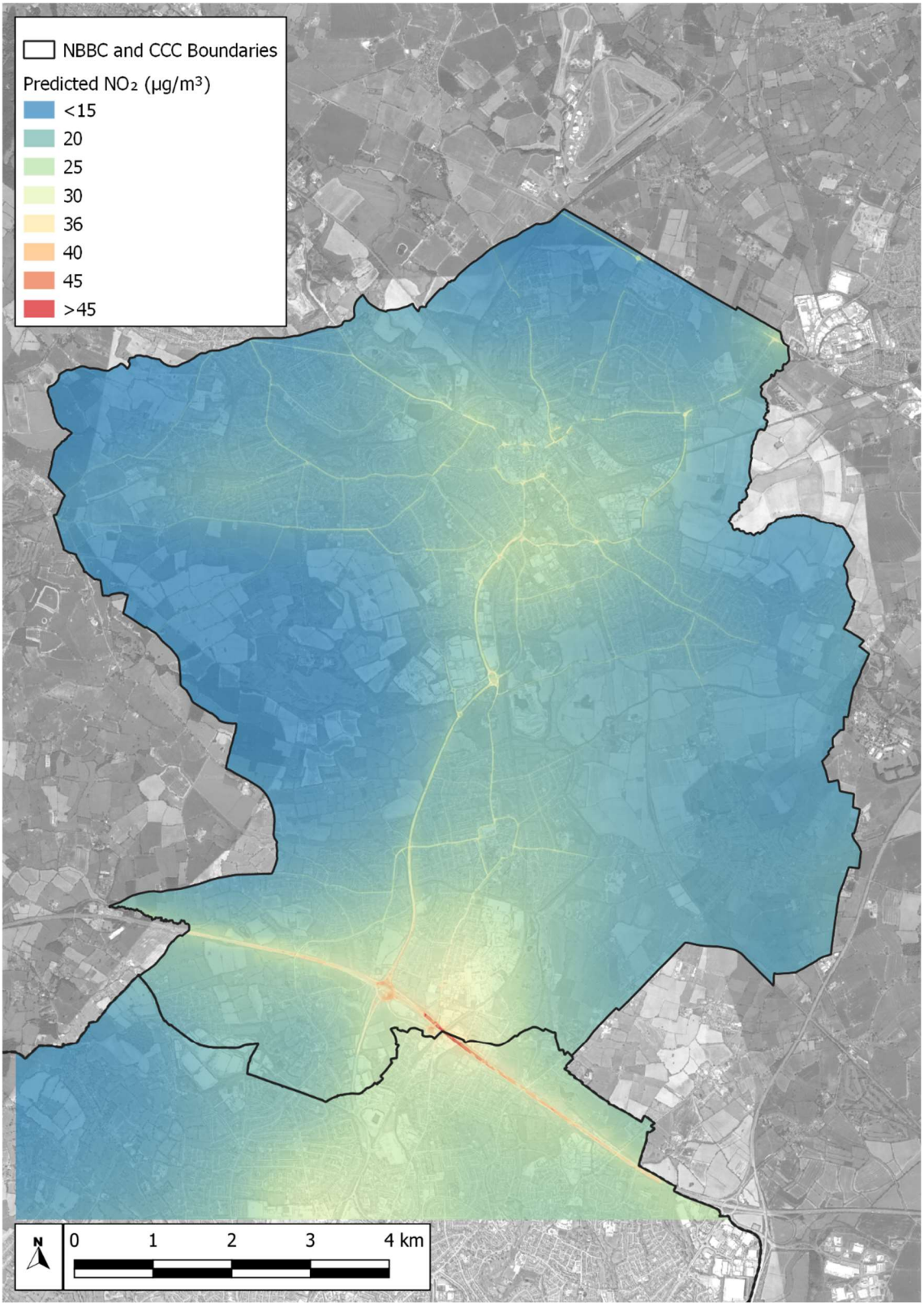


Figure notes: Imagery © 2023 Google, Map Data © 2023 Google.

Figure 2: Predicted Annual Mean NO_2 Concentrations in 2031 'Do Something' Scenario within and close to the Nuneaton AQMAs

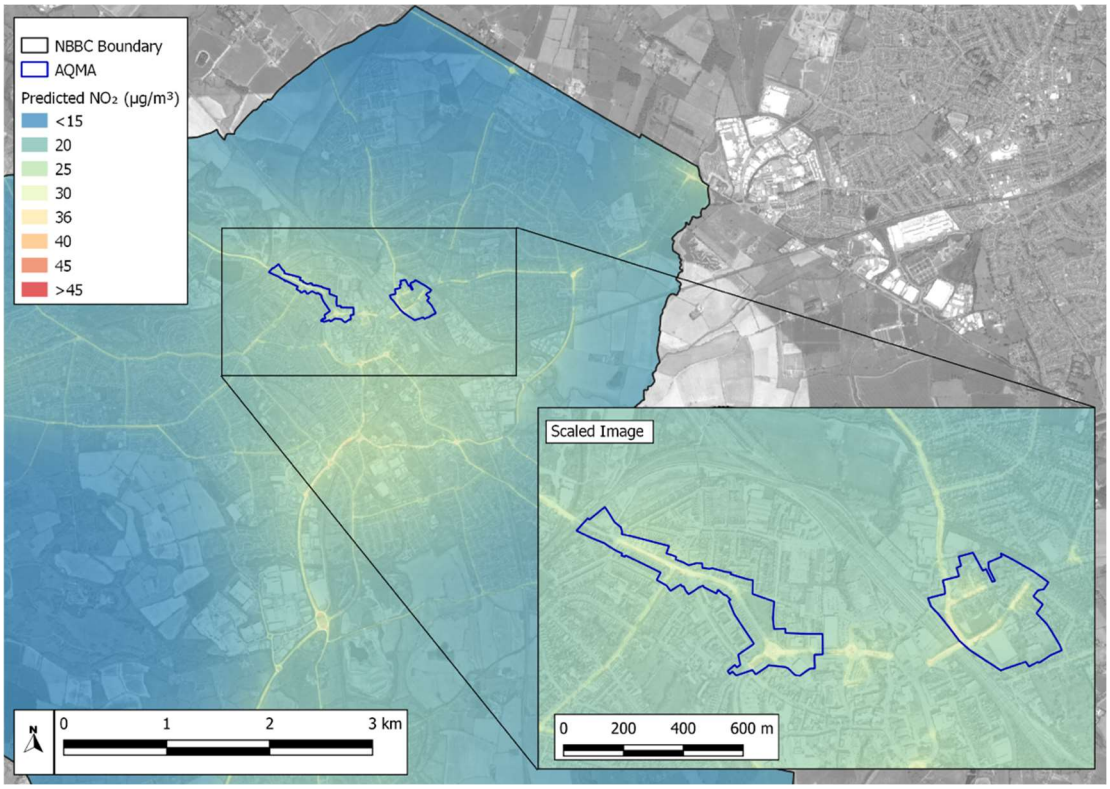


Figure notes: Imagery © 2023 Google, Map data © 2023.

Figure 3: Predicted Annual Mean NO_2 Concentrations in 2031 'Do Something' Scenario within and close to the AQMA in Coventry.

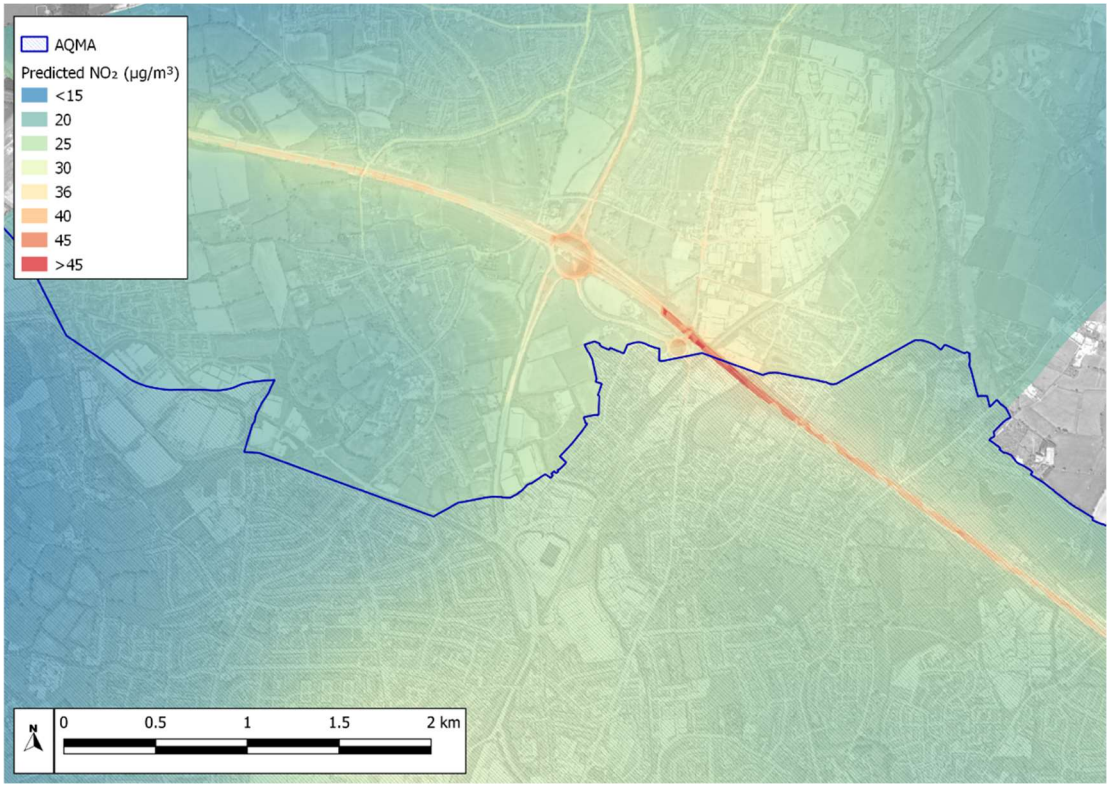


Figure notes: Imagery © 2023 Google, Map data © 2023.

Figure 4: Predicted Annual Mean NO_2 Concentrations in 2039 'Do Something' Scenario

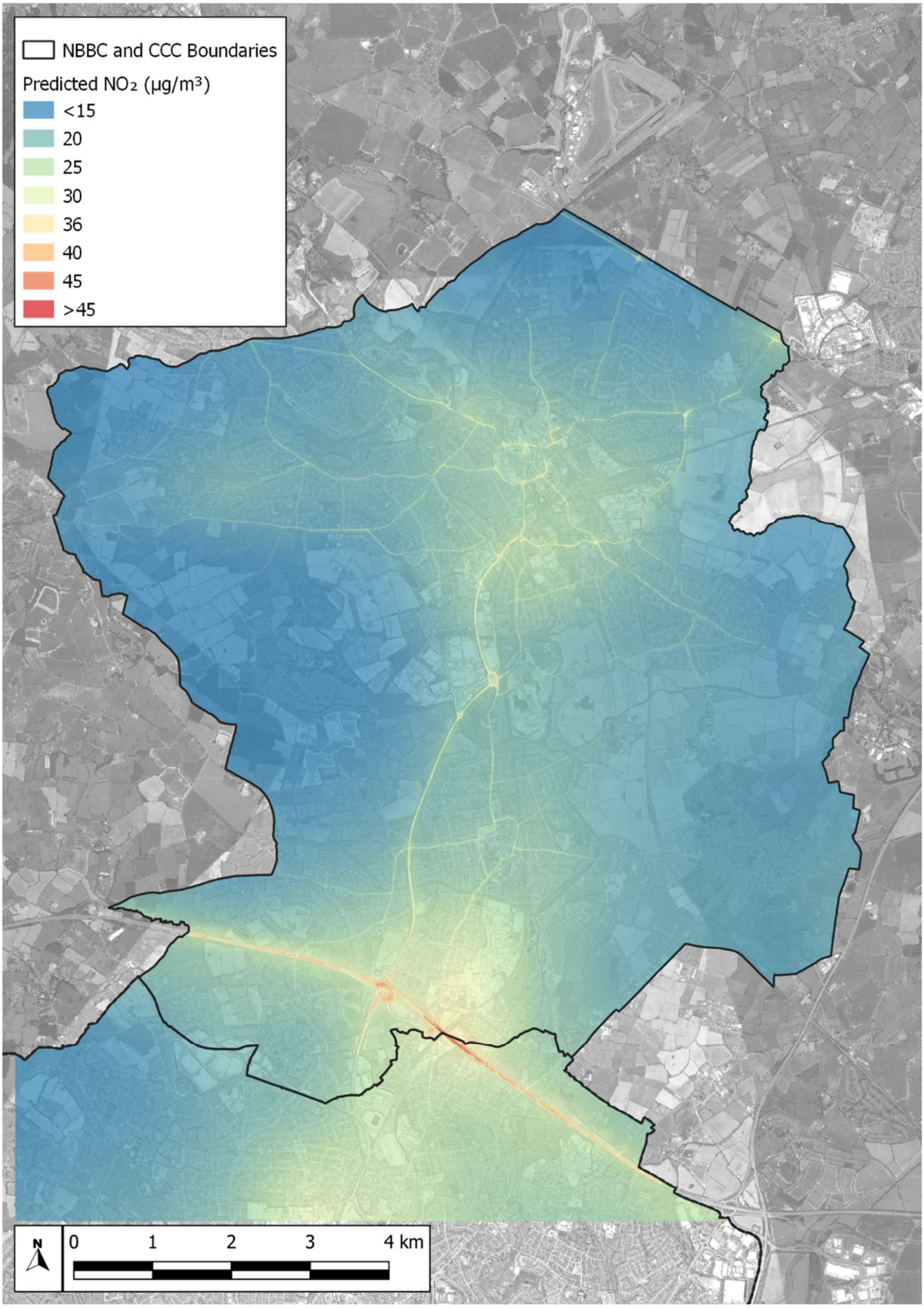


Figure notes: Imagery © 2023 Google, Map data © 2023.

Figure 5: Predicted Annual Mean NO_2 Concentrations in 2039 'Do Something' Scenario within and close to the Nuneaton AQMAs

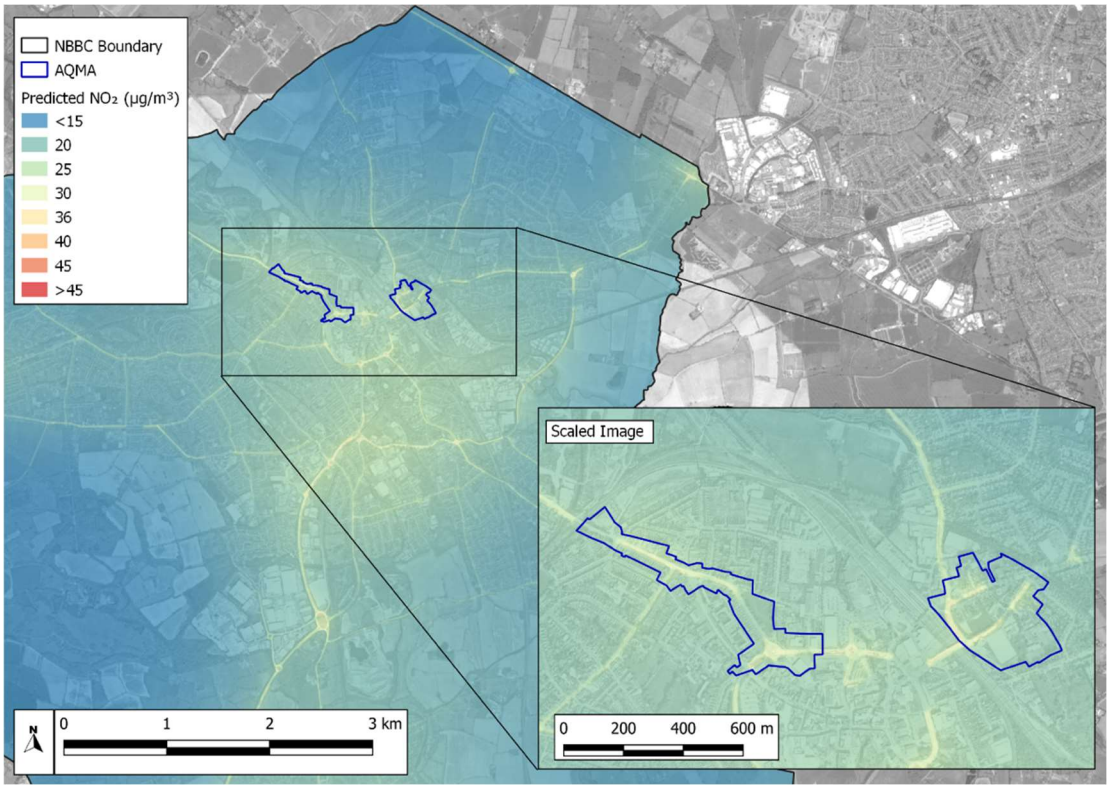


Figure notes: Imagery © 2023 Google, Map data © 2023.

Figure 6: Predicted Annual Mean NO_2 Concentrations in 2039 'Do Something' Scenario within and close to the Coventry AQMA

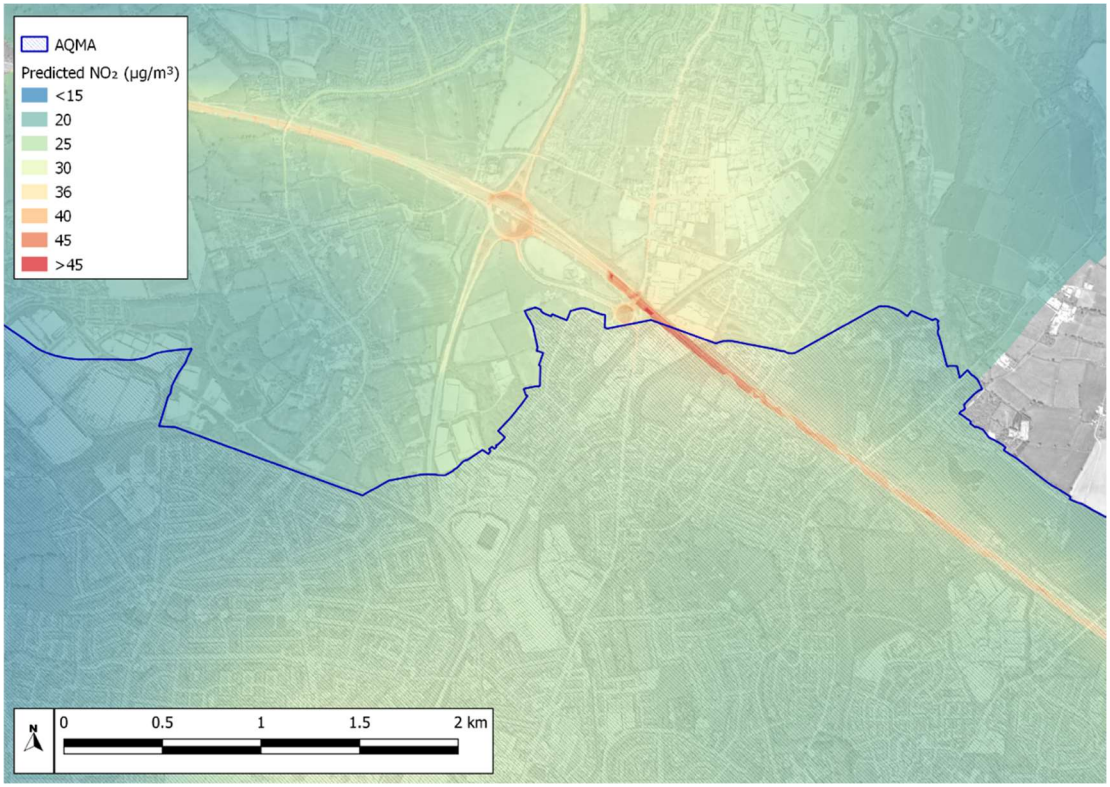


Figure notes: Imagery © 2023 Google, Map data © 2023.

Figure 7: Predicted Annual Mean NO_2 Concentrations in 2039 'Do Something' Scenario with Mode Shift

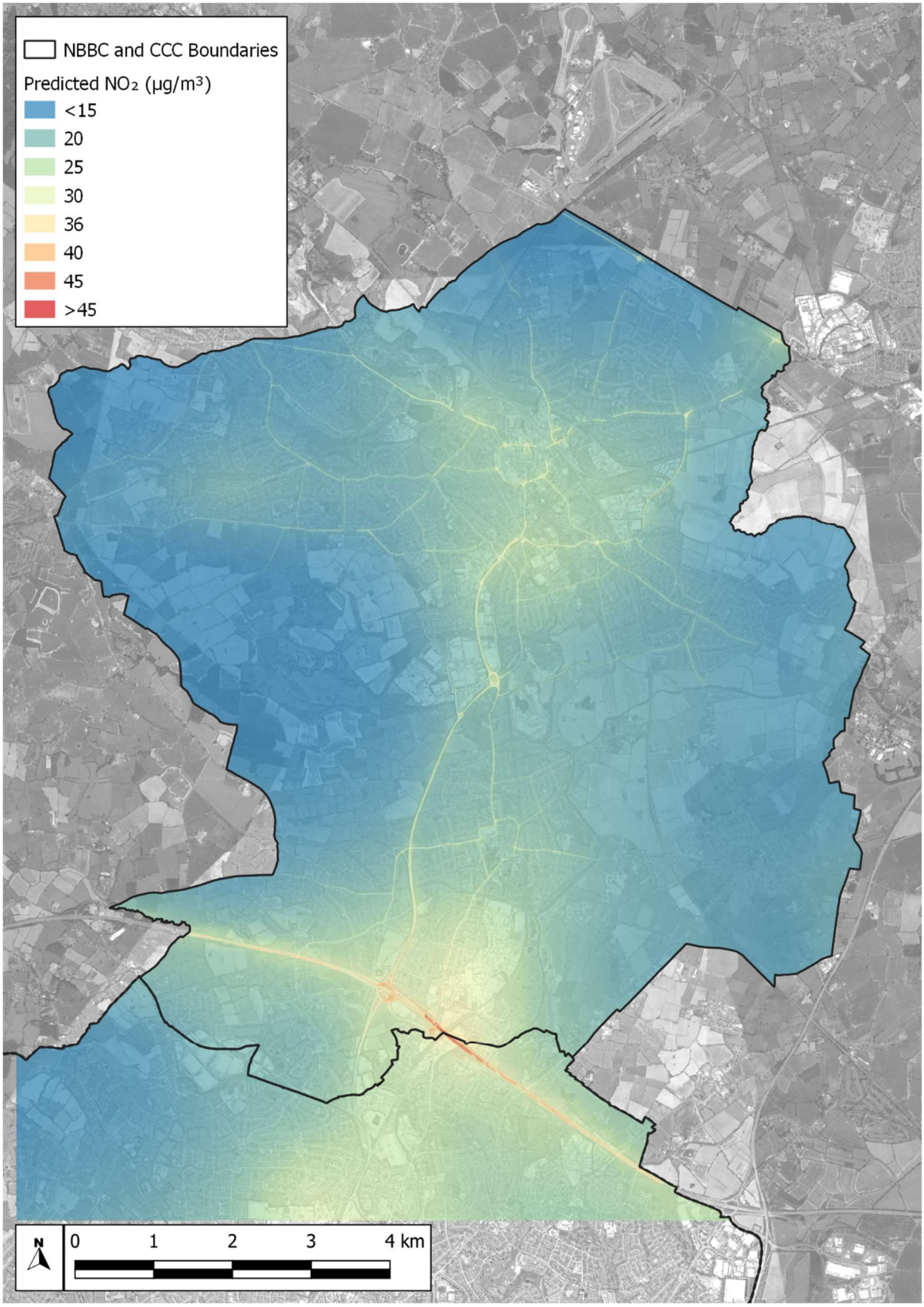


Figure notes: Imagery © 2023 Google, Map data © 2023.

Figure 8: Predicted Annual Mean NO_2 Concentrations in 2039 'Do Something' Scenario with mode shift within and close to the Nuneaton AQMAs

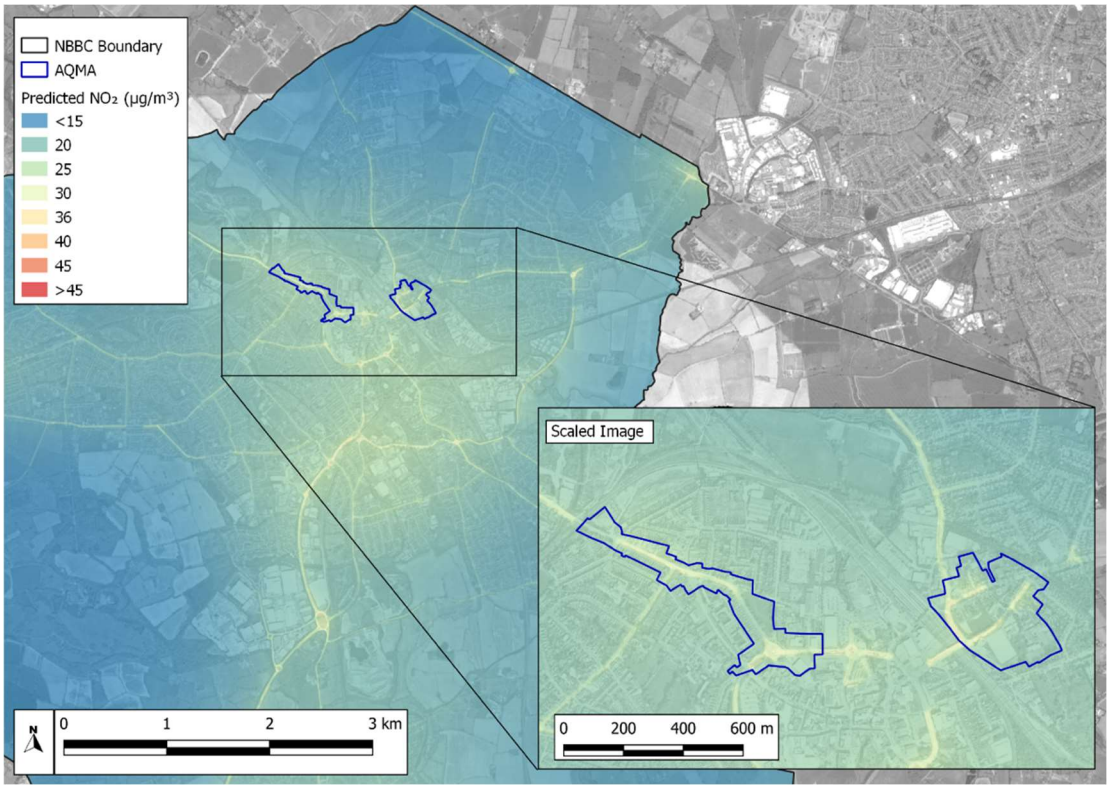
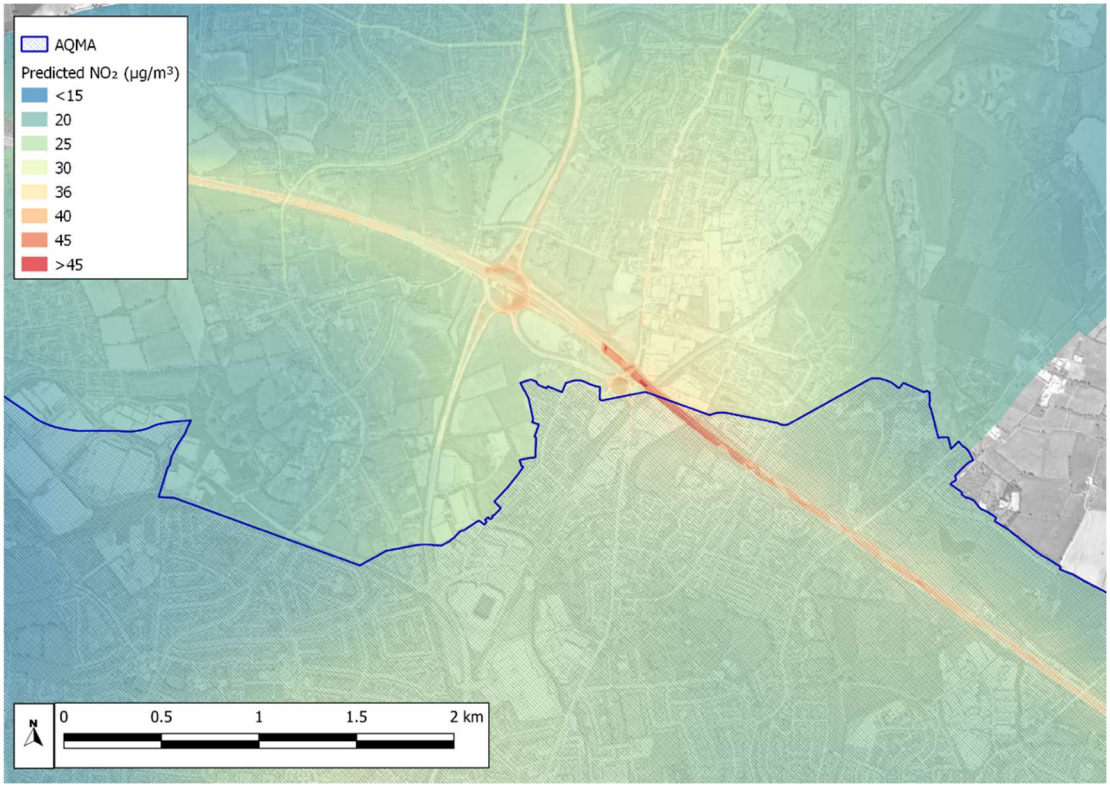


Figure notes: Imagery © 2023 Google, Map data © 2023.

Figure 9: Predicted Annual Mean NO_2 Concentrations in 2039 'Do Something' Scenario with mode shift within and close to the Coventry AQMA



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Borough Plan 2031

G3.3. The predicted concentrations demonstrate there will be no exceedances of the annual mean AQO at any relevant location of exposure in 2031 in the 'Do Something' scenario.

G3.4. Previous research carried out on behalf of Defra and the devolved administrations identified that, where road traffic is the dominant pollutant source, exceedances of the 1-hour mean NO_2 AQO are unlikely to occur where the annual mean is below 60 µg/m^3 (Defra, 2021). Road traffic is the dominant pollutant source in the borough and the predicted annual mean concentrations are well below 60 µg/m^3 at all locations of relevant exposure. There will therefore be no exceedances of the 1-hour mean AQO in the borough.

G3.5. NO_2 concentrations at proposed development allocation sites will therefore be acceptable for future residential use with respect to regulated thresholds in 2031.

Borough Plan 2039

G3.6. The predicted concentrations demonstrate there will be no exceedances of the AQO at any relevant location of exposure in 2039 in the 'Do Something' scenario and in the 'Do Something' scenario with Mode Shift.

G3.7. Previous research carried out on behalf of Defra and the devolved administrations identified that, where road traffic is the dominant pollutant source, exceedances of the 1-hour mean NO_2 AQO are unlikely to occur where the annual mean is below 60 µg/m^3 (Defra, 2021). Road traffic is the dominant pollutant source in the borough and the predicted annual mean concentrations are well below 60 µg/m^3 at all locations of relevant exposure. There will therefore be no exceedances of the 1-hour mean AQO in the borough.

G3.8. NO_2 concentrations at proposed development allocation sites will therefore be acceptable for future residential use with respect to regulated thresholds in 2039.

Impacts of Proposed Development Allocations Upon Existing Exposure

G3.9. The impacts of development associated with the emerging Borough Plan upon air quality at existing locations of sensitive exposure in the Borough have been considered, including within the two AQMAs in Nuneaton as well as within Coventry City Council's AQMA. The impacts of emissions from changes in vehicle movements on local roads has been assessed using detailed dispersion modelling (see appended document APS_L1007A_E1-1).

G3.10. The predicted changes in annual mean NO_2 concentrations throughout the borough are presented in Figure 10 for the 2031 'Do Something' scenario, Figure 13 for the 2039 'Do Something' scenario and Figure 16 for the 'Do Something' scenario with Mode Shift. Zoomed views of these for areas covering the AQMAs in Nuneaton are presented in Figure 11, Figure 14 and Figure 17, respectively, and for the AQMA in Coventry in Figure 12, Figure 15 and Figure 18.

Figure 10: Predicted Changes of the 'Do Something' scenario upon Annual Mean NO_2 Concentrations in 2031.

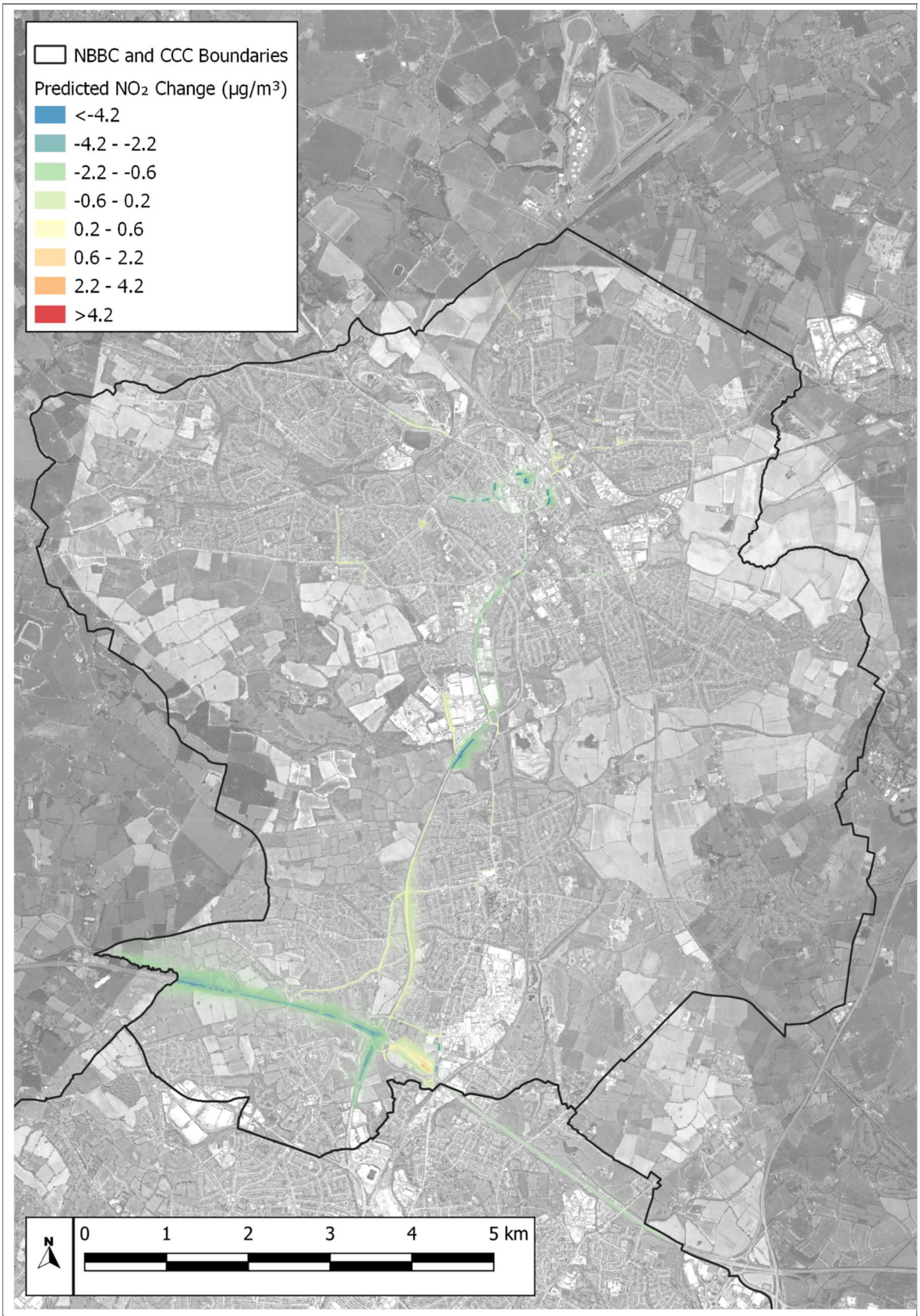

Figure notes: Imagery © 2023 Google, Map data © 2023.

Figure 11: Predicted Changes of the 'Do Something' scenario upon Annual Mean NO_2 Concentrations in 2031 within and close to the AQMAs in Nuneaton

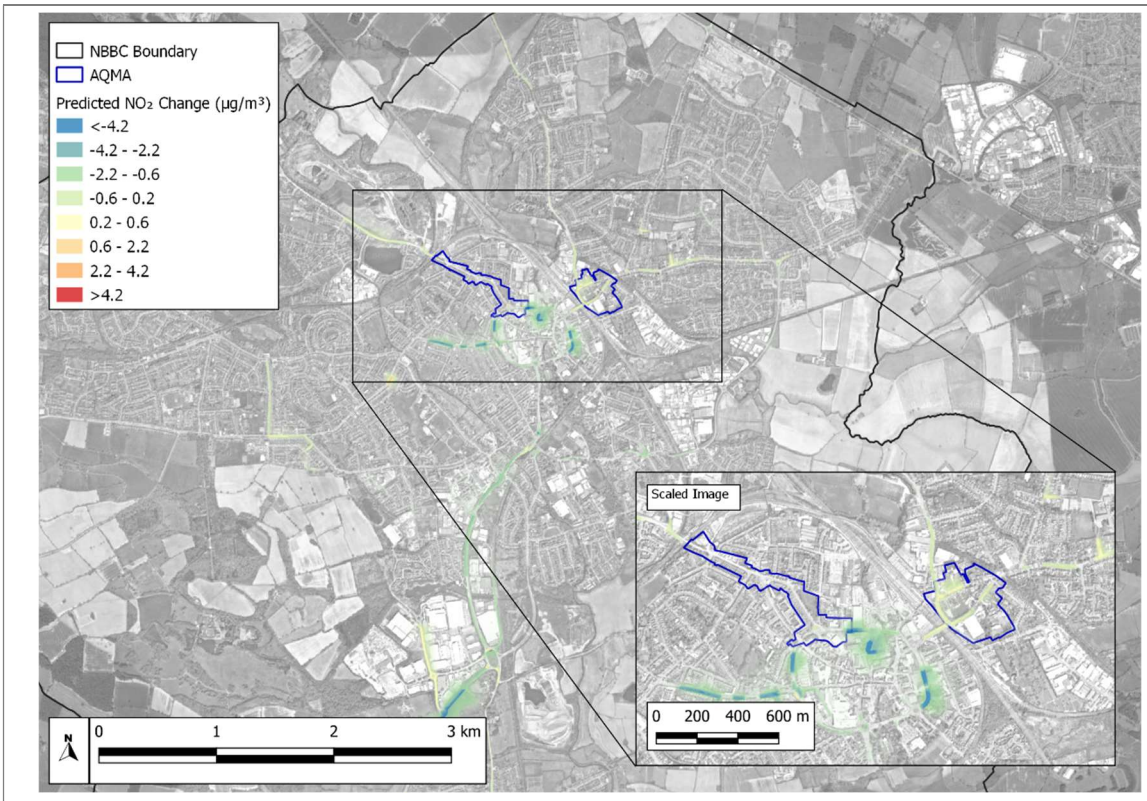

Figure notes: Imagery © 2023 Google, Map data © 2023.

Figure 12: Predicted Changes of the 'Do Something' scenario upon Annual Mean NO_2 Concentrations in 2031 within and close to the AQMA in Coventry

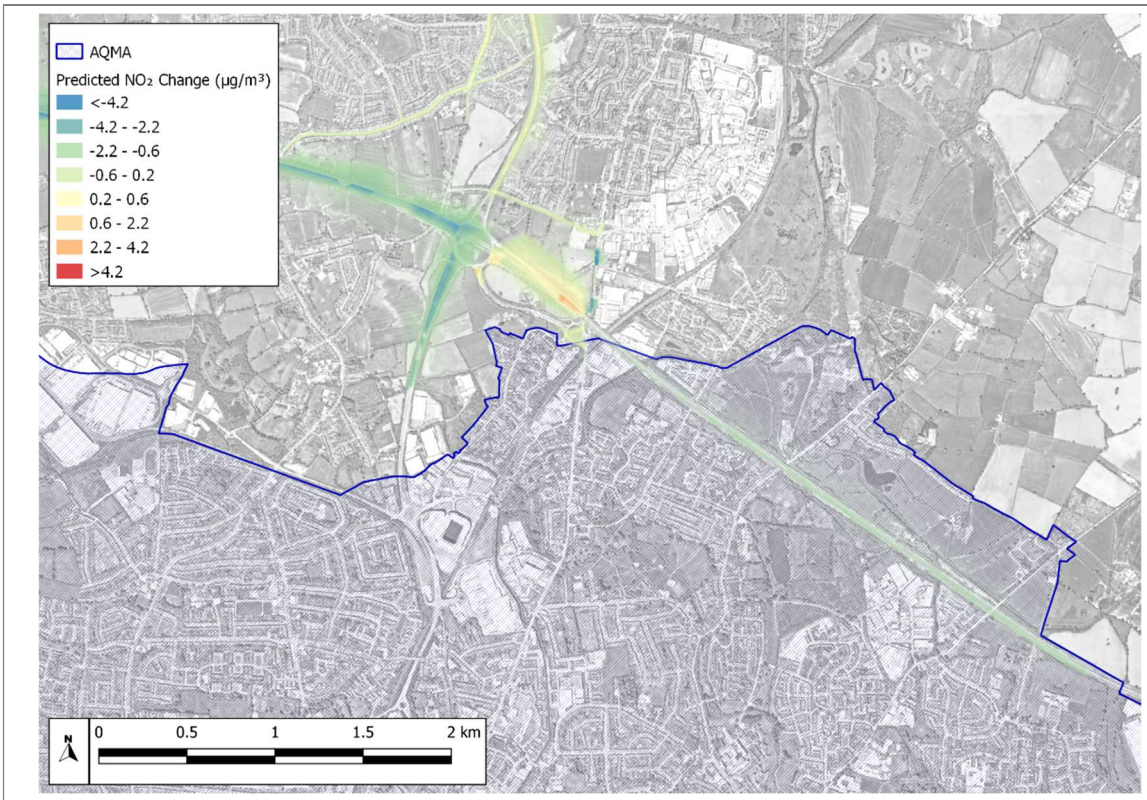

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Figure 13: Predicted Changes of the 'Do Something' scenario upon Annual Mean NO_2 Concentrations in 2039.

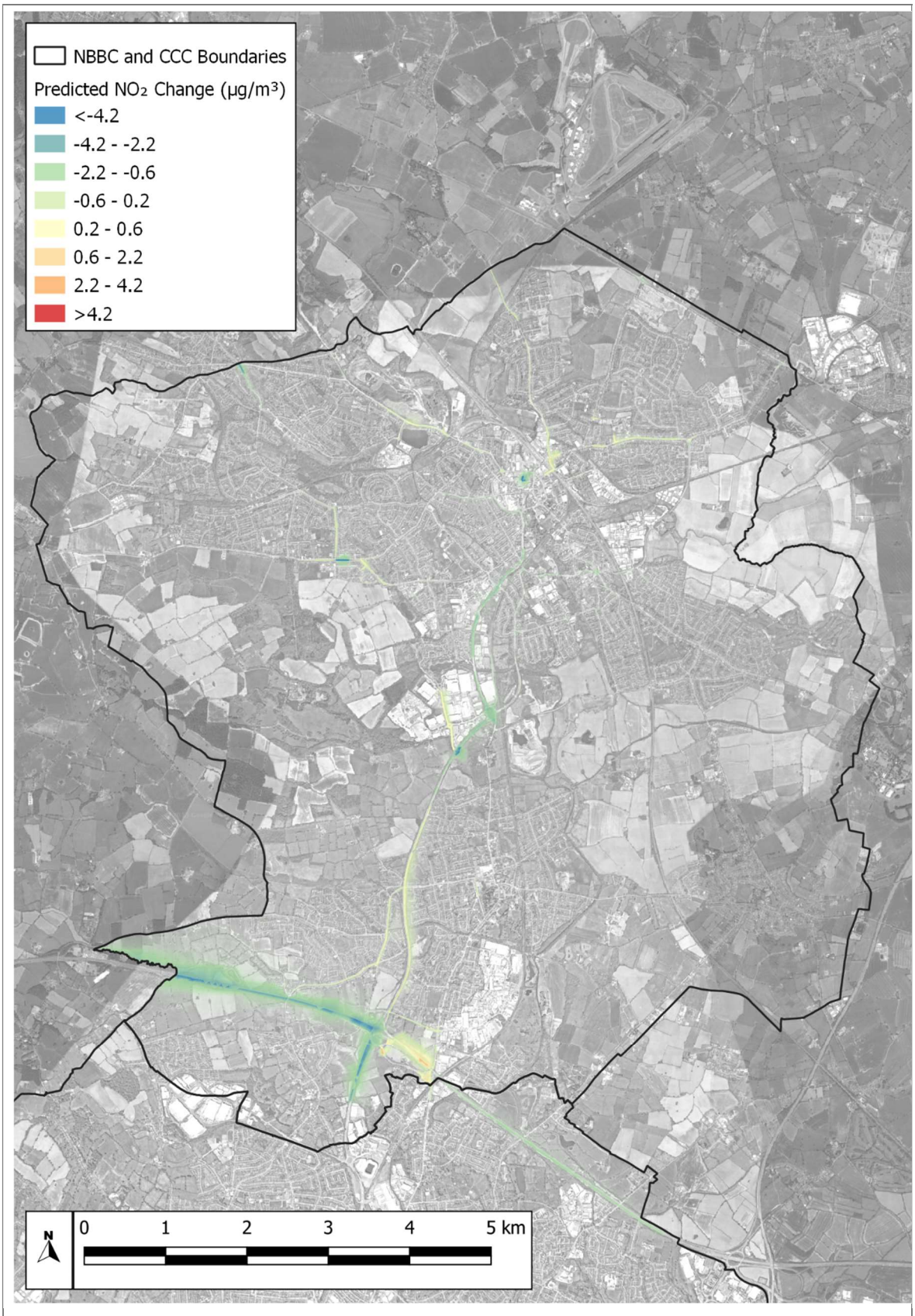

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Figure 14: Predicted Changes of the 'Do Something' scenario upon Annual Mean NO_2 Concentrations in 2039 within and close to the AQMAs in Nuneaton

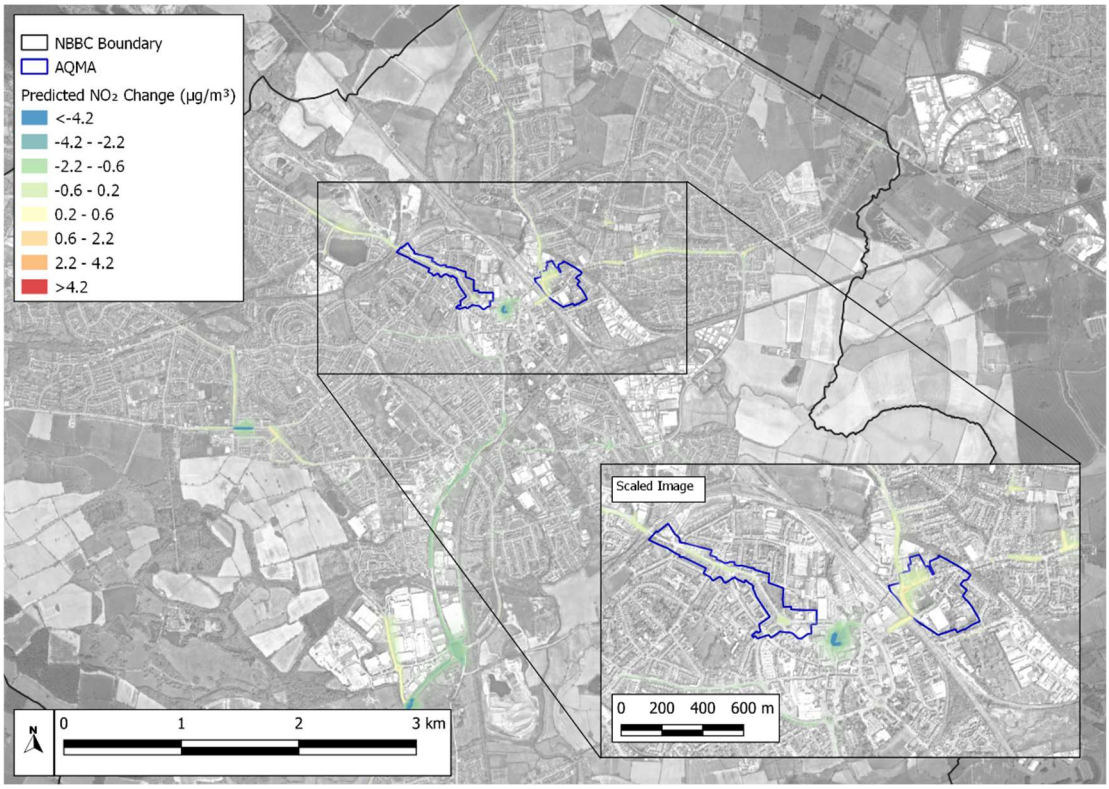

Figure notes: Imagery © 2023 Google, Map data © 2023.

Figure 15: Predicted Changes of the 'Do Something' scenario upon Annual Mean NO_2 Concentrations in 2039 within and close to the AQMA in Coventry

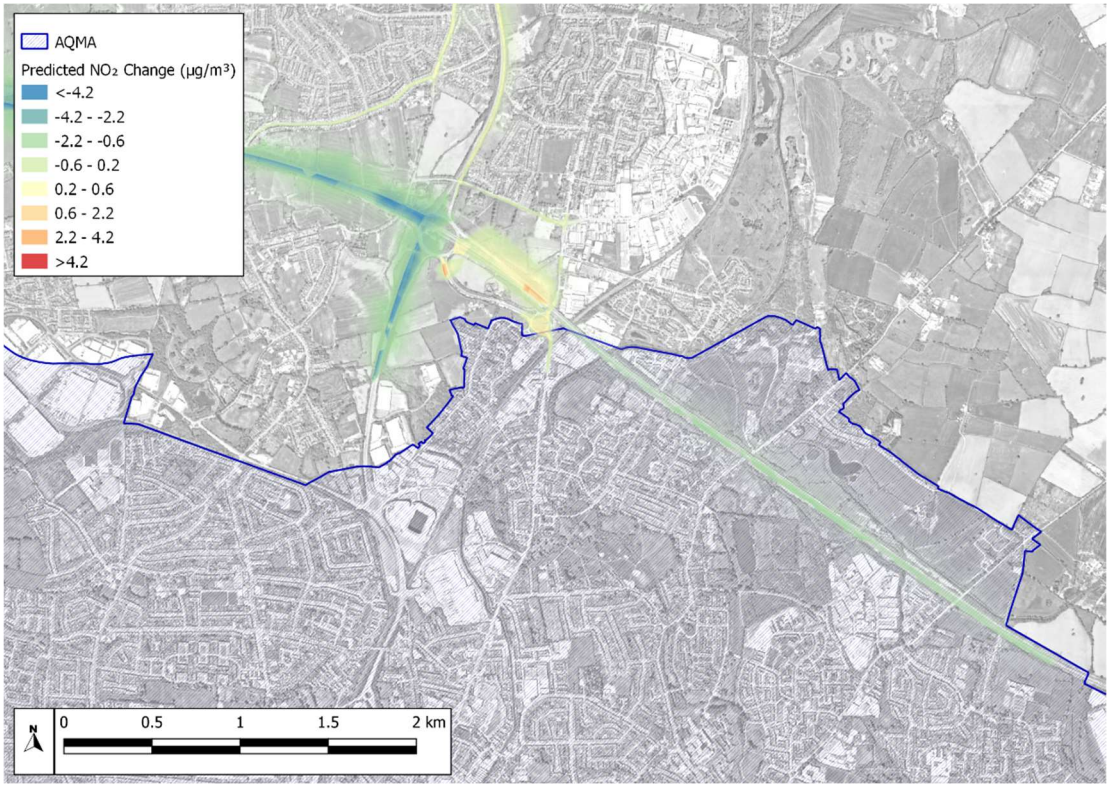

Figure notes: Imagery © 2023 Google, Map data © 2023.

Figure 16: Predicted Changes of the 'Do Something' scenario with mode shift upon Annual Mean NO_2 Concentrations in 2039

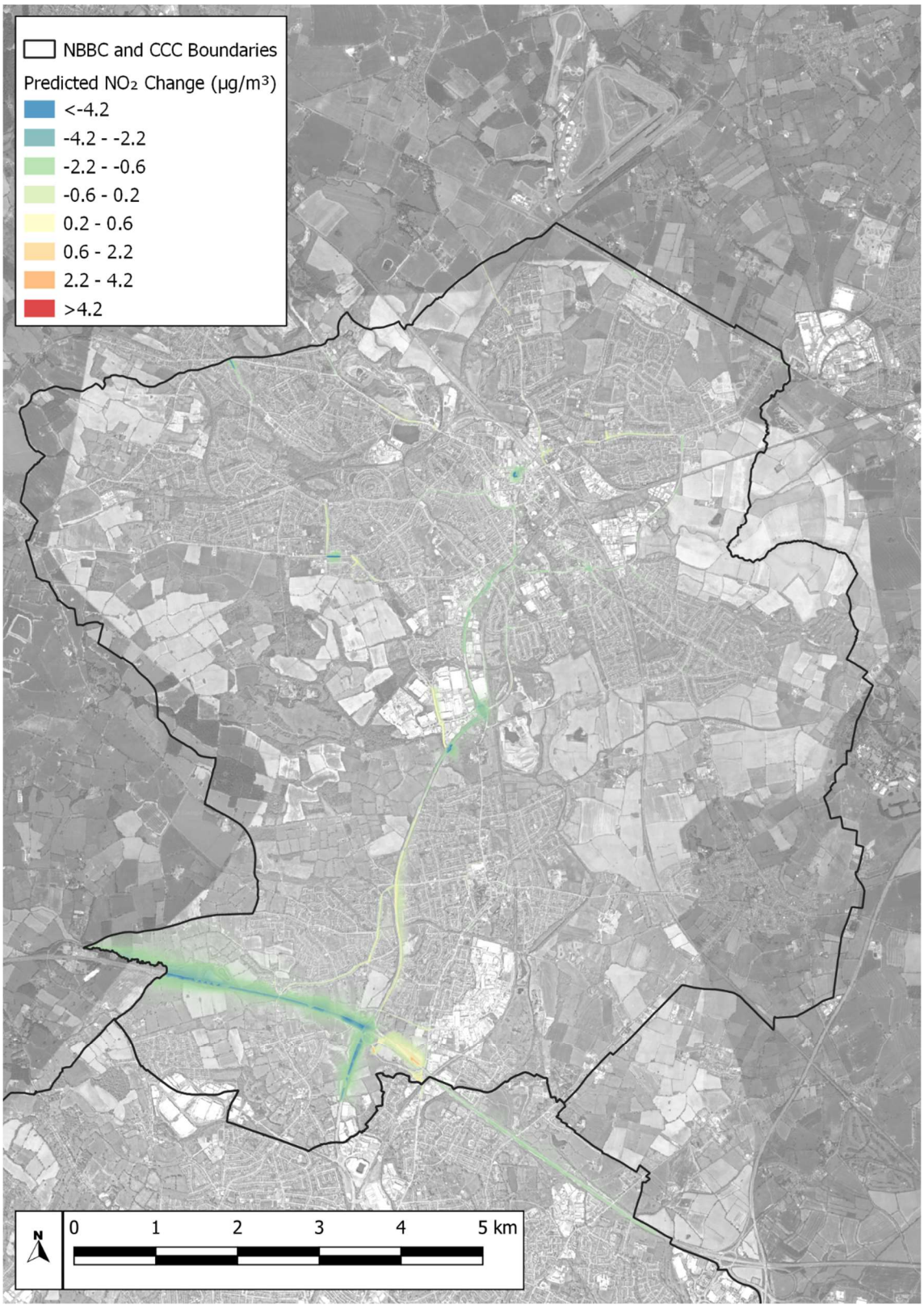

Figure notes: Imagery © 2023 Google, Map data © 2023.

Figure 17: Predicted Changes of the 'Do Something' scenario with mode shift upon Annual Mean NO_2 Concentrations in 2039 within and close to the AQMAs in Nuneaton

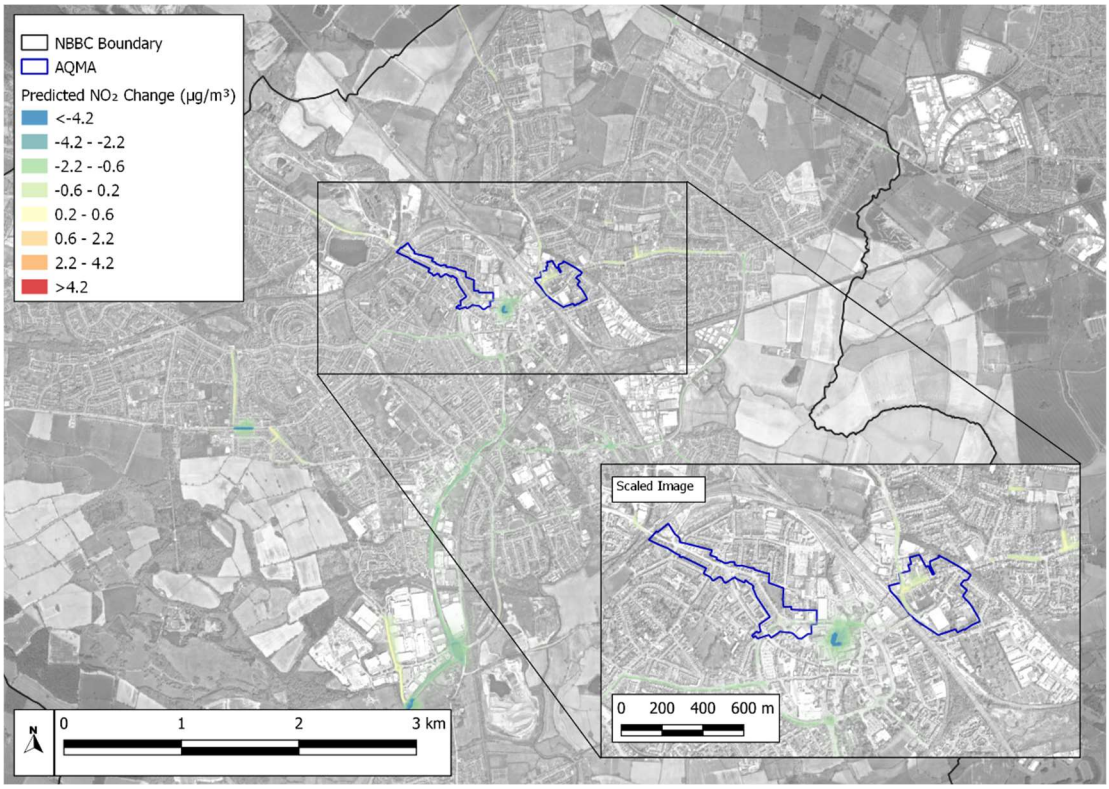

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Figure 18: Predicted Changes of the 'Do Something' scenario with mode shift upon Annual Mean NO_2 Concentrations in 2039 within and close to the AQMA in Coventry

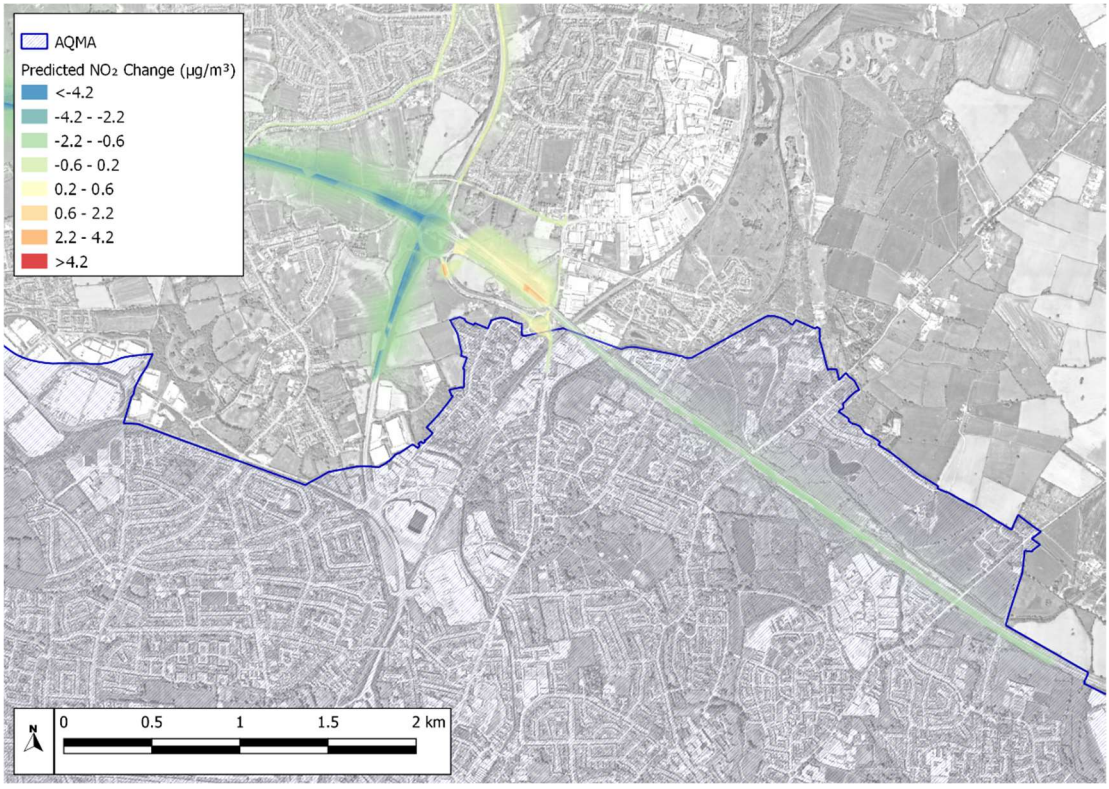

Figure notes: Imagery © 2023 Google, Map data © 2023.

Borough Plan 2031

G3.11. The 'Do Something' scenario in 2031 is predicted to lead to some increases and some decreases in annual mean NO_2 concentrations along the main arterial roads in the borough (predominantly the A5, A444 and M6).

G3.12. To understand whether the increases result in adverse impacts upon local air quality depends on the total annual mean NO_2 concentrations and there being relevant exposure within the increase areas. The impact descriptors for annual mean concentrations at individual receptors are based on the impact matrix set out in the EPUK and IAQM guidance (see Table 3). All increase areas have been reviewed and in all areas the impacts are described as Negligible and are therefore not considered further. The 'Do Something' scenario in 2031 does not result in any adverse impacts.

G3.13. Consideration has also been given as to whether the scenario will cause any locations of sensitive exposure to become in exceedance of the AQO. There are not predicted to be any exceedances of the AQO at locations of sensitive exposure in 2031 and it can therefore be concluded that this scenario will not lead to exceedances at any locations of sensitive exposure.

G3.14. Since the 'Do Something' scenario will not lead to any exceedances or cause any adverse impacts at locations of sensitive exposure, the effects of this scenario are judged to be 'not significant'.

Borough Plan 2039

G3.15. The 'Do Something' scenario and 'Do Something' scenario with Mode Shift in 2039 are also both predicted to lead to some increases and some decreases in annual mean NO_2 concentrations along the main arterial roads in the borough (predominantly the A5, A444 and M6).

G3.16. To understand whether the increases result in adverse impacts upon local air quality depends on the total annual mean NO_2 concentrations and there being relevant exposure within the increase areas. The impact descriptors for annual mean concentrations at individual receptors are based on the impact matrix set out in the EPUK and IAQM guidance (see Table 3). All increase areas have been reviewed for both scenarios and in all areas the impacts are described as Negligible and are therefore not considered further. The 'Do Something' scenario and 'Do Something' scenario with Model Shift in 2039 do not result in any adverse impacts.

G3.17. Consideration has also been given as to whether these scenarios will cause any locations of sensitive exposure to become in exceedance of the AQO. There are not predicted to be any exceedances of the AQO at locations of sensitive exposure in 2039 and it can therefore be concluded that these scenarios will not lead to exceedances at any locations of sensitive exposure.

G3.18. Since the 'Do Something' scenario and the 'Do Something' scenario with Mode Shift will not lead to any exceedances or cause any adverse impacts at locations of sensitive exposure, the effects of both these scenarios are judged to be 'not significant'.

Short-term Impacts

G3.19. The short-term NO_2 AQO is likely to be achieved in all scenarios since the predicted concentrations are well below the indicative annual mean equivalent for this AQO of 60 $\mu g/m^3$. The impacts on the short-term AQO are therefore considered Negligible in all scenarios.

Limit Value Compliance

G3.20. In all scenarios, there are no predicted exceedances of the LV at relevant locations for compliance reporting.

Source Apportionment

G3.21. Table 4 and Figure 19 provide the approximate NO_2 source apportionment for the two AQMAs in Nuneaton and the AQMA in Coventry. The main sources are Light Duty Vehicles (LDVs), predominantly private cars, and ambient background levels of pollution. Heavy Goods Vehicles (HGVs) make up a smaller, yet still significant, proportion of pollution. Any proposals to improve air quality should focus on reducing emissions from road vehicles, the contribution which forms more than 50% of the total concentration within all three AQMAs.

Table 4: Source Apportionment Percentages within each AQMA

AQMA	Background	LDVs	HDVs
Midland Road / Corporation Street	37%	52%	11%
Leicester Road Gyratory	41%	50%	9%
Coventry City Wide	48%	38%	14%
Table notes: -			

Figure 19: Source Apportionment within each AQMA

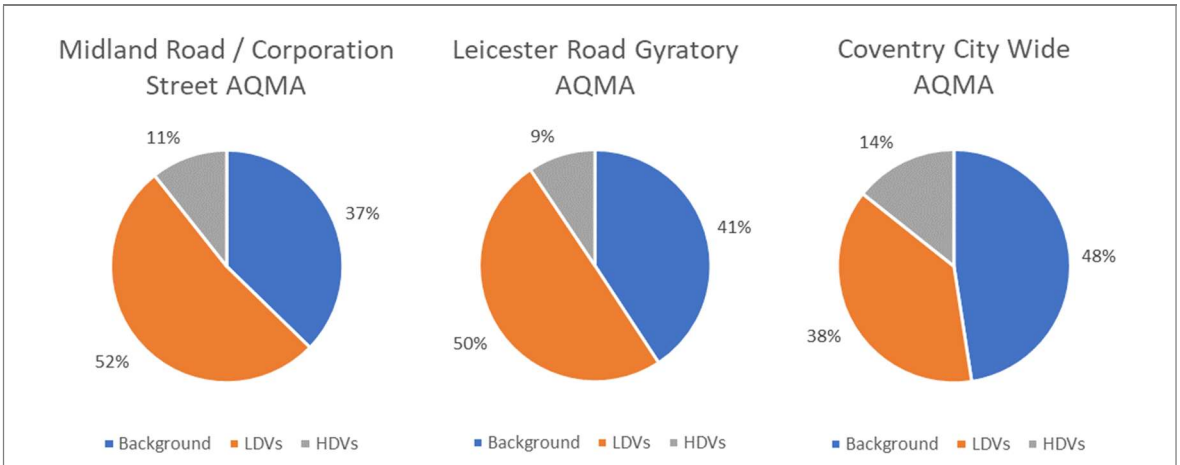

Figure notes: -

G4. Significance of Operational Air Quality Effects on Human Health

G4.1. The air quality effects of the emerging Borough Plan upon locations of human health exposure without additional mitigation are judged to be 'not significant'. This professional judgement takes account of the assessment that:

- the annual mean impacts of pollutant emissions in relation to the human health receptors are described as negligible at all relevant locations and in all scenarios;
- none of the scenarios will cause an exceedance of the annual mean AQO to occur;
- the short-term mean impacts of pollutant emissions in relation to the human health receptors are negligible; and

- in all scenarios, there are no predicted exceedances of the LV at relevant locations for compliance reporting.

G5. Glossary

Air Quality Standards	Concentrations recorded over a given time period, which are considered to be acceptable in terms of what is scientifically known about the effects of each pollutant on health and on the environment.
An exceedance	A period of time (defined for each standard) where the concentration is higher than that set out in the Standard.
An objective	The target date on which exceedances of a Standard must not exceed a specified number.
APS	Air Pollution Services
AQAL	Air Quality Assessment Levels
AQMA	Air Quality Management Area
AQO	Air Quality Objective
CCC	Coventry City Council
EPUK	Environmental Protection UK
HDV	Heavy Duty Vehicles
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LAQM.TG22	Local Air Quality Management Target 22
LDV	Light Duty Vehicles
Limit Values (LV)	Legally binding EU parameters that must not be exceeded. Limit values are set for individual pollutants and are made up of a concentration value, an averaging time over which it is to be measured, the number of exceedances allowed per year, if any, and a date by which it must be achieved. Some pollutants have more than one limit value covering different endpoints or averaging times.
NBBC	Nuneaton and Bedworth Borough Council
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides
µg/m^3	Microgrammes per cubic metre

G6. References

Defra. (2021). *Local Air Quality Management Technical Guidance (TG16)*. Retrieved from https://laqm.defra.gov.uk/technical-guidance/

Defra. (2022). *Local Air Quality Management Technical Guidance (TG22)*. Retrieved from https://laqm.defra.gov.uk/technical-guidance/

EPUK/IAQM. (2017). *Land-Use Planning & Development Control: Planning For Air Quality.*

NBBC. (2021). *Nuneaton and Bedworth Air Quality Action Plan .*