Bloor Homes Limited, Gillian Smith, John Robert Carmichael Smith, Robert Giles Russell Smith and Andrew James Smith

LAND EAST OF STATION ROAD, ELSENHAM

Air Quality Assessment

002
SEPTEMBER 2022

PUBLIC

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TYPE OF DOCUMENT (VERSION) PUBLIC

PROJECT NO. 70084697

OUR REF. NO. 002

DATE: SEPTEMBER 2022

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Air Quality Assessment

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QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	1st draft	2nd draft		
Date	23/9/2022	30/09/2022		
Prepared by	Jemima Hill	Lee Shelton		
Signature		[redacted] Digitally signed by Shelton, Lee (UKLFS001) Reason: I am the author of this document Date: 2022.10.05 14:58:36 +01'00'		
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Authorised by	Stuart Bennett	Stuart Bennett		
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Project number	70084697	70084697		
Report number	001	002		

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EXECUTIVE SUMMARY

WSP has been commissioned by Bloor Homes Limited, Gillian Smith, John Robert Carmichael Smith, Robert Giles Russell Smith and Andrew James Smith to carry out an assessment of the potential air quality impacts arising from a proposed residential located on a parcel of Land East of Station Road, Elsenham. The commission will inform an Outline Planning Application for the site to build up to 200 residential dwellings. The development has the potential to impact local air quality due to changes in traffic flow volume and distribution. Such traffic flow changes can impact on human health and the health of designated ecological sites.

In this report, a review of existing air quality conditions at and in proximity to the application site is provided and an assessment of the potential impacts of the development on local air quality during the construction and operational phases is described. The assessment was undertaken in accordance with the latest technical guidance and best practice such as that provided by the Department of Environment, Food and Rural Affairs and the Institute of Air Quality Management. A conservative approach has been adopted throughout the assessment to ensure all results are precautionary.

A qualitative assessment of the potential impacts on local air quality from construction activities has been carried out for this phase of the Proposed Development using the IAQM methodology. If best practice mitigation is applied to the management of dust, vehicle and plant emissions the residual effect of emissions to air is assessed as not significant.

A quantitative assessment of the potential human health impacts during the operational phase was undertaken using a complex atmospheric dispersion model for which the methodology was approved by Uttlesford District Council. To provide a precautionary assessment, it was assumed that all committed and non-committed development in the area would be fully built out in 5 years. All impacts on human health were assessed as negligible and not significant based on the magnitude of predicted increases. It is therefore judged that the development proposals comply with the NPPF and Policy ENV13 – Exposure to Poor Air Quality of the UDC Adopted Local Plan on the basis of human health.

ADMS-Roads was also used to assess impacts to the Elsenham Woods Site of Special Scientific Interest in proximity to Stansted Airport. The critical level and load for ambient ammonia and the deposition of nitrogen were exceeded without the development which indicates that the site may already be degraded. However, increases caused by traffic from the development are predicted to exceed 1% alone and in combination with other committed and non-committed developments. On this basis a significant effect cannot be ruled out. Therefore, in accordance with best practice, a judgement of the significance of the ecological impacts of the development and requirement for mitigation is provided in the Ecological Assessment. This assessment concludes that with the implementation of mitigation underpinned by a financial contribution, the residual effect would be not significant.

1. INTRODUCTION

1.1.1. WSP has been commissioned by Bloor Homes Limited, Gillian Smith, John Robert Carmichael Smith, Robert Giles Russell Smith and Andrew James Smith ("Bloor Homes Ltd et al") to carry out an assessment of the potential air quality impacts arising from a proposed residential development ("the Proposed Development") located on a parcel of Land East of Station Road, Elsenham ("the Application Site"). Bloor Homes Ltd et al seek to obtain Outline Planning Permission with all matters Reserved except for the Primary means of access for the development of up to 200 residential dwellings along with landscaping, public open space and associated infrastructure works.

1.1.2. The Application Site is located on the north-eastern edge of Elsenham. The Application Site is in agricultural use as arable land. The Proposed Development would be located on part of the existing field, but does not extend to the western, northern or eastern field boundaries. The site is 10.8Ha in size and is broadly rectangular in shape. The site is relatively flat, although the eastern part of the site at a slightly higher level than the western part of the site.

1.1.3. To the west of the site is the railway line, with Elsenham Station and station car park located to the north-west of the site. There are commercial buildings located to the north of the station car park. To the north and east of the site are agricultural fields. There is a public right of way adjacent to the northern field boundary. The land to the south of the site currently comprises a construction site and Bloor Homes are currently building out the 350 dwellings (Refs. Outline Permission UTT/17/3573/OP and APP/C1570/W/19/3243744 and Reserved Matters UTT/21/3269/DFO) approved here. A site location plan is shown in **Figure G-1**.

1.1.4. This report provides a review of existing air quality conditions at and in proximity to the Application Site and an assessment of the potential impacts of the Proposed Development on local air quality during the construction and operational phases. The assessment was undertaken in accordance with current technical guidance published by the Department of Environment, Food and Rural Affairs (DEFRA) and other relevant guidance published by the Institute of Air Quality Management (IAQM).

1.1.5. Air pollution in urban areas and adjacent to major roads is dominated by emissions from road vehicles. The main pollutants of human health concern from road traffic exhaust releases are nitrogen dioxide (NO_2) and fine particulate matter of mean aerodynamic diameter less than 10 and 2.5 micrometres (PM_{10} and $PM_{2.5}$, respectively). For the health of designated habitats, the deposition of nitrogen (N) is of concern due to the potential for increases in eutrophication and acidification. These pollutants are likely to be higher in proximity to major roads and in congested urbanised areas. As such, ambient concentrations of NO_2, PM_{10} and $PM_{2.5}$, and the deposition of N associated with the Proposed Development, are the focus of this assessment.

1.1.6. This report is supported by the following appendices:

- Appendix A – Glossary
- Appendix B – Construction Dust Assessment
- Appendix C – Dispersion Model Approach
- Appendix D – Model Verification
- Appendix E – Detailed Dispersion Model Results
- Appendix F – References
- Appendix G - Figures

2. LEGISLATION, POLICY & GUIDANCE

2.1. AIR QUALITY LEGISLATION & POLICY

2.1.1. A summary of the relevant air quality legislation and policy is provided below.

UK AIR QUALITY STRATEGY

2.1.2. The Government's policy on air quality within the UK is set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS)[1]. The AQS provides a framework for reducing air pollution in the UK with the aim of meeting the requirements of European Union legislation[2].

2.1.3. The AQS also sets standards and objectives for nine key air pollutants to protect health, vegetation and ecosystems. These are benzene (C_6H_6), 1,3 butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2), ozone (O_3), and polycyclic aromatic hydrocarbons (PAHs). The standards and objectives for the pollutants considered in this assessment are given in **Table 2-1**.

2.1.4. The air quality standards are levels recommended by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO) with regards to current scientific knowledge about the effects of each pollutant on health and the environment.

2.1.5. The air quality objectives are policy-based targets set by the Government, which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e. a limited number of permitted exceedances of the standard over a given period.

2.1.6. For the pollutants considered in this assessment, there are both long-term (annual mean) and short-term standards. In the case of NO_2, the short-term standard is for a 1-hour averaging period, whereas for PM_{10} it is for a 24-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants, for example temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road.

2.1.7. The AQS contains a framework for considering the effects of a finer group of particles known as '$PM_{2.5}$' as there is increasing evidence that this size of particles can be more closely associated with observed adverse health effects than PM_{10}. Local Authorities are required to work towards reducing emissions/concentrations of particulate matter within their administrative area. However, there is no statutory objective given in the AQS for $PM_{2.5}$ at this time.

[1] Department for Environment, Food and Rural Affairs (Defra) and the Devolved Administrations (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2)

[2] The UK formally left the EU on 31st January 2020 and new air quality legislation for the UK will be brought forward in due course. The Air Quality (Miscellaneous Amendment and Revocation of Retained Direct EU Legislation) (EU Exit) Regulations 2018 (SI 2018/1407) (see Regulation 5) makes changes to retained direct EU legislation relating to air quality, to ensure that it continues to operate effectively.

AIR QUALITY REGULATIONS

2.1.8. Many of the objectives in the AQS have been made statutory in England with the Air Quality (England) Regulations 2000[3] and the Air Quality (England) (Amendment) Regulations 2002[4] for the purpose of Local Air Quality Management (LAQM).

2.1.9. These Regulations require that likely exceedances of the AQS objectives are assessed in relation to:

"…the quality of air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present…"

2.1.10. The Air Quality Standards Regulations 2010[5] transpose the European Union Ambient Air Quality Directive (2008/50/EC) into law in England. This Directive sets legally binding limit values for concentrations in outdoor air of major air pollutants that impact public health such as PM_{10}, $PM_{2.5}$ and NO_2. The limit values for NO_2 and PM_{10} are the same concentration levels as the relevant AQS objectives and the limit value for $PM_{2.5}$ is a concentration of 20µg/m³.

2.2. RELEVANT UK AIR QUALITY OBJECTIVES

2.2.1. The national air quality objectives that the UK must comply with, specifically for traffic-related pollutants NO_2, PM_{10}, and $PM_{2.5}$, are presented **Table 2-1**. The respective UK objective concentration standards and averaging periods are numerically identical for each pollutant, based on air quality standards set for the protection of human health.

Table 2-1 - National (England) Air Quality Objectives Set for the Protection of Human Health

Pollutant	Applies to	Objective	Measured as	Date to be achieved by and maintained thereafter
Nitrogen dioxide (NO_2)	UK	200µg/m³ not to be exceeded more than 18 times a year	1 hour mean	31.12.2005
	UK	40µg/m³	annual mean	31.12.2005
Particulate Matter (PM_{10}) (gravimetric)[A]	UK (except Scotland)	40µg/m³	annual mean	31.12.2004
	UK (except Scotland)	50µg/m³ not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
Particulate Matter ($PM_{2.5}$)	UK (except Scotland)	20µg/m³	annual mean	2020

[3] The Air Quality (England) Regulations 2000 - Statutory Instrument 2000 No.928

[4] The Air Quality (England) (Amendment) Regulations 2002- Statutory Instrument 2002 No.3043

[5] The Air Quality Standards Regulations 2010 - Statutory Instrument 2010 No. 1001

WORLD HEALTH ORGANIZATION

2.2.2. The World Health Organization (WHO) publishes guideline values[6] for the concentrations of pollutants in ambient air. These values were updated and new guidelines published in 2021 informed by a wealth of new studies in scientific literature on the harmful effects of air pollutants. The guidelines values were significantly reduced for most pollutant categories and are substantially lower than statutory objectives, being based on the latest available research. The WHO Guideline Values are provided for reference in **Table 2-2**.

Table 2-2 – World Health Organization Guideline Values for the Protection of Human Health

Pollutant	Measured as	Suggested Interim Values (µg/m³)				Guideline Value (µg/m³)
		1	2	3	4	
Nitrogen dioxide (NO_2)	annual mean	40	30	20	-	10
	24-hour mean*	120	50	-	-	25
	1-hour mean	-	-	-	-	200
Particulate Matter (PM_{10})	annual mean	70	50	30	20	15
	24-hour mean*	150	100	75	50	45
Particulate Matter ($PM_{2.5}$)	annual mean	35	25	15	10	5
	24-hour mean*	75	50	37.5	25	15

* 99th percentile (i.e. 3-4 exceedance days per year)

2.2.3. The WHO guidelines provide suggested interim values for national governments to use on the route to meet the final non-statutory Guideline Values.

CLEAN AIR STRATEGY

2.2.4. Defra published the Government's Clean Air Strategy in 2019[7]. This sets out measures, which aim to reduce emissions from all sources of air pollution, making air healthier to breathe, protecting nature and boosting the economy. The Strategy also proposes tough new goals to cut public exposure to airborne particulate matter, as per the recommendation made by the World Health Organisation.

2.2.5. Furthermore, the Strategy confirms that the Government will set new legislation to 'create a stronger and a more coherent framework for action to tackle air pollution. This will be underpinned by new England-wide powers to control major sources of air pollution, in line with the risk they pose to public health and the environment, plus new local powers to take action in areas with an air pollution problem. These will support the creation of Clean Air Zones to lower emissions from all sources of

[6] World Health Organization (2021) WHO global air quality guidelines. Particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide. Geneva: World Health Organization

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

air pollution, backed up with clear enforcement mechanism.' New enforcement powers will also be given at a national and local level, across all sectors of society.

ENVIRONMENTAL PROTECTION ACT 1990 - CONTROL OF DUST AND PARTICULATES ASSOCIATED WITH CONSTRUCTION

2.2.6. Section 79 of the Environmental Protection Act 1990 gives the following definitions of statutory nuisance relevant to dust and particles:

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

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

2.2.7. Following this, Section 80 says that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

2.2.8. There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist. Nuisance is a subjective concept, and its perception is highly dependent upon the existing conditions and the change which has occurred.

ENVIRONMENT ACT 1995

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

ENVIRONMENT ACT 2021

2.2.10. The Environment Act 2021[8], published in November 2021, provides a new framework for environmental protection within the UK. It aims to ensure that environmental standards are maintained and that improvements are achieved (specifically in relation to air quality, water, waste and resources, nature and biodiversity) and bridges the gaps in legislation resulting from the UK's departure from the EU. The Environment Act 2021 does not replace the Environment Act 1995, but it does make amendments in order to strengthen environmental protections. In relation to air quality, the Environment Act 2021 includes a legally binding duty on Government to bring forward at least two new air quality targets for $PM_{2.5}$ into secondary legislation by 31 October 2022.

2.2.11. Target objectives under consideration for air quality include:

- Reducing the annual mean concentrations of $PM_{2.5}$ in ambient air; and
- Reducing population exposure to $PM_{2.5}$.

[8] Environment Act 2021 [online[redacted]

THE CONSERVATION OF HABITATS AND SPECIES (AMENDMENT) (EU EXIT) REGULATIONS 2019

2.2.12. Currently Regulation 9 of the Conservation of Habitats and Species Regulations 2017 sets out duties for relevant public authorities to exercise their nature conservation functions in compliance with, or with regard to, the requirements of the Habitats Directive and the Wild Birds Directives ('the Directives').

2.2.13. The Conservation of Habitats and Species Regulations transposes the EU Habitats Directive and Wild Bird Directive into domestic law. This requires that a development proposal, or a project or plan, will not cause a likely significant effect or, where likely significant effects cannot be discounted no adverse effect on the integrity of the designated site.

2.2.14. **Table 2-3** provides for the assessment criteria relevant to the Site of Special Scientific Interest (SSSI) at Elsenham Woods (designation ID: 1002969) which has the potential to be impacted by the Proposed Development.

Table 2-3 – Designated Site Assessment Criteria (Broadleaf, Mixed and Yew Woodland

Site	Critical Level (CLe) NO_x	Critical Level (CLe) NH_3	Critical load (CLo) N deposition
Elsenham Woods SSSI	30 µg/m³	1 µg/m³ *	15-20 kg N/ha/year

*lichens and bryophytes present

2.2.15. As a screening criterion, a 1% increase in ambient NO_x, NH_3 and N deposition is widely used throughout the air quality assessment profession to define a reasonable quantum of long-term pollution which is not likely to be discernible from fluctuations in background/measurements[16].

2.2.16. The 1% screening criterion is not a threshold of harm and exceeding this threshold does not, of itself, imply damage to a habitat. However, for all types of project, if the air quality specialist identifies that the impact is sufficiently large (alone and/or in-combination) that it cannot be screened out and therefore it could have a potential significant effect, the information should be passed to an ecologist to use their expertise to determine whether or not there is, in fact, a likely significant effect of the project or plan on the habitat.

2.3. PLANNING POLICY

2.3.1. A summary of the national and local planning policy relevant to the Proposed Development and air quality is provided below.

NATIONAL PLANNING POLICY

National Planning Policy Framework

2.3.2. The Government's overall planning policies for England are described in the National Planning Policy Framework[9]. The core underpinning principle of the Framework is the presumption in favour of sustainable development, defined as:

[9] Ministry of Housing, Communities and Local Government (July 2021) *National Planning Policy Framework.*

- *'… meeting the needs of the present without compromising the ability of future generations to meet their own needs'.*

2.3.3. One of the three overarching objectives of the NPPF is that the planning system should seek '*to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.*'

2.3.4. In relation to air quality, the paragraphs in the document are relevant:

- Paragraph 55, which states '*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.*';
- Paragraph 104, which relates to the need to consider transport related issues at the earliest stages of plan making and development proposals, so that *'…c) opportunities to promote walking, cycling and public transport use are identified and pursued; d) the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains...*';
- Paragraph 105, which states '…*Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health….'*;
- Paragraph 174, which states '*Planning policies and decisions should contribute to and enhance the natural and local environment by: …e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans...'*;
- Paragraph 185, which states '*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….*';
- Paragraph 186, which states '*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.*'; and
- Paragraph 188, which states '*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.'

LOCAL PLANNING POLICY

Uttlesford District Council Local Plan

2.3.5. The first 'Issues & Options' stage of the new UDC Local Plan was conducted in 2020/21 as a series of extensive consultations with the community and other stakeholders. The Regulation 18 'Preferred Options' Local Plan will be published for public consultation in late 2022 there the Therefore Adopted Local Plan[10] remains UDC's primary planning document. The Local Plan contains the follow air quality specific policy:

"Policy ENV13 – Exposure to Poor Air Quality

Development that would involve users being exposed on an extended long-term basis to poor air quality outdoors near ground level will not be permitted. A zone 100 metres on either side of the central reservation of the M11 and a zone 35 metres either side of the centre of the new A120 have been identified on the proposals map as particular areas to which this policy applies."

[10] Uttlesford District Council. Uttlesford Local Plan Adopted January 2005

3. SCOPE & METHODOLOGY

3.1.1. This section of the Air Quality assessment provides details of the data and information supplied for the purposes of the assessment. It also describes the adopted methodology for assessing and appraising the potential air quality impacts associated with the Proposed Development.

3.2. KEY DATA & RESOURCES

3.2.1. An index of the key data and resources used within the assessment is presented in **Table 3-1**.

Table 3-1 – Key Data & Resources

Data/Resource	Summary	Source/Reference
Annual Mean NO_2 monitoring data	Data obtained for the study area required to facilitate baseline air quality review and air quality model verification	UDC 2022 Air Quality Annual Status Report[11]
DEFRA national background pollutant mapping data	Background 1km x 1km grid pollutant data obtained for the respective grid squares encompassing the study area	DEFRA background mapping data (reference year 2018)[12]
DEFRA Local Air Quality Management (LAQM) Tools	A suite of tools to enable collation of vehicle emissions inventory data, background pollutant adjustment, and conversion of NO_x to NO_2.	All LAQM tools sourced from DEFRA: https://laqm.defra.gov.uk/review-and-assessment/tools/tools.html
Atmospheric dispersion modelling system for roads (ADMS-Roads)	Dispersion model capable of predicting dispersion of vehicle emissions from the assessed road network and calculating pollutant concentrations at identified receptors.	ADMS-Roads v5.0 developed by Cambridge Environmental Research Consultants (CERC) Ltd
Baseline and future years traffic data for all model scenarios	Traffic data provided in appropriate format to enable air pollutant emissions inventory (NO_x, PM_{10}, $PM_{2.5}$) databases to be generated prior to dispersion modelling.	Traffic Data supplied by projects transport consultant (WSP) (see **Appendix C**)
Meteorological Data	Stansted Airport 2018	See **Appendix C**
LAQM Technical Air Quality Guidance	Guidance document, including information on dispersion modelling and model verification / adjustment.	DEFRA (2022) Local Air Quality Management Technical Guidance TG22[13]
Guidance on the Assessment of Dust from Demolition and Construction ('IAQM Construction Guidance')	Guidance for developers, their consultants and environmental health practitioners on how to undertake a construction impact assessment.	Document published by IAQM[14]

[11] Uttlesford District Council 2022 Air Quality Annual Status Report. July 2022

[12] DEFRA 2018 background mapping [online] https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018

[13] DEFRA (2018) Part IV The Environment Act 1995 and Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management Technical Guidance LAQM.TG22

[14] IAQM (2016). Guidance on the Assessment of Dust from Demolition and Construction. June 2016/

Land Use Planning & Development Control Guidance ('EPUK/IAQM Planning Guidance')	Joint guidance provided by Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) that includes air quality impact descriptor criteria.	Document published by EPUK/IAQM (2017) Land-Use Planning & Development Control[15]
Uttlesford District Council Air Quality Technical Planning Guidance	The guidance is aimed at applicants, developers and their consultants to help to ensure consistency in approach to air quality within Uttlesford, and that it is addressed prior to submitting a planning application.	Guidance prepared to support the policies set by Uttlesford District Council relating to air quality within the Adopted Local Plan 2005.
Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites[16]	The guidance provides a summary of the tools and methods applicable to the assessment of air quality impacts on designated ecological sites and provides a summary of recent case law for many aspects of assessment and type of site.	This guidance was produced by the IAQM specifically for air quality practitioners assessing designated ecological sites.
AQTAG(06)[17] Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air	The guidance provides factors and constants for the calculation of rates of deposition from various different types of pollutant. Much of the methodology outlined within the IAQM's designated sites guidance has been derived from AQTAG(06).	This guidance was produced by Defra and the Devolved Authorities specifically for the assessment of industrial emissions, however, is fully applicable to the assessment of the impacts on designed ecological sites from traffic emissions
Joint Nature Conservation Committee Report No.665 Nitrogen Futures[18]	The nutrient nitrogen deposition and ambient NH3 concentrations provided are for the whole of the UK with no spatial disaggregation and the future projections applied in the assessment follow the precautionary modelled scenario assuming that the National Emissions Ceilings Regulations (NECR) targets will not be met.	The Joint Nature Conservation Committee (JNCC) report provides the summary of research undertaken on the future projections for nutrient nitrogen deposition and ambient NH3 concentrations in the UK.

3.3. CONSULTATION

3.3.1. The assessment methodology detailed below was defined and agreed through consultation with UDC's Environmental Health Officer (EHO) in September 2022[19]. The methodology was fully approved by the UDC EHO on 21st September 2022 on the assumption that Essex Highways approve of the traffic datasets used in the assessment.

[15] EPUK/IAQM Land-Use Planning & Development Control: Planning For Air Quality January 2017

[16] IAQM (May 2020) Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites Available at: [redacted] (Accessed 27/07/20)

[17] AQTAG(06). Available at: http://bailey.persona-pi.com/Public-Inquiries/A465-English/8%20Air%20Quality/8.2.2%20-%20AQTAG06_Technical%20Guidance%20Assessment%20emissions%20to%20air%20Mar2014.pdf (Accessed 02/12/18)

[18] Joint Nature Conservation Committee (2020) Report No. 665 Nitrogen Futures [Online] [redacted], accessed February 2022

[19] WSP (2022). Land East of Station Road, Elsenham. Transport Assessment. October 2022.

3.4. BASELINE AIR QUALITY REVIEW

3.4.1. The 2020 Air Quality Annual Status (ASR)[11] published by UDC has been reviewed to establish baseline air quality conditions within the immediate vicinity of the Proposed Development. The ASR provides the annual mean NO_2 monitored levels at the respective monitoring sites for the previous five years (2015 – 2019) near to the Application Site.

3.4.2. Background NO_2, PM_{10} and $PM_{2.5}$ concentrations corresponding to the 1km^2 grid squares covering the Application Site were obtained from DEFRA's published national pollutant mapping data[12]. The background pollutant data were used for air quality assessment at the associated link roads and identified sensitive receptor locations.

3.4.3. The DEFRA mapped background concentrations were selected to represent air quality at the Application Site instead of urban background monitoring. This approach was taken to enable a variable background to be applied to each receptor, utilising the most accurate representation of conditions at their location.

3.5. CONSTRUCTION PHASE ASSESSMENT METHODOLOGY

3.5.1. A construction phase impact assessment of dust and PM_{10} emissions was undertaken using the relevant assessment methodology published by the IAQM[20] together with available information provided by the applicant and project team and using professional judgement.

3.5.2. The IAQM[20] methodology assesses the risk of potential dust and PM_{10} impacts from the following four sources: demolition; earthworks; general construction activities and trackout (the transfer of dust and particulates from the construction site to the public road network by heavy construction vehicles). It considers the nature and scale of the activities undertaken for each source and the sensitivity of the area to an increase in dust and PM_{10} levels to assign a level of risk. Risks are described in terms of there being a low, medium or high risk of dust impacts. Once the level of risk has been ascertained, then site specific mitigation proportionate to the level of risk is identified, and the significance of residual effects determined. A summary of the IAQM[20] assessment methodology is provided in **Appendix B**.

3.5.3. During the construction phase of the Proposed Development, there will be additional construction vehicle movements along the road network. However, due to the nature of the construction phase, the frequency of these movements will be temporary and intermittent relative to existing flows on the local road network. Data relating to the number, type and routing of construction vehicles and non-road mobile machinery (NRMM) were not available at the time of assessment, therefore professional judgement was used to qualitatively assess potential local air quality impacts associated with emissions from construction vehicles and NRMM.

3.6. OPERATIONAL PHASE ASSESSMENT METHODOLOGY

ATMOSPHERIC DISPERSION MODELLING

3.6.1. The operational phase assessment focussed on the following scenarios, for which traffic data were provided to facilitate atmospheric dispersion modelling of vehicle emissions using Cambridge

[20] Institute of Air Quality Management (Version 1.1 Updated June 2016). Guidance on the Assessment of Dust from Demolition and Construction

Environmental Research Consultants'(CERC) Air Dispersion Modelling System (ADMS)-Roads v5.0 model:

- Baseline & Model Verification Year (2019)
- Opening Year without Proposed Development (2027)
- Opening Year with Proposed Development (2027).
  In addition, two further scenarios, both with and without the Proposed Development were modelled for the purpose of ecological assessment that included all committed and non-committed development *with the exception of* Land South of Henham Road, Elsenham ('Countryside development').

TRAFFIC DATA

3.6.2. Traffic flows for the Proposed Development were produced by WSP. A summary of the traffic data for each of the above scenarios is presented in **Appendix C**.

3.6.3. The traffic data include details of the Annual Average Daily Traffic (AADT) flows, speed limits (km/h) and the percentage of Heavy-Duty Vehicles (HDVs) applicable to the local road network in all assessment years considered. Traffic speeds were reduced at junctions in line with guidance provided in LAQM.TG22[13] and using professional judgement.

3.6.4. The traffic flows for the 'without Proposed Development' scenario represent future (2027) baseline flows with local committed and non-committed development traffic included, but do not include any contribution to road traffic from the Proposed Development itself. The traffic flows for the 'with Proposed Development' scenario account for the baseline flows in addition to the change in vehicle flows arising from the operation of the Proposed Development. The local committed and non-committed development sites contributing to the traffic flows are summarised in **Table 3-2**:

Table 3-2 –Local Development Sites

Development	Location	Description	Planning Reference	Status
Land To The North West Of Henham Road Elsenham	East Elsenham	350 dwellings and primary school that includes early years and childcare setting for up to 56 places	UTT/17/3573/OP (approved under appeal reference APP/C1570/W/19/3243744)	Approved
Land West of Hall Road	South-East Elsenham	130 dwellings	UTT/19/0462/FUL	Approved
Land to the West of Isabel Drive	West Elsenham	99 dwellings	UTT/19/2470/OP	Approved
Land South of Rush Lane	South Elsenham	40 dwellings	UTT/19/0437/OP	Approved
West of Parsonage Road	Takeley	119 dwellings	UTT/19/0393	Approved - Appeal Allowed
Land East of Parsonage Road	Takeley	88 dwellings	UTT/19/0394	Approved - Appeal Allowed
Garnetts (west of)	Takeley	155 dwellings	UTT/21/3311	Awaiting Decision

Land East Of Parsonage Road Takeley	Takeley	88 dwellings	UTT/21/2488/	Awaiting Decision
South of Vernon's Close, Henham	Henham	45 dwellings	UTT/20/0604	Approved - Appeal Allowed
Land South of Henham Road, Elsenham (Countryside development)	East Elsenham	130 dwellings	S62A/22/0007	Awaiting Decision

3.6.5. As it is assumed that all development sites described in **Table 3-2** will be fully built out by 2027, the traffic flows datasets are likely to be a conservative representation of reality. This approach to the derivation of traffic data was agreed with Essex Highways during consultation[19]. Further details on the traffic data are included in **Appendix C**.

VEHICLE EMISSION INVENTORIES

3.6.6. The traffic data were used to develop emissions inventory databases for each pollutant (NO_x, PM_{10} and $PM_{2.5}$) and scenario using the DEFRA Emissions Factors Toolkit (EFT) version 11.0[21]. This accounts for traffic flow characteristics, including:

- Road type (e.g. urban, rural, motorway)
- Total vehicle flow by link (AADT)
- Percentage of Heavy-Duty Vehicles (HDVs) per link
- Average link speed (km/h).

3.6.7. Emission of NH_3 were obtained through the use of the Air Quality Consultants (AQC) Calculator for Road Emissions of Ammonia (CREAM) v1A.

3.6.8. In addition, vehicle flows were disaggregated using the National Atmospheric Emission Inventory UK Fleet Mix predictions from 2019 in order to create inputs for the Detailed Option 3 in both the EFTv11 and CREAM v1A. This accounts for the increasing prevalence of electric vehicles in the road fleet and divides the internal combustion fleet between petrol and diesel vehicles where there are differing rates for the creation of NH_3 during catalytic reduction.

3.6.9. The emissions database outputs for each respective scenario provided road link-specific pollutant emission rates (g/km/s), which were input to the ADMS-Roads model to enable prediction of pollutant concentrations at identified sensitive receptor locations. In addition, the following model inputs were required:

- Geometry of each affected road link
- Hourly sequential meteorological data obtained from Stansted Airport for 2019
- Coordinates of each identified sensitive receptor at which the model calculated pollutant concentrations (see Section 3.7).
- Further detailed information of the modelling process and input data used for this assessment is presented in **Appendix C**.

[21] Emission Factor Toolkit v11.0 Available at https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

MODEL VERIFICATION

3.6.10. Verification of the ADMS-Roads model output was undertaken through comparing the annual mean NO_2 base year (2019) model outputs with UDC NO_2 monitoring data at the respective monitoring locations. This enabled appropriate model adjustment factors, derived with reference to LAQM.TG22[13], to be applied to model outputs to ensure the performance of the dispersion model was suitable within the context of the available monitoring data.

3.6.11. Verification of PM_{10} and $PM_{2.5}$ has been completed using the same factor determined through verification of NO_2 concentrations, in accordance with LAQM.TG22[13] technical guidance, which states *"…In the absence of any PM_{10} data for verification, it may be appropriate to apply the road-NO_x adjustment to the modelled road-PM_{10}."*

3.6.12. Further detailed information in regard to the model verification and adjustment procedure is presented in **Appendix C**.

3.7. IDENTIFIED DISCRETE RECEPTORS

3.7.1. Sensitive locations are places where the public or sensitive ecological habitats may be exposed to pollutants resulting from activities associated with the Proposed Development. These include locations sensitive to an increase in dust deposition and PM_{10} exposure as a result of on-site construction activities, and locations sensitive to exposure to fine particulate and gaseous pollutants emitted from the exhausts of construction and operational traffic associated with the Proposed Development. For the purposes of this assessment, we are assessing human health receptors which are classed as high sensitivity.

CONSTRUCTION PHASE

3.7.2. The IAQM[20] construction phase air quality assessment focusses on the following sensitive locations:

- 'human receptors' within 350 m of the site boundary, or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s); and/or,
- 'ecological receptors' within 50 m of the site boundary, or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

3.7.3. It is within these distances that the impacts of dust soiling and increased particulate matter in the ambient air will have the greatest impact on local air quality at sensitive receptors. There were no ecologically sensitive locations identified within 50 m of the Application Site boundary and thus were scoped out of the assessment.

OPERATIONAL PHASE

3.7.4. Locations that are sensitive to pollutants emitted from vehicles on the local road network include places where members of the public are likely to be regularly present over the period of time prescribed in the Air Quality Strategy. For instance, on a footpath where exposure will be transient (for the duration of passage along that path) comparison with a short-term standard (i.e. 15-minute mean or 1 hour mean) may be relevant. At a school or adjacent to a private dwelling, where exposure may be for longer periods, comparison with a long-term standard (such as 24-hour mean or annual mean) may be more appropriate.

3.7.5. To complete the assessment of operational phase impacts, a number of 'receptors' representative of locations of relevant public exposure were identified (using satellite imagery and OS mapping) at which pollutant concentrations were predicted. Receptors have been located adjacent to the roads that are likely to experience the greatest change in traffic flows or composition, and therefore NO_2, PM_{10}, and $PM_{2.5}$ concentrations, as a result of the Proposed Development.

3.7.6. For ecological receptors, the impact of vehicle emissions at designated sites within 200m of an affected road link should be considered within the air quality assessment, as stipulated by the IAQM guidance[22]. DEFRA's MAGIC Map[23] online portal was used to identify any ecological receptors in close proximity to the Application Site. The results show that there is one Site of Special Scientific Interest (SSSI) at Elsenham Woods (designation ID: 1002969) to the south of the Proposed Development which is a designated site because of the presence of ancient woodland comprising ancient mixed woods supporting wet ash-maple, oak-hornbeam and wych elm woodland types. The is site lies directly under the Stansted Airport flightpath.

3.7.7. All receptors were modelled at "breathing height" which is defined as 1.5 m above the ground level. The receptor IDs can be summarised as follows:

- Receptors R1 to R46 are existing receptors located off-site at building façades nearest to the modelled road network.
- Receptors P1 to P14 are all located at building façades on-site at the Proposed Development
- Receptors A1 to A6 are located on Henham Road High Street adjacent to the Countryside development.

3.7.8. The locations of the assessment receptors are shown depicted in **Figure G-3**.

3.8. SIGNIFICANCE CRITERIA

CONSTRUCTION PHASE

3.8.1. The IAQM[20] methodology recommends that significance criteria are only assigned to the identified risk of dust impacts occurring from construction activities following implementation of appropriate mitigation measures. Therefore, the significance criteria are used to assess the significance of residual effects only. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effect will normally be not significant.

3.8.2. For the assessment of the impact of exhaust emissions from plant used on-site and construction vehicles accessing and leaving the Application Site on local concentrations of NO_2 and particulate matter, the significance of residual effects have been determined using professional judgement and the principles outlined in the EPUK/IAQM guidance[15], which are described below.

OPERATIONAL PHASE

3.8.3. The approach provided in the EPUK/IAQM guidance[15] has been used within this assessment to assist in describing the air quality effects of additional emissions from traffic generated by the Proposed Development once operational.

[22] IAQM. A guide to the assessment of air quality impacts on designated nature conservation sites. May 2020

[23] DEFRA MAGIC Map [online] https://magic.defra.gov.uk/MagicMap.aspx

3.8.4. This guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change in pollution concentration as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion, as summarised in **Table 3-3**.

Table 3-3 – Impact Descriptors for Individual Receptors

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

Notes

AQAL = Air Quality Assessment Level, which for this assessment related to the UK Air Quality Strategy objectives.

Where the %change in concentrations is <0.5%, the change is described as 'Negligible' regardless of the concentration.

When defining the concentration as a percentage of the AQAL, 'without scheme' concentration should be used where there is a decrease in pollutant concentration and the 'with scheme;' concentration where there is an increase.

Where concentrations increase, the impact is described as adverse, and where it decreases as beneficial.

3.8.5. The EPUK/IAQM guidance[15] notes that the criteria in **Table 3-3** should be used to describe impacts at individual receptors and should be considered as a starting point to make a judgement on significance of effects, as other influences may need to be accounted for. The EPUK/IAQM guidance[15] states that the assessment of overall significance should be based on professional judgement, considering several factors, including:

- The existing and future air quality in the absence of the development
- The extent of current and future population exposure to the impacts
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

3.8.6. The EPUK/IAQM guidance[15] states that for most road transport related emissions, long-term average concentrations are the most useful for evaluating the impacts. The guidance does not include criteria for determining the significance of the effect on hourly mean NO_2 concentrations or daily mean PM_{10} concentrations. The significance of effects of hourly mean NO_2 and daily mean

PM_{10} concentrations arising from the operational phase have therefore been determined qualitatively using professional judgement and the principles described above.

3.9. LIMITATIONS & ASSUMPTIONS

NO_2 MONITORING AND TRAFFIC DATA

3.9.1. The most recently published complete year of NO_2 monitoring data recorded in 2019 was used for the baseline assessment and in combination with traffic data for model verification. Given the proximity of the monitoring locations to the Application Site and NO_2 data recovery prior to the restrictions implemented for the COVID-19 pandemic, the data is considered representative of the Application Site and appropriate for use in this assessment.

METEOROLOGICAL DATA

3.9.2. Meteorological data recorded at nearby Stansted Airport for the calendar year of 2019 was used for dispersion modelling, as 2019 aligns with the most recent available NO_2 monitoring data required for model verification. Meteorological data recorded in 2019 was used in the dispersion modelling assessment and assumed representative of future meteorological conditions in the assessment year 2027. The impact of variations in annual trends on predicted annual mean concentrations could make a difference to predicted pollutant concentrations.

3.9.3. Given the similarities in topography and land use at the Application Site and Stansted Airport, the meteorological data is assumed to be broadly representative of conditions at the Application Site.

CONSTRUCTION PHASE

3.9.4. Due to the limited details on the construction methods and programme, the assessment was completed using available information and professional judgement on the likely activity scale and sensitivity of the receiving environment.

ATMOSPHERIC DISPERSION MODEL

3.9.5. There are uncertainties associated with both measured and predicted concentrations. The model (ADMS Roads v5) used in this assessment relies on input data such as predicted traffic flows and meteorological data which are subject to uncertainty. The model itself simplifies complex physical systems into a range of algorithms. In addition, local micro-climatic conditions, such as those caused by coastal effects, may affect the concentrations of pollutants that the ADMS Roads model does not consider.

MODEL VERIFICATION

3.9.6. In order to reduce the uncertainty associated with predicted concentrations, model verification has been carried out following guidance set out in LAQM.TG22. It is advised that verification is carried out at as many locations as possible, therefore, six monitoring location in Stansted Mountfitchet have been used in the verification process.

The average uncertainty (derived as the root mean square error) calculated in the model verification equates to 4.1µg/m³ for annual mean NO_2. As such, the modelled receptors that are predicted to experience NO_2 concentrations above 35.9µg/m³ are considered to be at potential risk of exceeding the annual mean objective of 40µg/m³. None of receptor locations included in the assessment are predicted to be within this range in the assessment year 2027 (see **Appendix D**).

4. BASELINE CONDITIONS

4.1. REVIEW & ASSESSMENT OF AIR QUALITY

4.1.1. UDC has designated one Air Quality management Areas (AQMA) within their administrative area as a consequence of their local air quality review and assessment work. This AQMA (Saffron Walden AQMA) is located more than 10km north of the Application Site in the town of Saffron Walden. As such the Proposed Development is not expected to impact on this, or any AQMA.

4.2. LOCAL EMISSION SOURCES

4.2.1. The Application Site is located in an area where air quality is mainly influenced by emissions from road transport using the local road network including Station Road and Old Mead Road.

4.2.2. With reference to the Environmental Agency's Pollution Inventory[24], there is one industrial pollution source within 1km of the Application Site. A waste management service (Viridor) is located approximately 0.8km east of the Application Site. Given the distance between the waste management facility and the Application Site, and that no other industrial sources are identified, it is unlikely that significant adverse air quality impacts will arise as a result of industrial source emissions in the area.

4.2.3. Stansted Airport which is a source of both vehicle and aircraft emissions from fuel combustion products is located approximately 3km to the south of the application site.

4.3. BACKGROUND AIR QUALITY DATA

4.3.1. Background pollutant concentrations for NO_2, PM_{10} and $PM_{2.5}$ were obtained from DEFRA's national background maps for the 1km x 1km grid square encompassing the Application Site.

4.3.2. Data were obtained for the baseline year (2019), current year (2022) and assessment year (2027), as summarised in **Table 4-1**. All of the annual mean background concentrations are well below the relevant objectives. Furthermore, the data shows a reduction in pollutant concentrations from 2019 to 2027 with the greatest reduction in annual mean NO_2. The greater rate of reduction in annual mean NO_2 is expected as a result of continued improvements in vehicle emissions the technologies and targeted policies to reduce NO_2.

Table 4-1 - DEFRA Background Concentrations (µg/m³)

Grid Square (centre on O.S. Grid Reference)	NO_2 (µg/m³)			PM_{10} (µg/m³)			$PM_{2.5}$ (µg/m³)		
	2019	2022	2027	2019	2022	2027	2019	2022	2027
553500, 227500	10.7	9.4	8.0	16.2	15.6	15.1	9.8	9.3	8.9
553500, 226500	11.2	9.9	8.5	15.2	14.5	14.0	9.7	9.2	8.8
AQS Objective	**40µg/m³**			**40µg/m³**			**20µg/m³**		

[24] 2019 Pollution Inventory https://data.gov.uk/dataset/cfd94301-a2f2-48a2-9915-e477ca6d8b7e/pollution-inventory

4.4. LOCAL AUTHORITY AIR QUALITY MONITORING DATA

CONTINUOUS MONITORING

4.4.1. UDC operates continuous automatic monitoring at three locations within the district; however, all three monitors are located in the town of Saffron Walden, approximately 10km north of the Application Site. As such, concentrations from these monitors are not considered to be representative of air quality conditions at the Application Site and as such have not been included in this assessment.

PASSIVE MONITORING

4.4.2. UDC carry out passive diffusion tube monitoring of NO_2 at various locations throughout the district. Annual mean NO_2 concentrations at those locations situated within 3.5km of the Application Site are provided in **Table 4-2**.

Table 4-2 – UDC NO_2 Diffusion Tube Data (µg/m³)

Site ID - Location	Site Type	Distance From Application Site (km)	Annual Mean Concentration (µg/m³)				
			2017	2018	2019	2020	2021
UT020	Roadside	2.6	-	35.7	30.7	25.3	25.2
UT033	Roadside	2.8	27.0	26.9	23.8	18.7	20.4
UT018	Roadside	2.9	-	26.7	24.4	20.0	18.6
UT019	Roadside	3.1	-	35.0	31.9	22.8	24.8
UT009	Roadside	3.1	36.8	33.6	30.1	23.5	23.6
Annual Mean Objective			**40**				

4.4.3. The data from **Table 4-2** shows that annual mean NO_2 concentrations have been below the objective at all sites within 3.5km of the Application Site between 2017 and 2021. Furthermore, the data shows that NO_2 concentrations have decreased at all but one location between the period 2018 – 2020, although reduction in 2020 may be attributed to travel restrictions implemented during the Covid -19 Pandemic. In the most recent year 2021, concentrations rose at all diffusion tubes except UT020 and UT018. The highest concentration recorded from diffusion tubes within 3.5km of the Application Site in 2021 was 25.2µg/m³, which is below the objective by 14.8µg/m³.

4.4.4. Diffusion tubes UT020, 033, 018 and 019 are all roadside monitors located in the larger village of Stansted Mountfitchet, while monitor UT009 is located 30m from the M11 motorway. As such, none of the monitors listed in **Table 4-2** are considered to be particularly representative of air quality conditions at the Application Site which is located in the smaller village of Elsenham away from any major roads.

4.5. APIS BACKGROUND CONCENTRATIONS AND DEPOSITION RATES

4.5.1. To better understand baseline conditions across the study area, NO_x and NH_3 concentrations in relation to CLes and N Deposition in relation to the relevant CLos were sourced from APIS. APIS provides estimated background concentrations of NO_x (from Defra), and concentrations of NH_3 and rates of N deposition as a three-year average (2017 – 2019) (from FRAME[25]), based on modelling.

4.5.2. The APIS CLe and CLo for the Elsenham Woods SSSI are shown in **Table 4-3**.

Table 4-3 – Designated Site Assessment Criteria broadleaf mixed and Yew Woodland

Elsenham Woods SSSI	Ambient concentration of NO_x	Ambient concentration of NH_3	Rate of N deposition
Minimum (2019)	15.2	2.04	32.6
Maximum (2019)	21.4	2.05	32.8
Minimum (2027)	12.3	2.05	29.9
Maximum (2027)	18.0	2.06	30.0

4.6. SUMMARY

4.6.1. The Proposed Development is not located within or near to any AQMA's. UDC operates an extensive network of continuous monitoring and passive diffusion tubes within the district. The data from **Table 4-2** demonstrates that there are no pollutant exceedances from diffusion tubes located within 3.5km of the Application Site. Despite a lack of representative monitoring data close to the Proposed Development, monitoring conditions within the Application Site, and surrounding area, are estimated to be below the relevant air quality objectives.

4.6.2. DEFRA's background pollutants (**Table 4-1**) show that concentrations in the current year (2022) are predicted to remain below their respective annual mean objectives. Furthermore, these concentrations are predicted to fall further in assessment year 2027.

[25] FRAME - Fine Resolution Atmospheric Multi-pollutant Exchange model, contracted by Defra to the Centre of Ecology and Hydrology

5. ASSESSMENT OF IMPACTS

5.1. CONSTRUCTION PHASE

DUST AND PM_{10} ARISING FROM ON-SITE ACTIVITIES

5.1.1. Construction activities that have the potential to generate and/or re-suspend dust and PM_{10} include:

- Site clearance and preparation
- Preparation of temporary access/egress to the Application Site and haulage routes
- Earthworks
- Materials handling, storage, stockpiling, spillage and disposal
- Movement of vehicles and construction traffic within the Application Site
- Use of crushing and screening equipment/plant
- Exhaust emissions from site plant, especially when used at the extremes of their capacity and during mechanical breakdown
- Construction of buildings, roads and areas of hardstanding alongside fabrication processes
- Internal and external finishing and refurbishment
- Site landscaping after completion.

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

ASSESSMENT OF POTENTIAL DUST EMISSION MAGNITUDE

5.1.3. The IAQM assessment methodology has been used to determine the potential dust emission magnitude for the following four different dust and PM_{10} sources: demolition; earthworks; construction; and trackout.

5.1.4. At this stage, specific details on the construction of the Proposed Development are not known. As such, the construction assessment has been completed using the information that is available and professional judgement where appropriate. The findings of the assessment are presented below.

Demolition

5.1.5. No demolition activities will occur at the Application Site as part of the construction phase of the Proposed Development. Therefore, consideration of the impact of this source on dust soiling and ambient PM_{10} is not required.

Earthworks

5.1.6. The Application Site falls within the IAQM[20] range for large sites (more than 10,000m^2). At this stage, little else is known about the nature and scale of earthworks activities taking place at the Application Site. Therefore, the potential dust emission magnitude, which is solely based on the size of the Application Site, is considered to be **large** for earthwork activities.

Construction

5.1.7. The proposals are for the development of approximately 200 residential dwellings. This is estimated to have a total construction volume of more than 100,000m^3, with potentially dusty materials being used. At this stage it is not known if on site concrete batching will occur. Therefore, based on the volume of construction alone, the potential dust emission magnitude is considered to be **large** for construction activities.

Trackout

5.1.8. Information on the number of HDVs associated with this phase of the Proposed Development is not available and therefore professional judgement has been used. It has been assumed that given the size and nature of the development area there are likely to be between 10 and 50 HDV outward movements in any one day. Therefore, the potential dust emission magnitude is considered to be **medium** for trackout activities.

5.1.9. **Table 5-1** provides a summary of the potential dust emission magnitude determined for each construction activity considered.

Table 5-1 - Potential Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	N/A
Earthworks	Large
Construction Activities	Large
Trackout	Medium

ASSESSMENT OF SENSITIVITY OF THE STUDY AREA

5.1.10. A wind rose generated using 2019 meteorological data from Stansted Airport (**Appendix C**) shows that the prevailing wind direction is from the south-west. Therefore, receptors primarily located to the north-east of the Application Site are more likely to be affected by dust and particulate matter emitted and re-suspended during the construction phase. The land north-east of the Application Site is open farmland and as such there are no sensitive receptors the are likely to be impacted by dust carried by the prevailing wind.

5.1.11. Given the nature of construction phase emissions, it is likely that the majority of dust would be deposited in proximity to the source. The closest high sensitivity receptors to the Application Site are the residential dwellings of Station Road/Old Mead Road, some of which are 50m from the Application Site boundary.

5.1.12. Planning permission has been approved for the construction of 350 residential dwellings on land directly south of the Application Site and some of these dwellings will be occupied during the construction. However, it is assumed that these dwellings will be fully built out in 2027. The closest dwellings within this committed development are estimated to be approximately 50m from the Application Site boundary.

5.1.13. The area's most sensitive to construction dust deposition are highlighted in **Figure G-2**, which depicts 20m, 50m, 100m and 350m distance bands (buffer zones) around the Proposed Development.

5.1.14. Taking the above into account and following the IAQM[20] assessment methodology, the sensitivity of the area to changes in dust and PM_{10} has been derived for each of the construction activities considered. The results are shown in **Table 5-2**.

Table 5-2 - Sensitivity of the Study Area

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

RISK OF IMPACTS

5.1.15. The predicted dust emission magnitude has been combined with the defined sensitivity of the area to determine the risk of impacts during the construction phase, prior to mitigation. **Table 5-3** below provides a summary of the risk of dust impacts for the Proposed Development. The risk category identified for each construction activity has been used to determine the level of mitigation required.

Table 5-3 - Summary Dust Risk Table to Define Site Specific Mitigation

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

5.1.16. The results of the dust risk assessment indicate that there is a medium risk of off-site impacts on local air quality during construction of the Proposed Development. However, the risks for human health are low due to the low background concentrations of PM_{10} locally.

CONSTRUCTION VEHICLES & PLANT

5.1.17. In terms of construction plant and NRMM, the LAQM.TG22[13] guidance states that:

"Experience of assessing the exhaust emissions from on-site plant (NRMM) and site traffic suggests that, with suitable controls and site management, they are unlikely to make a significant impact on local air quality. In the vast majority of cases, they will not need to be quantitatively assessed – qualitative consideration to the above points will likely provide sufficient screening."

5.1.18. Final details of the exact plant and equipment likely to be used at the Application Site will be determined by the appointed contractor, but likely to comprise dump trucks, tracked excavators, diesel generators, asphalt spreaders, rollers, compressors and trucks. The number of plant and their location within the Application Site are likely to be variable over the construction period. Furthermore, the operational patterns of such equipment are usually variable and intermittent over the construction period, limiting the release of total emissions at any given time.

5.1.19. Therefore, based on the available information and professional judgement, the local air quality impacts associated with emissions from construction vehicles and plant are expected to be **negligible**.

5.2. OPERATION PHASE

5.2.1. Full results of the dispersion modelling are presented in **Appendix E** and a summary is provided below.

ANNUAL MEAN NO_2 CONCENTRATIONS

5.2.2. The AQS objective for annual mean NO_2 concentrations is 40µg/m³. The results of the assessment show that in the 2019 baseline case the highest predicted concentrations are as follows:

- Off-site 39.0µg/m³ at R21 adjacent to the M11 and 27.2µg/m³ at R44 on Grove Hill, Stansted Mountfitchet
- On-site 12.9µg/m³ at P1 next to the railway line, Elsenham
- Countryside development 19.9µg/m³ at A6 on High Street/Hall Road junction, Elsenham

5.2.3. The Review and Assessment work reported by UDC in the 2022 ASR (UDC, 2022) concluded that exceedances of the objective did not occur anywhere in the study area in 2019 on the basis of monitoring data reported to Defra. The baseline modelled results are consistent with this conclusion.

5.2.4. By 2027, the assessment year of the Proposed Development, the predicted concentrations at receptors both with and without the development are well below the 2019 base case. The highest concentrations are predicted as follows:

- Off-site 21.7µg/m³ at R21 (Do-Minimum) adjacent to the M11 and 18.7µg/m³ (Do-Something) at R44 on Grove Hill, Stansted Mountfitchet
- On-site 10.1µg/m³ (Do-Something) at P5 in the approved Phase 1 development
- Countryside development at 10.8µg/m³ C6 on High Street/Hall Road junction, Elsenham

5.2.5. The greatest increase in concentrations due to the redevelopment is 0.6µg/m³ at R44. The predicted changes in annual mean NO_2 at all existing receptors were <1.5% of the relevant AQS objective, therefore in accordance with the EPUK/IAQM guidance, the impact of the increased emissions associated with the Proposed Development on annual mean NO_2 concentrations is considered to be **negligible**.

5.2.6. The local dispersion patterns for Elsenham and Stanstead Mountfitchet are shown in **Figure G-4**.

HOURLY MEAN NO_2 CONCENTRATIONS

5.2.7. The annual mean NO_2 concentrations predicted by the model were all below 60µg/m³, and therefore hourly mean NO_2 concentrations are unlikely to cause a breach of the hourly mean AQS objective. The impact of the Proposed Development on hourly mean NO_2 concentrations at existing sensitive receptors is considered to be **negligible**.

ANNUAL MEAN PM_{10} CONCENTRATIONS

5.2.8. The AQS objective for annual mean PM_{10} concentrations is a concentration of 40µg/m³. The results of the assessment show that in the 2019 baseline case concentrations at all of the receptors are predicted to easily meet the objective. The highest predicted baseline concentration is 22.0µg/m³ at R21 adjacent to the M11 and 19.2µg/m³ at R44 on Grove Hill, Stansted Mountfitchet. With the development in place these are 20.4µg/m³ at R21 and 18.8µg/m³ at R44. The highest deterioration due to the development of 0.2µg/m³ occurs at R44.

5.2.9. Predicted concentrations of PM_{10} are well below 50% of annual mean objective at all receptors in each of the modelled scenarios in 2027 and as such as all below the baseline modelled concentrations. The predicted changes in annual mean PM_{10} concentrations are all <0.7% of the relevant AQS objective. Therefore, based on the EPUK/IAQM guidance, the impact of the increased emissions associated with the Proposed Development on annual mean PM_{10} concentrations is considered to be **negligible**.

DAILY MEAN PM_{10} CONCENTRATIONS

5.2.10. The AQS objective for daily mean PM_{10} concentrations is 50µg/m³ to be exceeded no more than 35 times a year. No daily mean PM_{10} concentration predicted 50µg/m³ in the baseline assessment year and therefore the objective is not exceeded at any of the sensitive receptors.

5.2.11. In assessment year 2027, the increased emissions associated with the Proposed Development do not result in no changes to the number of days experiencing concentrations greater than 50µg/m³ and the impact on daily mean PM_{10} concentrations is thus also considered to be **negligible**.

ANNUAL MEAN $PM_{2.5}$ CONCENTRATIONS

5.2.12. The AQS objective for annual mean $PM_{2.5}$ concentrations is a concentration of 20µg/m³. The results of the assessment show that in the 2019 baseline case concentrations at all of the receptors are predicted to easily meet the objective. The highest predicted baseline concentrations are 12.2µg/m³ at R21 adjacent to the M11 and 11.4µg/m³ at R44 on Grove Hill, Stansted Mountfitchet. With the development in place these are 10.9µg/m³ at R21 and 10.7µg/m³ at R44. The highest deterioration due to the development is 0.2µg/m³ at R44.

5.2.13. Predicted concentrations of $PM_{2.5}$ are under 55% of annual mean objective at all receptors in each of the modelled scenarios in 2027 and as such as all below the baseline modelled concentrations. The predicted changes in annual mean PM_{10} concentrations are all <0.5% of the relevant AQS objective. Therefore, based on the EPUK/IAQM guidance, the impact of the increased emissions associated with the Proposed Development on annual mean $PM_{2.5}$ concentrations is considered to be **negligible**.

EXPOSURE OF FUTURE RESIDENTS

5.2.14. At the Application Site, the highest predicted annual mean NO_2 concentration is 10.1µg/m³ (Do-Something) at P5 in the approved Phase 1 development Elsenham whilst the highest predicted annual mean PM_{10} concentration is 15.0µg/m³ at P9 and P13 and with no day exceeding 50µg/m³. The highest predicted $PM_{2.5}$ concentration is 9.0µg/m³ predicted at P9 and P10. Therefore, all predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ are all below the relevant objectives at all proposed receptors located at the Application Site in 2027

DESIGNATED SITES

5.2.15. Results for the Elsehnam Woods SSSI are summarised as follows:

- The CLe for annual mean NO_x concentrations for the protection of vegetation and ecosystems is 30.0µg/m³. The maximum predicted concentration at the Elsenham Woods SSSI in the base year 2019 was 29.9µg/m³ and in 2027 22.5µg/m³. at 10m from the roadside. The Proposed Development will add 0.15µg/m³ to the Do-Minimum predicted concentration which is an increase of 0.51%. The addition of the Countryside development adds a further 0.35% to the change in NO_x CLe.

- The CLe for annual mean NH_3 concentrations for the protection of vegetation and ecosystems is 1.0µg/m³ due to the presence of lichens and bryophytes as described on APIS. The maximum predicted concentration at the Elsenham Woods SSSI in the base year 2019 was 2.54µg/m³ and in 2027 2.69µg/m³, with the cumulative dispersion isopleths shown in **Figure G-5**. The Proposed Development will add 0.02µg/m³ to the Do-Minimum predicted concentration which is an increase of 2.06%. All predictions are in excess of the CLe (with and without the Proposed Development) and increases of greater than 1% is predicted up to 20m from the site boundary. The cumulative addition of the Countryside development adds a further 1.45% to the change in NH_3 concentrations and increases the distance of impacts >1% up to 40m from the habitat boundary. The cumulative dispersion isopleths for the percentage change are shown in **Figure G-6**.

- The lower CLo for N deposition for the protection of vegetation and ecosystems is 15 kg N/ha/yr. The maximum predicted rate of deposition at the Elsenham Woods SSSI in the base year 2019 was 37.87 kg N/ha/yr and in 2027 35.59 kg N/ha/yr at 10m from the roadside. The cumulative dispersion isopleths for the rate of nutrient nitrogen deposition are shown in **Figure G-7**. At 10m from the roadside, the Proposed Development will add 0.18 kg N/ha/yr to the Do-Minimum predicted concentration which is an increase of 1.22%. The cumulative addition of the Countryside development adds a further 0.85% to the change in N deposition lower CLo and increases the distance of impacts >1% up to 20m from the site boundary. The cumulative dispersion isopleths for the percentage change in nutrient nitrogen deposition are shown in **Figure G-8**.

5.2.16. The results show that the NO_x CLe will not be exceeded in 2027 and the Proposed Development will not cause an increase of more than 1% in any part of the SSSI. However, CLe for NH_3 and CLo for N deposition will be exceeded in 2027 without the Proposed Development which indicates that the site may already be degraded. As increases caused by the Proposed Development are predicted to exceed 1%, the overall impacts cannot definitively be described as not significant on the basis of the air quality assessment results. Whilst these predicted impacts have taken account of the predicted changes to APIS backgrounds due to the JNCC Nitrogen Futures predictions and the dispersion modelling outputs from this assessment, the contribution to NO_x concentrations and rates of N deposition from Stansted Airport cannot be included. Further assessment by an ecologist is therefore required to provide a qualified judgement as to the significance of these impacts.

6. MITIGATION AND RESIDUAL EFFECTS

6.1. CONSTRUCTION PHASE

6.1.1. Based on the assessment results, and in line with best practice, mitigation of construction phase emissions will be required. The IAQM Construction Guidance states that for almost all construction activity, the aim should be to prevent significant effects on receptors thought the use of effective mitigation. Experience shows that this is normally. Hence the residual effect will normally always be no significant on the assumption that mitigation measures are applied robustly.

6.1.2. The IAQM Construction Guidance provides a summary of recommended mitigation measures commensurate to the risk of impacts which can be broadly categorised into measures relating to:

- General communication
- General dust management
- Site management
- Monitoring
- Preparing and maintaining the site
- Operating vehicle/machinery and sustainable travel
- General operations
- Waste management
- Specific measures relating to demolition, earthworks, construction activities and trackout.

6.1.3. These measures are summarised in **Appendix F**.

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

RESIDUAL EFFECTS

6.1.5. The residual effects of dust and PM_{10} generated by construction activities following the application of the mitigation measures described above and good site practice is considered to be **negligible**.

6.1.6. The residual effects of emissions to air from construction vehicles and plant on local air quality is considered to be **negligible**.

6.2. OPERATIONAL PHASE

MITIGATION

6.2.1. In the context of human health impacts, the change in pollutant concentrations attributable to traffic emissions associated with the operation phase of the Proposed Development (i.e. impacts on local air quality) are negligible and therefore do not warrant specific mitigation.

6.2.2. The IAQM Planning Guidance also provides several principles of good practice which should be applied to all developments covering both emissions and exposure and address both in the design and operational phases. These could include:

- New developments should not contravene the Council's Air Quality Action Plan, or render any of the measures unworkable
- Wherever possible, new developments should not create a new "street canyon", or a building configuration that inhibits effective pollution dispersion
- Delivering sustainable development should be the key theme of any application
- New development should be designed to minimise public exposure to pollution sources, e.g. by locating habitable rooms away from busy roads, or directing combustion generated pollutants through well sited vents or chimney stacks
- The provision of at least 1 Electric Vehicle (EV) "rapid charge" point per 10 residential dwellings and/or 1,000m^2 of commercial floorspace. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made
- Where development generates significant additional traffic, provision of a detailed travel plan (with provision to measure its implementation and effect) which sets out measures to encourage sustainable means of transport (public, cycling and walking) via subsidised or free-ticketing, improved links to bus stops, improved infrastructure and layouts to improve accessibility and safety.

6.2.3. For the Elsenham Woods SSSI, it is not possible to rule out significant effects because exceedances of the screening thresholds for ambient NH_3 and N deposition are predicted. The results presented in this report provide an indication as to the specific proportion of the impact attributable to the Proposed Development in comparison to other committed and non-committed developments. Appropriate and proportionate mitigation measures should be agreed with Natural England but will likely include a financial contribution to the management of the SSSI woodland as described in the Ecological Assessment[26].

RESIDUAL EFFECTS

6.2.4. The Proposed Development is predicted to cause negligible increases in local NO_2, PM_{10} and $PM_{2.5}$ concentrations. These increases will be reduced by the implementation of commensurate mitigation. However, at all locations pollutant concentrations are predicted to meet the statutory objectives for human health both with and without the Proposed Development.

6.2.5. The residual effects of the Proposed Development on air quality are **negligible** for NO_2, PM_{10} and $PM_{2.5}$ according to the EPUK assessment criteria.

6.2.6. The mitigation of impacts to the Elsenham Woods SSSI will ensure a favourable condition is maintained as a whole with potential measures such as planting and screening where possible and other measures to minimise pollutants. Once this mitigation is agreed it is considered that the development will result in a **not significant** residual impact on the Elsenham Wood SSSI.

[26] SES (2022). Ecological Assessment. Land East of Elsenham Station. September 2022.

7. CONCLUSIONS

7.1.1. A qualitative assessment of the potential impacts on local air quality from construction activities has been carried out for this phase of the Proposed Development using the IAQM methodology. This identified that there is a medium risk of dust soiling impacts and a low risk of human health impacts from increases in particulate matter concentrations due to construction activities. However, through good site practice and the implementation of suitable mitigation measures, the effect of dust and PM_{10} releases would be significantly reduced. The residual effects of dust and PM_{10} generated by construction activities on air quality are therefore considered to be **not significant**. The residual effects of emissions to air from construction vehicles and plant on local air quality is considered to be **not significant**.

7.1.2. A quantitative assessment of the potential human health impacts during the operational phase was undertaken using ADMS Roads to predict the changes in NO_2, PM_{10} and $PM_{2.5}$ concentrations that would occur due to traffic generated by the Proposed Development. The methodology was approved by UDC. To provide a precautionary assessment, it was assumed that all committed and non-committed development in the area will be fully built out in 5 years. As approval and full build-out of all committed and non-committed development is unlikely to occur, traffic flows are overestimated and are therefore considered to be precautionary.

7.1.3. The results show that the Proposed Development would cause a small increase in ambient NO_2, PM_{10}. and $PM_{2.5}$ concentrations but would not cause any exceedances of the statutory objectives. All impacts on human health are judged as **negligible** and **not significant** based on the magnitude of predicted increases. It is therefore judged that the development proposals comply with the NPPF and Policy ENV13 – Exposure to Poor Air Quality of the UDC Adopted Local Plan on the basis of human health.

7.1.4. ADMS-Roads was also used to assess impacts to ecological sites and against the critical level, load and 1% change screening criterion. For ambient NO_x the critical level and screening criterion are not met which indicates that the impact is not likely to be significant. However, the critical level and load for NH_3 and N deposition will be met without the Proposed Development which indicates that the site may already be degraded. Furthermore, increases caused by the Proposed Development are predicted to exceed 1% alone and in combination with other committed development. On this basis a significant effect cannot be ruled out. A judgement of the significance of the ecological impacts of the Proposed Development and requirement for mitigation is provided the Ecological Assessment. This assessment concludes that with the implementation of mitigation underpinned by a financial contribution, the residual effect would be **not significant**.

Appendix A

GLOSSARY

APPENDIX A - GLOSSARY

Table A1 - Glossary

Term	Definition
AADT Annual Average Daily Traffic	A daily total traffic flow (24 hrs), expressed as a mean daily flow across all 365 days of the year.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year.
AQMA	Air Quality Management Area.
Conservative	Tending to over-predict the impact rather than under-predict.
Data capture	The percentage of all the possible measurements for a given period that were validly measured.
DEFRA	Department for Environment, Food and Rural Affairs.
DfT	Department for Transport.
Dust	Dust comprises particles typically in the size range 1-75 micrometres (μm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials.
Emission rate	The quantity of a pollutant released from a source over a given period of time.
Exceedance	A period of time where the concentration of a pollutant is greater than the appropriate air quality standard.
HDV/HGV	Heavy Duty Vehicle/Heavy Goods Vehicle.
LAQM	Local Air Quality Management.
Minor roads	Non A-roads or Motorways.
Model adjustment	Following model verification, the process by which modelled results are amended. This corrects for systematic error.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 micrometres.

Term	Definition
Ratification (Monitoring)	Involves a critical review of all information relating to a data set, in order to amend or reject the data. When the data have been ratified they represent the final data to be used (see also validation).
Road link	A length of road which is considered to have the same flow of traffic along it. Usually, a link is the road from one junction to the next.
Trackout	The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction / demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site.
$\mu g/m^3$ microgrammes per cubic metre	A measure of concentration in terms of mass per unit volume. A concentration of $1ug/m^3$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
Uncertainty	A measure, associated with the result of a measurement, which characterizes the range of values within which the true value is expected to lie. Uncertainty is usually expressed as the range within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more clearly defined than the closely related parameter 'accuracy', and has replaced it on recent European legislation.
Validation (modelling)	Refers to the general comparison of modelled results against monitoring data carried out by model developers.
Validation (monitoring)	Screening monitoring data by visual examination to check for spurious and unusual measurements (see also ratification).
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.

Appendix B

IAQM CONSTRUCTION ASSESSMENT METHODOLOGY

APPENDIX B – CONSTRUCTION DUST ASSESSMENT

STEP 1 – SCREENING THE NEED FOR A DETAILED ASSESSMENT

An assessment will normally be required where there are:

- 'Human receptors' within 350m of the site boundary; or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s); and/or
- 'Ecological receptors' within 50m of the site boundary; or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is "negligible".

STEP 2A – DEFINE THE POTENTIAL DUST EMISSION MAGNITUDE

The following are examples of how the potential dust emission magnitude for different activities can be defined. (Note that not all the criteria need to be met for a particular class). Other criteria may be used if justified in the assessment.

Table B1: Definitions of Dust Emission Magnitudes

Dust Emission Magnitude	Activity
Large	Demolition >50,000m^3 building demolished, dusty material (e.g. concrete), on-site crushing/screening, demolition >20m above ground level
	Earthworks >10,000m^2 site area, dusty soil type (e.g. clay), >10 earth moving vehicles active simultaneously, >8m high bunds formed, >100,000 tonnes material moved
	Construction >100,000m^3 building volume, on site concrete batching, sandblasting
	Trackout >50 HDVs out / day, dusty surface material (e.g. clay), >100m unpaved roads
Medium	Demolition 20,000 - 50,000m^3 building demolished, dusty material (e.g. concrete) 10-20m above ground level
	Earthworks 2,500 - 10,000m^2 site area, moderately dusty soil (e.g. silt), 5-10 earth moving vehicles active simultaneously, 4m - 8m high bunds, 20,000 -100,000 tonnes material moved
	Construction 25,000 - 100,000m^3 building volume, dusty material e.g. concrete, on site concrete batching

Dust Emission Magnitude	Activity
	Trackout 10 - 50 HDVs out / day, moderately dusty surface material (e.g. clay), 50 -100m unpaved roads
Small	Demolition <20,000m^3 building demolished, non-dusty material (e.g metal cladding), <10m above ground level, work during wetter months
	Earthworks <2,500m^2 site area, soil with large grain size (e.g. sand), <5 earth moving vehicles active simultaneously, <4m high bunds, <20,000 tonnes material moved, earthworks during wetter months
	Construction <25,000m^3, non-dusty material (e.g. metal cladding or timber)
	Trackout <10 HDVs out / day, non-dusty soil, < 50m unpaved roads

STEP 2B – DEFINE THE SENSITIVITY OF THE AREA

The tables below present the IAQM assessment methodology to determine the sensitivity of the area to dust soiling, human health and ecological impacts respectively. The IAQM guidance provides guidance to allow the sensitivity of individual receptors to dust soiling and health effects to assist in the assessment of the overall sensitivity of the study area.

Table B2: Sensitivity of the Area to Dust Soiling Effects

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table B3: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration ($\mu g/m^3$)	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table B4: Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Sources (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

STEP 2C – DEFINE THE RISK OF IMPACTS

The dust emissions magnitude determined at Step 2A should be combined with the sensitivity of the area determined at Step 2B to determine the risk of impacts without mitigation applied. For those cases where the risk category is 'negligible' no mitigation measures beyond those required by legislation will be required.

Table B5: Risk of Dust Impacts

Sensitivity of surrounding area	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible
Earthworks and Construction			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Trackout			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

STEP 3 –SITE SPECIFIC MITIGATION

Having determined the risk categories for each of the four activities it is possible to determine the site-specific measures to be adopted. These measures will be related to whether the site is considered to be a low, medium or high-risk site. The IAQM guidance details the mitigation measures required for high, medium and low risk sites as determined in Step 2C.

STEP 4 – DETERMINE SIGNIFICANT EFFECTS

Once the risk of dust impacts has been determined in Step 2C and the appropriate dust mitigation measures identified in Step 3, the final step is to determine whether there are significant effects arising from the construction phase. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effect will normally be negligible.

Appendix C

DISPERSION MODELLING METHODOLOGY

APPENDIX C – DISPERSION MODELLING METHODOLOGY

INTRODUCTION

Air pollution in urban areas is dominated by emissions from road vehicles. The main pollutants of concern from road traffic are oxides of nitrogen (NO_x/NO_2) and fine particulate matter (PM_{10} & $PM_{2.5}$), since these pollutants are most likely to approach their relevant air quality limit values in proximity to major road links.

The introduction of the Proposed Development has the potential to change the total flow, distribution and characteristics of traffic movements on the affected road links, which would result in changes to emissions of the aforementioned pollutants. The local air quality assessment was completed to predict the potential impacts of these changes on ambient pollutant concentrations at identified sensitive receptors within proximity to affected roads.

The air quality conditions were described for the base year (2019), assessment year without development (2027) and opening year with development (2027). The assessment year was selected as that 5-years from the present year 2022.

The changes in local traffic related pollution levels predicted at the receptor locations were assessed by comparing the predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ with the current air quality objectives and considering the change (improvement or worsening) between the 'without' and 'with' development scenarios.

ATMOSPHERIC DISPERSION MODEL SELECTION

The predicted impacts on local air quality associated with changes to vehicle emissions as a result of the operation of the scheme were assessed using Cambridge Environmental Research Consultants (CERC) atmospheric dispersion modelling system for roads (ADMS-Roads v5.0).

ADMS-Roads applies advanced algorithms for the height-dependence of wind speed, turbulence and stability to produce improved predictions of air pollutant concentrations within the given model domain. It can predict long-term and short-term concentrations, as well as calculations of percentile concentrations.

ADMS-Roads is a validated model, developed in the UK by CERC. The model validation process includes comparisons with data from the UK's Automatic Urban Rural Network (AURN) and specific verification exercises using standard field, laboratory and numerical data sets. CERC is also involved in European programmes on model harmonisation, and their models were compared favourably against other EU and U.S. EPA systems. Further information in relation to this is available from the CERC web site at http://www.cerc.co.uk/environmental-software/model-validation.html.

ATMOSPHERIC DISPERSION MODELLING PROCESS

The procedures involved in undertaking the dispersion modelling assessment are outlined below:

- Collation of input data – traffic data (flows, speeds, percentage of Heavy-Duty Vehicles (HDVs)), road network mapping, sensitive receptor coordinates and meteorological data
- Input of data in to the ADMS-Roads model for the scenarios to be modelled

- Development of emissions inventories for each pollutant to be assessed, using DEFRA's emission factor toolkit (EFT v11.0)
- Running the ADMS-Roads model for each considered scenario
- Conversion of modelled NO_X concentrations to NO_2 concentrations using DEFRA's NO_x-NO_2 calculator v8.1
- Verification and adjustment of modelled road-NO_x contributions from the assessed road network through analysing the ADMS-Roads modelled road-NO_x outputs versus scheme specific monitored road-NOx for the base year scenario (2019)
- Comparison of predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations at all receptors to the relevant air quality objectives in each scenario
- Analysis of changes in pollutant concentrations between the 'without development' and 'with development' scenarios to assess the significance of impacts associated with the Proposed Development on local air quality
- The significance or otherwise of impacts is determined with refence to the EPUK & IAQM guidance document *Land-Use Planning & Development Control: Planning for Air Quality* [15].

TRAFFIC DATA

Traffic data were provided by the WSP Transport Planning team. The traffic data were flow data comprising Annual Average Daily Traffic (AADT) flows, traffic composition (percentage HDVs) and average link speeds (km/h) for the assessed road network. The WSP Transport Planning team provided traffic speeds on approach to and progress through junctions (i.e. lower speeds on approach and progress through junctions) and therefore no assumptions needed to be made within the assessment.

Queue lengths were provided for the following six locations and was applied to the AM and PM peaks only;

- The B1383/B1051 (Chapel Hill)/ Bentfield Road Junction
- The roundabout connecting Lower Street, Mountfitchet Castle Street, Church Road and the B1051 (Chapel Hill)
- The Junction on the B1051 (Lower Street) leading to the B1051 (Grove Hill)
- The Henham Road, Hall Road and the B1051 (High Street) junction in Elsenham.
- The Parsonage Road Roundabout
- The double mini roundabout connecting Station Road, the B1051 and Robin Hood Road

The queuing data provided by the WSP Transport Planning Team allowed for higher accuracy within the model. The majority of the data indicated that longer queue lengths were experienced at all junctions within the PM period.

Peak Flows
Peak and trough flows for the standard time periods outlined in LA105, formerly the DMRB Interim Advice Note 185/15[27] were obtained from the WSP Transport Planning Team. The time periods requested were

- AM 7am - 10am
- IP 10am - 16pm
- PM 16pm - 19pm
- OP 19pm - 7am

The peak flow datasets were used to create time varying data files and emissions were calculated for each time period per road length using the latest version of Defra's Emission Factor Toolkit.

Committed Development

Committed development included within the traffic data are as follows:

- Land to Western of Henham Road. A development consisting of 350 residential units and a primary school including an early years and childcare facility for 56 children. (UTT/17/3573/OP (approved under appeal reference APP/C1570/W/19/3243744)
- Land West of Hall Road. A development comprising 130 dwellings (UTT/19/0462/FUL).
- Land West of Isabel Drive. A development comprising 99 dwellings (UTT/19/2470/OP)
- Land South of Rush Lane. A development in South Elsenham comprising 40 dwellings (UTT/19/0437/OP)

The following committed developments have also been included in the assessment at the request of ECC;

- West of Parsonage Road (UTT/19/0393 – Status approved (appeal allowed))
- Land East of Parsonage Road (UTT/19/0394) – Status approved (appeal allowed))
- Garnetts (West of) – (UTT/21/3311 – Awaiting decision)
- Land East of Parsonage Road, Takeley – (UTT/21/2488/ - Awaiting decision)
- South of Verson's Close, Henham – (UTT/20/0604 - Status approved (appeal allowed))

Full traffic data is provided in **Tables C1 –C3** overleaf. The data in Table C1 that ***include*** the Countryside Development were used for the general assessment of impacts on human health objectives and for the assessment of impacts on Elsenham Woods SSSI. The data in Table C2 that ***exclude*** the Countryside Development were used to determine the exact contributions of the Proposed Development and the Countryside development to the impacts on Elsenham Woods SSSI.

[27] Highways England (2020) HE-DMRB-SE LA 105 Air quality (formerly HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13, part of IAN 185/15)

Table C1 – Development Traffic Flows including the Countryside Development

Road Link	Speed (kph)	Queue Length (m)	Gradient (%)	2019 Baseline		2027 Do-Minimum Sensitivity		2027 Do-Something Sensitivity	
				AADT	HDV%	AADT	HDV%	AADT	HDV%
1_19_OP_N_2	5	-	0	6,591	0.30	8,199	0.25	8,577	0.24
2_19_OP_N_2	5	-	0	6,591	0.30	8,199	0.25	8,577	0.24
3_19_OP_N_2	5	-	0	6,591	0.30	8,199	0.25	8,577	0.24
4_17_OP_N_2	16	-	0	8,770	0.63	10,873	0.53	11,399	0.51
5_18_OP_N_2	33.6	-	0	6,668	0.95	7,312	0.90	7,440	0.89
6_18_OP_N_1	54.4	-	0	6,668	0.95	7,312	0.90	7,440	0.89
7_7_OP_N_1	112	-	0.84	35,804	17.38	38,618	17.38	38,618	17.38
8_8_OP_N_1	112	-	0.99	32,758	16.73	35,333	16.73	35,333	16.73
9_11_OP_N_1	40	-	0.67	3,642	1.21	4,067	1.13	4,155	1.11
10_10_OP_N_1	51.2	-	0.43	5,841	0.71	7,939	0.54	8,562	0.50
11_11_OP_N_1	51.2	-	1.43	3,642	1.21	4,067	1.13	4,155	1.11
12_8_OP_N_1	51.2	-	0.79	6,201	3.65	7,768	3.03	7,930	2.97
13_8_OP_N_1	51.2	-	0.18	6,201	3.65	7,768	3.03	7,930	2.97
14_15_OP_N_2	16	-	0	5,556	0.55	7,551	0.42	8,087	0.40
15_20_OP_N_2	5	-	1.72	12,247	1.31	12,752	1.31	12,752	1.31
16_20_OP_N_1	41.6	-	1.11	12,247	1.31	12,752	1.31	12,752	1.31
17_16_OP_N_1	16	-	1.75	3,480	0.63	3,647	0.62	3,658	0.62

Road Link	Speed (kph)	Queue Length (m)	Gradient (%)	2019 Baseline		2027 Do-Minimum Sensitivity		2027 Do-Something Sensitivity	
				AADT	HDV%	AADT	HDV%	AADT	HDV%
18_16_OP_N_1	48	-	2.45	3,480	0.63	3,647	0.62	3,658	0.62
19_16_OP_N_1	48	-	0.35	3,480	0.63	3,647	0.62	3,658	0.62
20_20_OP_N_1	41.6	-	1.77	12,247	1.31	12,752	1.31	12,752	1.31
21_3_OP_N_1	54.4	-	0.71	3,384	0.81	3,693	0.78	3,718	0.77
22_21_OP_N_1	44.8	-	0	16,999	1.11	18,990	1.03	19,349	1.01
23_21_OP_N_1	16	-	0	16,999	1.11	18,990	1.03	19,349	1.01
24_11_OP_N_1	40	-	0.86	3,642	1.21	4,067	1.13	4,155	1.11
25_15_OP_N_1	48	-	0.59	5,556	0.55	7,551	0.42	8,087	0.40
26_10_OP_N_1	54.4	-	0	5,841	0.71	7,939	0.54	8,562	0.50
27_27_OP_N_1	54.4	-	0	947	0.53	1,875	0.28	2,213	0.23
28_6_OP_N_1	54.4	-	1.89	3,453	1.12	4,914	0.82	5,252	0.76
29_18_OP_N_1	54.4	-	0.21	6,668	0.95	7,312	0.90	7,440	0.89
30_19_OP_N_1	33.6	-	0	6,591	0.30	8,199	0.25	8,577	0.24
31_20_OP_N_1	5	-	0.67	12,247	1.31	12,752	1.31	12,752	1.31
32_17_OP_N_2	16	-	11.29	8,770	0.63	10,873	0.53	11,399	0.51
33_18_OP_N_2	5	-	0	6,668	0.95	7,312	0.90	7,440	0.89
34_16_OP_N_1	16	-	0	3,480	0.63	3,647	0.62	3,658	0.62
35_12_OP_N_2	16	-	0	5,602	1.19	7,551	0.92	8,087	0.86

Road Link	Speed (kph)	Queue Length (m)	Gradient (%)	2019 Baseline		2027 Do-Minimum Sensitivity		2027 Do-Something Sensitivity	
				AADT	HDV%	AADT	HDV%	AADT	HDV%
36_10_OP_N_2	16	-	0	5,841	0.71	7,939	0.54	8,562	0.50
37_5_OP_N_1	54.4	-	0	3,384	0.81	5,836	0.49	6,797	0.42
38_28_OP_N_2	16	-	0	3,070	0.16	3,626	0.14	3,626	0.14
39_12_OP_N_1	43.2	-	0.86	5,602	1.19	7,551	0.92	8,087	0.86
40_11_OP_N_2	16	-	1.36	3,642	1.21	4,067	1.13	4,155	1.11
41_15_OP_N_2	16	-	0	5,556	0.55	7,551	0.42	8,087	0.40
42_15_OP_N_2	16	-	1.49	5,556	0.55	7,551	0.42	8,087	0.40
43_13_OP_N_1	40	-	0	0	0.00	193	0.00	272	0.00
44_15_OP_N_2	16	-	0	5,556	0.55	7,551	0.42	8,087	0.40
45_26_OP_N_2	5	-	2.96	4,261	0.12	5,728	0.09	6,086	0.09
46_22_OP_N_2	5	-	1.73	3,046	0.37	3,211	0.37	3,231	0.37
47_23_OP_N_2	16	-	0.69	1,774	0.00	1,888	0.00	1,908	0.00
48_30_OP_N_1	5	-	0	4,779	0.10	5,787	0.09	6,014	0.09
49_31_OP_N_1	5	-	0	922	0.00	982	0.00	993	0.00
50_32_OP_N_1	5	-	0	3,324	0.30	3,660	0.28	3,733	0.28
51_33_OP_N_1	5	-	0	3,170	0.16	4,015	0.13	4,230	0.12
52_29_OP_N_2	16	-	0	344	0.00	382	0.00	392	0.00
53_24_OP_N_2	16	-	1.36	1,071	0.00	1,313	0.00	1,313	0.00

Road Link	Speed (kph)	Queue Length (m)	Gradient (%)	2019 Baseline		2027 Do-Minimum Sensitivity		2027 Do-Something Sensitivity	
				AADT	HDV%	AADT	HDV%	AADT	HDV%
54_27_OP_N_2	16	-	11.36	947	0.53	1,875	0.28	2,213	0.23
55_19_OP_N_2	5	-	0	6,591	0.30	8,199	0.25	8,577	0.24
56_21_OP_N_1	44.8	-	0.53	16,999	1.11	18,990	1.03	19,349	1.01
57_18_OP_N_1	33.6	-	2.66	6,668	0.95	7,312	0.90	7,440	0.89
58_12_OP_N_1	43.2	-	0.37	5,602	1.19	7,551	0.92	8,087	0.86
59_12_OP_N_1	43.2	-	1.38	5,602	1.19	7,551	0.92	8,087	0.86
60_10_OP_N_1	54.4	-	0.59	5,841	0.71	7,939	0.54	8,562	0.50
61_3_OP_N_1	54.4	-	1.08	3,384	0.81	3,693	0.78	3,718	0.77
62_10_OP_N_1	54.4	-	0	5,841	0.71	7,939	0.54	8,562	0.50
63_11_OP_N_1	40	-	1.17	3,642	1.21	4,067	1.13	4,155	1.11
64_11_OP_N_1	40	-	0.25	3,642	1.21	4,067	1.13	4,155	1.11
65_20_OP_N_1	41.6	-	0.66	12,247	1.31	12,752	1.31	12,752	1.31
66_21_OP_N_1	44.8	-	0.21	16,999	1.11	18,990	1.03	19,349	1.01
28_7_OP_N_1	54.4	-	0.23	7,394	3.14	9,121	2.65	9,459	2.55
2_25_OP_N_2	5	-	5.89	2,113	0.24	2,240	0.23	2,260	0.23
38_6_OP_N_2	16	-	0	3,453	1.12	4,914	0.82	5,252	0.76
1_19_PM_N_4	5	-	0	6,591	0.30	8,199	0.25	8,577	0.24
2_19_PM_Q_4	5	-	0	6,591	0.30	8,199	0.25	8,577	0.24

Road Link	Speed (kph)	Queue Length (m)	Gradient (%)	2019 Baseline		2027 Do-Minimum Sensitivity		2027 Do-Something Sensitivity	
				AADT	HDV%	AADT	HDV%	AADT	HDV%
3_19_PM_Q_4	5	31	0	6,591	0.30	8,199	0.25	8,577	0.24
4_17_PM_Q_4	5	55	0	8,770	0.63	10,873	0.53	11,399	0.51
5Q_18_PM_Q_4	33.6	46	0	6,668	0.95	7,312	0.90	7,440	0.89
14_15_PM_Q_4	5	117	0	5,556	0.55	7,551	0.42	8,087	0.40
15Q_20_PM_Q_4	16	12	0	12,247	1.31	12,752	1.31	12,752	1.31
32_17_PM_Q_4	5	18	11.29	8,770	0.63	10,873	0.53	11,399	0.51
33_18_PM_Q_4	5	39	0	6,668	0.95	7,312	0.90	7,440	0.89
35Q_12_PM_Q_4	5	55	0	5,602	1.19	7,551	0.92	8,087	0.86
36Q_10_PM_Q_4	5	38	0	5,841	0.71	7,939	0.54	8,562	0.50
38_28_PM_Q_4	5	20	0	3,070	0.16	3,626	0.14	3,626	0.14
40_11_PM_N_4	5	32	3.11	3,642	1.21	4,067	1.13	4,155	1.11
41_15_PM_Q_4	5	-	0	5,556	0.55	7,551	0.42	8,087	0.40
42_15_PM_N_4	5	39	2.55	5,556	0.55	7,551	0.42	8,087	0.40
44_15_PM_Q_4	5	-	0	5,556	0.55	7,551	0.42	8,087	0.40
45_26_PM_Q_4	5	34	2.96	4,261	0.12	5,728	0.09	6,086	0.09
46Q_22_PM_Q_4	5	36	0	3,046	0.37	3,211	0.37	3,231	0.37

Road Link	Speed (kph)	Queue Length (m)	Gradient (%)	2019 Baseline		2027 Do-Minimum Sensitivity		2027 Do-Something Sensitivity	
				AADT	HDV%	AADT	HDV%	AADT	HDV%
47Q_23_PM_Q_4	5	24	0	1,774	0.00	1,888	0.00	1,908	0.00
52_29_PM_Q_4	5	7	0	344	0.00	382	0.00	392	0.00
53Q_24_PM_Q_4	5	14	7.33	1,071	0.00	1,313	0.00	1,313	0.00
54_27_PM_Q_4	5	18	11.36	947	0.53	1,875	0.28	2,213	0.23
55_19_PM_N_4	33.6	121	0	6,591	0.30	8,199	0.25	8,577	0.24
2_25_PM_Q_4	5	-	5.89	2,113	0.24	2,240	0.23	2,260	0.23
38Q_6_PM_Q_4	5	12	0	3,453	1.12	4,914	0.82	5,252	0.76
38_6_PM_N_4	5	67	0	3,453	1.12	4,914	0.82	5,252	0.76
53_24_PM_N_4	5	-	0	1,071	0.00	1,313	0.00	1,313	0.00
35_12_PM_N_4	5	-	0	5,602	1.19	7,551	0.92	8,087	0.86
36_10_PM_N_4	5	-	0	5,841	0.71	7,939	0.54	8,562	0.50
40Q_11_PM_Q_4	5	-	0	3,642	1.21	4,067	1.13	4,155	1.11
47_23_PM_N_4	16	120	0.83	1,774	0.00	1,888	0.00	1,908	0.00
55Q_19_PM_Q_4	5	-	0	6,591	0.30	8,199	0.25	8,577	0.24
42Q_15_PM_Q_4	5	28	0	5,556	0.55	7,551	0.42	8,087	0.40

Road Link	Speed (kph)	Queue Length (m)	Gradient (%)	2019 Baseline		2027 Do-Minimum Sensitivity		2027 Do-Something Sensitivity	
				AADT	HDV%	AADT	HDV%	AADT	HDV%
46_22_PM_N_4	5	137	2.19	3,046	0.37	3,211	0.37	3,231	0.37
15_20_PM_N_4	5	-	2.17	12,247	1.31	12,752	1.31	12,752	1.31
1Q_19_AM_Q_3	5	-	0	6,591	0.30	8,199	0.25	8,577	0.24
2_19_AM_Q_3	5	16	0	6,591	0.30	8,199	0.25	8,577	0.24
3_19_AM_Q_3	5	31	0	6,591	0.30	8,199	0.25	8,577	0.24
4_17_AM_Q_3	5	55	0	8,770	0.63	10,873	0.53	11,399	0.51
5Q_18_AM_Q_3	33.6	40	0	6,668	0.95	7,312	0.90	7,440	0.89
14_15_AM_Q_3	5	117	0	5,556	0.55	7,551	0.42	8,087	0.40
15Q_20_AM_Q_3	5	23	0	12,247	1.31	12,752	1.31	12,752	1.31
32_17_AM_Q_3	5	18	11.29	8,770	0.63	10,873	0.53	11,399	0.51
33_18_AM_Q_3	5	39	0	6,668	0.95	7,312	0.90	7,440	0.89
35Q_12_AM_Q_3	5	58	0	5,602	1.19	7,551	0.92	8,087	0.86
36_10_AM_Q_3	5	74	0	5,841	0.71	7,939	0.54	8,562	0.50
38_28_AM_Q_3	5	20	0	3,070	0.16	3,626	0.14	3,626	0.14
40_11_AM_N_3	5	41	2.44	3,642	1.21	4,067	1.13	4,155	1.11
41_15_AM_Q_3	5	-	0	5,556	0.55	7,551	0.42	8,087	0.40

Road Link	Speed (kph)	Queue Length (m)	Gradient (%)	2019 Baseline		2027 Do-Minimum Sensitivity		2027 Do-Something Sensitivity	
				AADT	HDV%	AADT	HDV%	AADT	HDV%
42_15_AM_Q_3	5	67	1.49	5,556	0.55	7,551	0.42	8,087	0.40
44_15_AM_Q_3	5	47	0	5,556	0.55	7,551	0.42	8,087	0.40
45_26_AM_Q_3	5	34	2.96	4,261	0.12	5,728	0.09	6,086	0.09
46Q_22_AM_Q_3	5	36	0	3,046	0.37	3,211	0.37	3,231	0.37
52_29_AM_Q_3	5	7	0	344	0.00	382	0.00	392	0.00
53Q_24_AM_Q_3	5	23	4.4	1,071	0.00	1,313	0.00	1,313	0.00
54_27_AM_Q_3	5	18	11.36	947	0.53	1,875	0.28	2,213	0.23
55_19_AM_N_3	33.6	133	0	6,591	0.30	8,199	0.25	8,577	0.24
2_25_AM_Q_3	5	-	5.89	2,113	0.24	2,240	0.23	2,260	0.23
38Q_6_AM_Q_3	5	12	0	3,453	1.12	4,914	0.82	5,252	0.76
1_19_AM_N_3	33.6	141	0	6,591	0.30	8,199	0.25	8,577	0.24
46_22_AM_N_3	5	-	2.19	3,046	0.37	3,211	0.37	3,231	0.37
15_20_AM_N_3	5	-	2.87	12,247	1.31	12,752	1.31	12,752	1.31
47_23_AM_N_3	16	-	0.76	1,774	0.00	1,888	0.00	1,908	0.00
55Q_19_AM_N_3	5	-	0	6,591	0.30	8,199	0.25	8,577	0.24
35_12_AM_N_3	5	25	0	5,602	1.19	7,551	0.92	8,087	0.86

Road Link	Speed (kph)	Queue Length (m)	Gradient (%)	2019 Baseline		2027 Do-Minimum Sensitivity		2027 Do-Something Sensitivity	
				AADT	HDV%	AADT	HDV%	AADT	HDV%
53_24_AM_N_3	5	-	0	1,071	0.00	1,313	0.00	1,313	0.00
40Q_11_AM_Q _3	5	-	0	3,642	1.21	4,067	1.13	4,155	1.11
38_6_AM_N_3	5	67	0	3,453	1.12	4,914	0.82	5,252	0.76
4_67_OP_N_1	24	-	2.46	0	0.00	1,722	0.00	2,708	0.00
4_67_OP_N_1	24	-	0.74	0	0.00	1,722	0.00	2,708	0.00
4_67_OP_N_1	24	-	0	0	0.00	1,722	0.00	2,708	0.00
4_67_OP_N_1	24	-	0	0	0.00	1,722	0.00	2,708	0.00

Table C2 – Development Traffic Flows excluding the Countryside Development

Road Link	Speed (kph)	Queue Length (m)	Gradient (%)	2019 Baseline		2027 Do-Minimum		2027 Do-Something	
				AADT	HDV%	AADT	HDV%	AADT	HDV%
1_19_OP_N_2	5	-	0	6,591	0.30	7,926	0.26	8,304	0.25
2_19_OP_N_2	5	-	0	6,591	0.30	7,926	0.26	8,304	0.25
3_19_OP_N_2	5	-	0	6,591	0.30	7,926	0.26	8,304	0.25
4_17_OP_N_2	16	-	0	8,770	0.63	10,601	0.54	11,127	0.52
5_18_OP_N_2	33.6	-	0	6,668	0.95	7,312	0.90	7,440	0.89
6_18_OP_N_1	54.4	-	0	6,668	0.95	7,312	0.90	7,440	0.89
7_7_OP_N_1	112	-	0.84	35,804	17.38	38,618	17.38	38,618	17.38
8_8_OP_N_1	112	-	0.99	32,758	16.73	35,333	16.73	35,333	16.73
9_11_OP_N_1	40	-	0.67	3,642	1.21	4,034	1.14	4,121	1.12
10_10_OP_N_1	51.2	-	0.43	5,841	0.71	7,633	0.56	8,256	0.52
11_11_OP_N_1	51.2	-	1.43	3,642	1.21	4,034	1.14	4,121	1.12
12_8_OP_N_1	51.2	-	0.79	6,201	3.65	7,658	3.08	7,820	3.01
13_8_OP_N_1	51.2	-	0.18	6,201	3.65	7,658	3.08	7,820	3.01
14_15_OP_N_2	16	-	0	5,556	0.55	7,278	0.44	7,814	0.41
15_20_OP_N_2	5	-	1.72	12,247	1.31	12,752	1.31	12,752	1.31
16_20_OP_N_1	41.6	-	1.11	12,247	1.31	12,752	1.31	12,752	1.31
17_16_OP_N_1	16	-	1.75	3,480	0.63	3,647	0.62	3,658	0.62

Road Link	Speed (kph)	Queue Length (m)	Gradient (%)	2019 Baseline		2027 Do-Minimum		2027 Do-Something	
				AADT	HDV%	AADT	HDV%	AADT	HDV%
18_16_OP_N_1	48	-	2.45	3,480	0.63	3,647	0.62	3,658	0.62
19_16_OP_N_1	48	-	0.35	3,480	0.63	3,647	0.62	3,658	0.62
20_20_OP_N_1	41.6	-	1.77	12,247	1.31	12,752	1.31	12,752	1.31
21_3_OP_N_1	54.4	-	0.71	3,384	0.81	3,655	0.78	3,680	0.78
22_21_OP_N_1	44.8	-	0	16,999	1.11	18,718	1.05	19,076	1.03
23_21_OP_N_1	16	-	0	16,999	1.11	18,718	1.05	19,076	1.03
24_11_OP_N_1	40	-	0.86	3,642	1.21	4,034	1.14	4,121	1.12
25_15_OP_N_1	48	-	0.59	5,556	0.55	7,278	0.44	7,814	0.41
26_10_OP_N_1	54.4	-	0	5,841	0.71	7,633	0.56	8,256	0.52
27_27_OP_N_1	54.4	-	0	947	0.53	1,636	0.32	1,974	0.26
28_6_OP_N_1	54.4	-	1.89	3,453	1.12	4,674	0.86	5,012	0.80
29_18_OP_N_1	54.4	-	0.21	6,668	0.95	7,312	0.90	7,440	0.89
30_19_OP_N_1	33.6	-	0	6,591	0.30	7,926	0.26	8,304	0.25
31_20_OP_N_1	5	-	0.67	12,247	1.31	12,752	1.31	12,752	1.31
32_17_OP_N_2	16	-	11.29	8,770	0.63	10,601	0.54	11,127	0.52
33_18_OP_N_2	5	-	0	6,668	0.95	7,312	0.90	7,440	0.89
34_16_OP_N_1	16	-	0	3,480	0.63	3,647	0.62	3,658	0.62
35_12_OP_N_2	16	-	0	5,602	1.19	7,278	0.95	7,814	0.89

Road Link	Speed (kph)	Queue Length (m)	Gradient (%)	2019 Baseline		2027 Do-Minimum		2027 Do-Something	
				AADT	HDV%	AADT	HDV%	AADT	HDV%
36_10_OP_N_2	16	-	0	5,841	0.71	7,633	0.56	8,256	0.52
37_5_OP_N_1	54.4	-	0	3,384	0.81	5,291	0.54	6,252	0.46
38_28_OP_N_2	16	-	0	3,070	0.16	3,626	0.14	3,626	0.14
39_12_OP_N_1	43.2	-	0.86	5,602	1.19	7,278	0.95	7,814	0.89
40_11_OP_N_2	16	-	1.36	3,642	1.21	4,034	1.14	4,121	1.12
41_15_OP_N_2	16	-	0	5,556	0.55	7,278	0.44	7,814	0.41
42_15_OP_N_2	16	-	1.49	5,556	0.55	7,278	0.44	7,814	0.41
43_13_OP_N_1	40	-	0	0	0.00	164	0.00	243	0.00
44_15_OP_N_2	16	-	0	5,556	0.55	7,278	0.44	7,814	0.41
45_26_OP_N_2	5	-	2.96	4,261	0.12	5,455	0.10	5,814	0.09
46_22_OP_N_2	5	-	1.73	3,046	0.37	3,211	0.37	3,231	0.37
47_23_OP_N_2	16	-	0.69	1,774	0.00	1,888	0.00	1,908	0.00
48_30_OP_N_1	5	-	0	4,779	0.10	5,662	0.09	5,889	0.09
49_31_OP_N_1	5	-	0	922	0.00	982	0.00	993	0.00
50_32_OP_N_1	5	-	0	3,324	0.30	3,660	0.28	3,733	0.28
51_33_OP_N_1	5	-	0	3,170	0.16	3,867	0.13	4,082	0.13
52_29_OP_N_2	16	-	0	344	0.00	382	0.00	392	0.00
53_24_OP_N_2	16	-	1.36	1,071	0.00	1,313	0.00	1,313	0.00

Road Link	Speed (kph)	Queue Length (m)	Gradient (%)	2019 Baseline		2027 Do-Minimum		2027 Do-Something	
				AADT	HDV%	AADT	HDV%	AADT	HDV%
54_27_OP_N_2	16	-	11.36	947	0.53	1,636	0.32	1,974	0.26
55_19_OP_N_2	5	-	0	6,591	0.30	7,926	0.26	8,304	0.25
56_21_OP_N_1	44.8	-	0.53	16,999	1.11	18,718	1.05	19,076	1.03
57_18_OP_N_1	33.6	-	2.66	6,668	0.95	7,312	0.90	7,440	0.89
58_12_OP_N_1	43.2	-	0.37	5,602	1.19	7,278	0.95	7,814	0.89
59_12_OP_N_1	43.2	-	1.38	5,602	1.19	7,278	0.95	7,814	0.89
60_10_OP_N_1	54.4	-	0.59	5,841	0.71	7,633	0.56	8,256	0.52
61_3_OP_N_1	54.4	-	1.08	3,384	0.81	3,655	0.78	3,680	0.78
62_10_OP_N_1	54.4	-	0	5,841	0.71	7,633	0.56	8,256	0.52
63_11_OP_N_1	40	-	1.17	3,642	1.21	4,034	1.14	4,121	1.12
64_11_OP_N_1	40	-	0.25	3,642	1.21	4,034	1.14	4,121	1.12
65_20_OP_N_1	41.6	-	0.66	12,247	1.31	12,752	1.31	12,752	1.31
66_21_OP_N_1	44.8	-	0.21	16,999	1.11	18,718	1.05	19,076	1.03
28_7_OP_N_1	54.4	-	0.23	7,394	3.14	8,882	2.72	9,220	2.62
2_25_OP_N_2	5	-	5.89	2,113	0.24	2,240	0.23	2,260	0.23
38_6_OP_N_2	16	-	0	3,453	1.12	4,674	0.86	5,012	0.80
1_19_PM_N_4	5	-	0	6,591	0.30	7,926	0.26	8,304	0.25
2_19_PM_Q_4	5	-	0	6,591	0.30	7,926	0.26	8,304	0.25

Road Link	Speed (kph)	Queue Length (m)	Gradient (%)	2019 Baseline		2027 Do-Minimum		2027 Do-Something	
				AADT	HDV%	AADT	HDV%	AADT	HDV%
3_19_PM_Q_4	5	31	0	6,591	0.30	7,926	0.26	8,304	0.25
4_17_PM_Q_4	5	55	0	8,770	0.63	10,601	0.54	11,127	0.52
5Q_18_PM_Q_4	33.6	46	0	6,668	0.95	7,312	0.90	7,440	0.89
14_15_PM_Q_4	5	117	0	5,556	0.55	7,278	0.44	7,814	0.41
15Q_20_PM_Q_4	16	12	0	12,247	1.31	12,752	1.31	12,752	1.31
32_17_PM_Q_4	5	18	11.29	8,770	0.63	10,601	0.54	11,127	0.52
33_18_PM_Q_4	5	39	0	6,668	0.95	7,312	0.90	7,440	0.89
35Q_12_PM_Q_4	5	55	0	5,602	1.19	7,278	0.95	7,814	0.89
36Q_10_PM_Q_4	5	38	0	5,841	0.71	7,633	0.56	8,256	0.52
38_28_PM_Q_4	5	20	0	3,070	0.16	3,626	0.14	3,626	0.14
40_11_PM_N_4	5	32	3.11	3,642	1.21	4,034	1.14	4,121	1.12
41_15_PM_Q_4	5	-	0	5,556	0.55	7,278	0.44	7,814	0.41
42_15_PM_N_4	5	39	2.55	5,556	0.55	7,278	0.44	7,814	0.41
44_15_PM_Q_4	5	-	0	5,556	0.55	7,278	0.44	7,814	0.41
45_26_PM_Q_4	5	34	2.96	4,261	0.12	5,455	0.10	5,814	0.09
46Q_22_PM_Q_4	5	36	0	3,046	0.37	3,211	0.37	3,231	0.37
47Q_23_PM_Q_4	5	24	0	1,774	0.00	1,888	0.00	1,908	0.00
52_29_PM_Q_4	5	7	0	344	0.00	382	0.00	392	0.00

Road Link	Speed (kph)	Queue Length (m)	Gradient (%)	2019 Baseline		2027 Do-Minimum		2027 Do-Something	
				AADT	HDV%	AADT	HDV%	AADT	HDV%
53Q_24_PM_Q_4	5	14	7.33	1,071	0.00	1,313	0.00	1,313	0.00
54_27_PM_Q_4	5	18	11.36	947	0.53	1,636	0.32	1,974	0.26
55_19_PM_N_4	33.6	121	0	6,591	0.30	7,926	0.26	8,304	0.25
2_25_PM_Q_4	5	-	5.89	2,113	0.24	2,240	0.23	2,260	0.23
38Q_6_PM_Q_4	5	12	0	3,453	1.12	4,674	0.86	5,012	0.80
38_6_PM_N_4	5	67	0	3,453	1.12	4,674	0.86	5,012	0.80
53_24_PM_N_4	5	-	0	1,071	0.00	1,313	0.00	1,313	0.00
35_12_PM_N_4	5	-	0	5,602	1.19	7,278	0.95	7,814	0.89
36_10_PM_N_4	5	-	0	5,841	0.71	7,633	0.56	8,256	0.52
40Q_11_PM_Q_4	5	-	0	3,642	1.21	4,034	1.14	4,121	1.12
47_23_PM_N_4	16	120	0.83	1,774	0.00	1,888	0.00	1,908	0.00
55Q_19_PM_Q_4	5	-	0	6,591	0.30	7,926	0.26	8,304	0.25
42Q_15_PM_Q_4	5	28	0	5,556	0.55	7,278	0.44	7,814	0.41
46_22_PM_N_4	5	137	2.19	3,046	0.37	3,211	0.37	3,231	0.37
15_20_PM_N_4	5	-	2.17	12,247	1.31	12,752	1.31	12,752	1.31
1Q_19_AM_Q_3	5	-	0	6,591	0.30	7,926	0.26	8,304	0.25
2_19_AM_Q_3	5	16	0	6,591	0.30	7,926	0.26	8,304	0.25
3_19_AM_Q_3	5	31	0	6,591	0.30	7,926	0.26	8,304	0.25

Road Link	Speed (kph)	Queue Length (m)	Gradient (%)	2019 Baseline		2027 Do-Minimum		2027 Do-Something	
				AADT	HDV%	AADT	HDV%	AADT	HDV%
4_17_AM_Q_3	5	55	0	8,770	0.63	10,601	0.54	11,127	0.52
5Q_18_AM_Q_3	33.6	40	0	6,668	0.95	7,312	0.90	7,440	0.89
14_15_AM_Q_3	5	117	0	5,556	0.55	7,278	0.44	7,814	0.41
15Q_20_AM_Q_3	5	23	0	12,247	1.31	12,752	1.31	12,752	1.31
32_17_AM_Q_3	5	18	11.29	8,770	0.63	10,601	0.54	11,127	0.52
33_18_AM_Q_3	5	39	0	6,668	0.95	7,312	0.90	7,440	0.89
35Q_12_AM_Q_3	5	58	0	5,602	1.19	7,278	0.95	7,814	0.89
36_10_AM_Q_3	5	74	0	5,841	0.71	7,633	0.56	8,256	0.52
38_28_AM_Q_3	5	20	0	3,070	0.16	3,626	0.14	3,626	0.14
40_11_AM_N_3	5	41	2.44	3,642	1.21	4,034	1.14	4,121	1.12
41_15_AM_Q_3	5	-	0	5,556	0.55	7,278	0.44	7,814	0.41
42_15_AM_Q_3	5	67	1.49	5,556	0.55	7,278	0.44	7,814	0.41
44_15_AM_Q_3	5	47	0	5,556	0.55	7,278	0.44	7,814	0.41
45_26_AM_Q_3	5	34	2.96	4,261	0.12	5,455	0.10	5,814	0.09
46Q_22_AM_Q_3	5	36	0	3,046	0.37	3,211	0.37	3,231	0.37
52_29_AM_Q_3	5	7	0	344	0.00	382	0.00	392	0.00
53Q_24_AM_Q_3	5	23	4.4	1,071	0.00	1,313	0.00	1,313	0.00
54_27_AM_Q_3	5	18	11.36	947	0.53	1,636	0.32	1,974	0.26

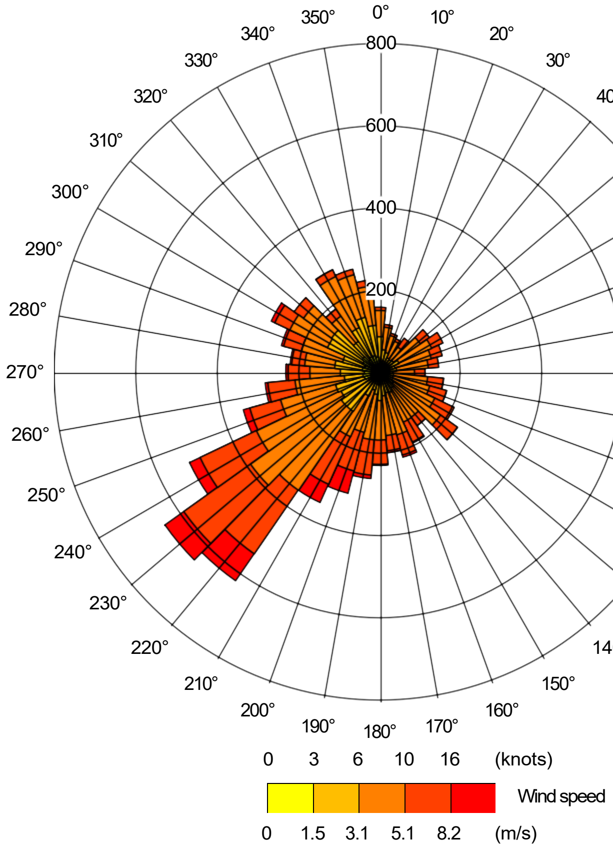
Road Link	Speed (kph)	Queue Length (m)	Gradient (%)	2019 Baseline		2027 Do-Minimum		2027 Do-Something	
				AADT	HDV%	AADT	HDV%	AADT	HDV%
55_19_AM_N_3	33.6	133	0	6,591	0.30	7,926	0.26	8,304	0.25
2_25_AM_Q_3	5	-	5.89	2,113	0.24	2,240	0.23	2,260	0.23
38Q_6_AM_Q_3	5	12	0	3,453	1.12	4,674	0.86	5,012	0.80
1_19_AM_N_3	33.6	141	0	6,591	0.30	7,926	0.26	8,304	0.25
46_22_AM_N_3	5	-	2.19	3,046	0.37	3,211	0.37	3,231	0.37
15_20_AM_N_3	5	-	2.87	12,247	1.31	12,752	1.31	12,752	1.31
47_23_AM_N_3	16	-	0.76	1,774	0.00	1,888	0.00	1,908	0.00
55Q_19_AM_N_3	5	-	0	6,591	0.30	7,926	0.26	8,304	0.25
35_12_AM_N_3	5	25	0	5,602	1.19	7,278	0.95	7,814	0.89
53_24_AM_N_3	5	-	0	1,071	0.00	1,313	0.00	1,313	0.00
40Q_11_AM_Q_3	5	-	0	3,642	1.21	4,034	1.14	4,121	1.12
38_6_AM_N_3	5	67	0	3,453	1.12	4,674	0.86	5,012	0.80
4_67_OP_N_1	24	-	2.46	0	0.00	1,722	0.00	2,708	0.00
4_67_OP_N_1	24	-	0.74	0	0.00	1,722	0.00	2,708	0.00
4_67_OP_N_1	24	-	0	0	0.00	1,722	0.00	2,708	0.00
4_67_OP_N_1	24	-	0	0	0.00	1,722	0.00	2,708	0.00

METEOROLOGICAL DATA

ADMS-Roads utilises hourly sequential meteorological data including wind direction, wind speed, temperature, precipitation and cloud cover, to facilitate the prediction of pollution dispersion between source and receptor.

Meteorological data input to the model were obtained from the closest meteorological station with available data, Stanstead, for the year 2019. The 2019 data was used to be consistent with the base/verification traffic year and were applied to the remaining scenarios for the local air quality assessment. The 2019 wind rose is presented as **Figure C1**.

Figure C1 - 2019 Wind Rose for Stansted Airport



MODEL PARAMETERS

Surface Roughness

The land uses of the local area were taken into consideration when choosing an appropriate value for surface roughness within the model. The surface roughness at the dispersion site was 0.5m and at the meteorological measurement site (Stanstead) a value of 0.1 was chosen.

A variable surface roughness file was also applied to the model. This was derived using the following datasets:

- Built up Areas Dataset from the Office For National Statistics[28]
- Ordnance Survey (OS) Open Greenspace Dataset[29]
- OS Openmap Local Dataset[30]
- Ancient Woodland Dataset from the Forestry Commission[31]
- National Forest Inventory from the Forestry Commission[32]

A variable resolution was used to provide higher resolution (40m) within 200m of the ARN and a coarser resolution (500m) beyond this. ADMS-Roads can interpret this data and then resolve it into the dispersion model. A resolution setting of 128x128 was selected.

Variable Terrain

A variable terrain file was created using the Environment Agency LiDAR Digital Terrain Model (DTM) for the area due to the presence of gradients greater than 10%. A variable resolution was used to provide higher resolution (40m) within 200m of the ARN and a coarser resolution (500m) beyond this. ADMS-Roads can interpret this data and then resolve it into the dispersion model. A resolution setting of 128x128 was selected.

Urban Street Canyons

Urban street canyons were created for the model using the CERC Street Canyon Tool for ArcGIS. The tool was provided with the following inputs:

- Affected Road Network
- OS Openmap Local Building layer with heights derived using the Environment Agency LiDAR Digital Surface Model (DSM) and DTM

Manual modifications were made to the output from the Street Canyon Tool as some canyons were observed to have been created in anomalous places. The linear referenced positions of the street canyons can be found in **Figure G-9**.

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[28] Office For National Statistics (2017) Built up areas (December 2011) Boundaries V.2 [online] Available here: Built-up Areas (December 2011) Boundaries V2 - data.gov.uk

[29] Ordnance Survey (2021) OS Open Greenspace [Online] Available at: OS Open Greenspace - data.gov.uk

[30] Ordnance Survey (2022) OS Openmap Local [Online] Available at: OS OpenMap Local | OS Products (ordnancesurvey.co.uk)

[31] Forestry Commission (2022) Ancient Woodland Dataset

[32] Forestry Commission Open Data (2022) National Forest Inventory woodland GB 2020 [online] Available at: National Forest Inventory Woodland GB 2020 | Forestry Commission (arcgis.com)

Traffic Queues

Queueing was applied to the traffic model through the use of variable length links and a variable factor (.fac) file. Queueing data were provided through the WSP Transport Planning Team from surveys undertaken by Intelligent Data Collection Limited. The following locations were used for queue observations:

- B1383 / B1051 Chapel Hill / Bentfield Road
- Lower Street / Mountfitchet Castle Street / Church Road / B1051 Chapel Hill
- B1051 Lower Street / B1051 Grove Hill
- Station Road / B1051 / Robin Hood Road
- B1051 Henham Road / Hall Road / B1051 High Street
- Unnamed Road / Parsonage Road

At each location the worst-case maximum queue length on the observed roads was used for the model.

Conversion of NO_x to NO_2

NO_x concentrations were predicted using the ADMS-Roads model. The modelled road contribution of NO_x at the modelled receptor locations was then converted to NO_2 using the NO_x to NO_2 calculator (v8.1), in accordance with DEFRA guidance.

Ammonia

Ammonia (NH_3) was added as a new pollutant into the ADMS-Roads pollutant palette. A parts-per-billion (ppb) to µg/m³ conversion factor of 0.73 was derived based on an average annual temperature recorded at Stanstead Airport in 2019 of 11°C and an overall molecular weight for NH_3 of 17.03056. Entries were added for both short (grassland/moorland) and long (forest/woodland) vegetation deposition velocities.

N Deposition

Deposition was modelled for the Elsenham Woods SSSI using deposition velocities for Forest vegetation from the Environment Agency AQTAG06 note. Background rates of deposition for forest habitats were obtained from the APIS background dataset for the three-year period 2018-2020.

Sensitive Receptors

The sensitive human receptors included in the assessment and their locations are shown in **Table C4** and **Figure G-3**.

Table C4 – Sensitive Receptors

Receptor	Receptor Type	Description/ Address	Grid Reference	
			X	Y
A1	Countryside	St Anthony, Henham Road	553950	226403
A2	Countryside	Lodge Cottage, Henham Road	553918	226380
A3	Countryside	Crown Cottage, Henham Road	553842	226343
A4	Countryside	Cross Cottage, Hall Road	553838	226329
A5	Countryside	The Crown Public House, Henham Road	553814	226334

Receptor	Receptor Type	Description/ Address	Grid Reference	
			X	Y
A6	Countryside	Old Hall House, Hall Road	553813	226321
R1	Offsite Existing	Theydon Lodge, North Hall Road	552679	229301
R2	Offsite Existing	2, Old Mead Lane	553235	227831
R3	Offsite Existing	Springfield, Henham Road	554545	227149
R4	Offsite Existing	St Anthony, Henham Road	553956	226410
R5	Offsite Existing	Cross Cottage, Hall Road	553836	226324
R6	Offsite Existing	Elsenham C of E Primary School	553757	226317
R7	Offsite Existing	Harleigh House, High Street	553515	226343
R8	Offsite Existing	18, Ridley Gardens	553332	226702
R9	Offsite Existing	2, Fourways	553398	226342
R10	Offsite Existing	Old Farm Cottages, Stanstead Road	553021	226032
R11	Offsite Existing	21, Grove Hill	551562	225070
R12	Offsite Existing	3, Lower Street	551409	224933
R13	Offsite Existing	27, Chapel Hill	551247	224937
R14	Offsite Existing	70, Chapel Hill	551047	225037
R15	Offsite Existing	Western House, Chapel Hill	550996	225070
R16	Offsite Existing	Hermitage House, Silver Street	550959	225080
R17	Offsite Existing	25, Silver Street	550938	224926
R18	Offsite Existing	16 Blythwood Gardens	550892	224747
R19	Offsite Existing	Pine Cottage, Church Street	551545	224665
R20	Offsite Existing	Forest Hall School, Church Road	551926	224043
R21	Offsite Existing	Tall Tree Caravan Park, Church Road	552278	223889
R22	Offsite Existing	Loppingdales Farmhouse, Parsonage Road	555491	225363
R23	Offsite Existing	9, Molehill Green Cottages, Parsonage Road	556210	224748
R24	Offsite Existing	Rose Cottage, Parsonage Road	556187	223724
R25	Offsite Existing	31, Chestnut Way	556091	221495
R26	Offsite Existing	5, Dunmow Road	555737	221278
R27	Offsite Existing	Yew Tree House, Dunmow Road	554670	221264
R28	Offsite Existing	48, Silver Street	550925	224923
R29	Offsite Existing	27, Grove Hill	551534	225064
R30	Offsite Existing	44, Cambridge Road	551121	225299
R31	Offsite Existing	Lower Street	551483	225075
R32	Offsite Existing	28, Brewery Lane	551523	225186
R33	Offsite Existing	Elsenham Primary School	553774	226271

Receptor	Receptor Type	Description/ Address	Grid Reference	
			X	Y
R34	Offsite Existing	Magna Carta Primary School	551332	225070
R35	Offsite Existing	Mountfitchet House, High Lane	551527	225598
R36	Offsite Existing	The Old Bell Hotel, Silver Street	550834	224518
R37	Offsite Existing	Broome End Care Home, Silver Street	550739	224494
R38	Offsite Existing	Chapel Hill Studio	551215	224960
R39	Offsite Existing	53. Lower Street	551476	225102
R40	Offsite Existing	34. Cambridge Road	551087	225246
R41	Offsite Existing	64, Cambridge Road	551149	225341
R42	Offsite Existing	22, Meadowcroft	551543	225431
R43	Offsite Existing	Bear and Eden, Brewery Yard	551452	225041
R44	Offsite Existing	2, Grove Hill	551473	225028
R45	Offsite Existing	Cranmore Close	553345	226858
R46	Offsite Existing	Broom Farm Road	553349	226797
P1	On-site Proposed	Development Site	553477	226823
P2	On-site Proposed	Development Site	553944	226571
P3	On-site Proposed	Development Site	553951	226679
P4	On-site Proposed	Development Site	553895	226697
P5	On-site Proposed	Development Site	553869	226688
P6	On-site Proposed	Development Site	553816	226779
P7	On-site Proposed	Development Site	553739	226796
P8	On-site Proposed	Development Site	553671	226834
P9	On-site Proposed	Development Site	553659	226874
P10	On-site Proposed	Development Site	553674	226879
P11	On-site Proposed	Development Site	553698	226971
P12	On-site Proposed	Development Site	553462	227021
P13	On-site Proposed	Development Site	553554	227098
P14	On-site Proposed	Development Site	553726	227079

Gridded receptors were created to cover the central areas of Elsenham and Stanstead Mountfitchet. The grid extended up to 40 from the road centre and was of decreasing resolution with increasing distance from the road centreline.

Similarly, gridded receptors were created for the Elsenham Woods SSSI. A horizontal resolution of 20m was used at 10m intervals from the habitat edge closest to the road up to 200m, and horizontal resolution of 50m at 50m intervals up to 1km from the habitat edge.

MODEL VALIDATION

The ADMS-Roads dispersion model has been validated for road traffic assessments and is considered to be fit for purpose. Model validation undertaken by CERC is unlikely to have included validation in the vicinity of the scheme considered in this assessment. It is therefore necessary to perform a comparison of model results with local monitoring data at relevant locations.

Appendix D

MODEL VERIFICATION

APPENDIX D – MODEL VERIFICATION

The comparison of modelled concentrations with local monitored concentrations is a process termed 'verification'. Model verification investigates the discrepancies between modelled and measured concentrations, which can arise due to the presence of inaccuracies and/or uncertainties in model input data, modelling and monitoring data assumptions. The following are examples of potential causes of such discrepancy:

- Estimates of background pollutant concentrations
- Meteorological data uncertainties
- Traffic data uncertainties
- Model input parameters such as 'roughness length
- Overall limitations of the dispersion model.

Full details of the model verification process specific to the Proposed Development modelling assessment are provided in the 'Assessment Verification Methodology' section below.

MODEL PRECISION

Residual uncertainty may remain after systematic error or 'model accuracy' has been accounted for in the final predictions. Residual uncertainty may be considered synonymous with the 'precision' of the model predictions, i.e. how wide the scatter or residual variability of the predicted values compare with the monitored true value, once systematic error has been allowed for. The quantification of model precision provides an estimate of how the final predictions may deviate from true (monitored) values at the same location over the same period. Suitable local monitoring data for the purpose of verification is used for model verification.

An evaluation of model performance has been undertaken to establish confidence in model results. LAQM.TG16[13] identifies a number of statistical procedures that are appropriate to evaluate model performance and assess the uncertainty. The statistical parameters used in this assessment are:

- Root mean square error (RMSE)
- Fractional bias (FB)
- Correlation coefficient (CC).

A brief explanation of each statistic is provided in **Table D1**, and further details can be found in DEFRA's LAQM.TG22[13] document.

Table D1 – Methods for describing model uncertainty

Statistical Parameter	Comments	Ideal value
RMSE	RMSE is used to define the average error or uncertainty of the model. The units of RMSE are the same as the quantities compared. If the RMSE values are higher than 25% of the objective being assessed, it is recommended that the model inputs and verification should be revisited in order to make improvements. For example, if the model predictions are for the annual mean NO_2 objective of 40 µg/m^3, if an RMSE of 10µg/m^3 or above is	0.00

Statistical Parameter	Comments	Ideal value
	determined for a model it is advised to revisit the model parameters and model verification. Ideally an RMSE within 10% of the air quality objective would be derived, which equates to 4µg/m^3 for the annual mean NO_2 objective.	
Fractional Bias	It is used to identify if the model shows a systematic tendency to over or under predict. FB values vary between +2 and -2 and has an ideal value of zero. Negative values suggest a model over-prediction and positive values suggest a model under-prediction.	0.00
Correlation Coefficient	It is used to measure the linear relationship between predicted and observed data. A value of zero means no relationship and a value of 1 means absolute relationship. This statistic can be particularly useful when comparing a large number of model and observed data points.	1.00

The calculations were carried out after model adjustment to provide information on the improvement of the model predictions as a result of the application of the verification adjustment factors

ASSESSMENT VERIFICATION METHODOLOGY

The verification process involves a review of the modelled pollutant concentrations against corresponding monitoring data to determine how well the air quality model has performed. Depending on the outcome it may be considered that the model has performed adequately and that there is no need to adjust any of the modelled results LAQM.TG22[13].

Alternatively, the model may perform outside of the ideal performance limits as stated by LAQM.TG22[13] (i.e. model agrees within +/-25% of monitored equivalent, but ideally within +/-10%). There is then a need to check all the input data to ensure that it is reasonable and accurately represented in the air quality modelling process.

Where all input data, such as traffic data, emissions rates, and background concentrations have been checked and considered as reasonable, then the modelled results require adjustment to best align with the monitoring data. This may either be a single verification adjustment factor to be applied to the modelled concentrations across the study area, or a range of different adjustment factors to account for different zones in the study area e.g. major roads, local roads.

The air quality model has been run to predict the 2019 annual mean road-NO_x contribution at four UDC roadside diffusion tubes adjacent to the modelled road network, based on 2019 baseline traffic data.

The model outputs of road-NO_x have been compared with the 'measured' road-NO_x, which was determined from the NO_2 concentrations measured using diffusion tubes at the monitoring locations, utilising the NO_x from NO_2 calculator provided by DEFRA and the NO_2 background concentration (from the DEFRA background map). As discussed in the methodology section, the most recent suitable data available for model verification purposes is 2019 data.

The tables and graph below present the data used in the verification exercise.

Table D2 – Data Used in Model Verification

Monitoring Site	2019 Measured Data (µg/m³)	Measured Road-NO_x (µg/m³) (from NO_x:NO_2 calculator)	Modelled Road-NO_x (µg/m³) – Before Adjustment	Modelled Annual Mean NO_2 Concentration (µg/m³) – Before Adjustment	% Difference (Measured vs Monitored NO_2)
Cambridge Rd - UT018	24.4	26.8	27.5	24.4	0.04
Silver St - UT019	31.9	42.9	25.4	23.4	-26.65
Grove Hill - UT020	24.7	25.8	13.0	17.8	-28.08
Chapel Hill - UT033	23.8	24.5	22.9	22.7	-4.58

Table D2 shows that the model is under predicting at all locations. Therefore, verification of the model was progressed to derive an appropriate road-NOx adjustment factor.

The road-NOx adjustment factor was determined as the slope of the best fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (see **Figure C1**). This factor (**1.301**) was then applied to the modelled road-NO_x concentration for each monitoring site to provide adjusted modelled road-NO_x concentrations (as shown in **Table C6**). The total NO_2 concentrations were then determined by inputting the adjusted modelled road-NO_x concentrations and the background NO_2 concentration into the NO_x to NO_2 calculator.

Graph D-1 - Comparison of Measured Road-NOx with Unadjusted Modelled Road-NOx

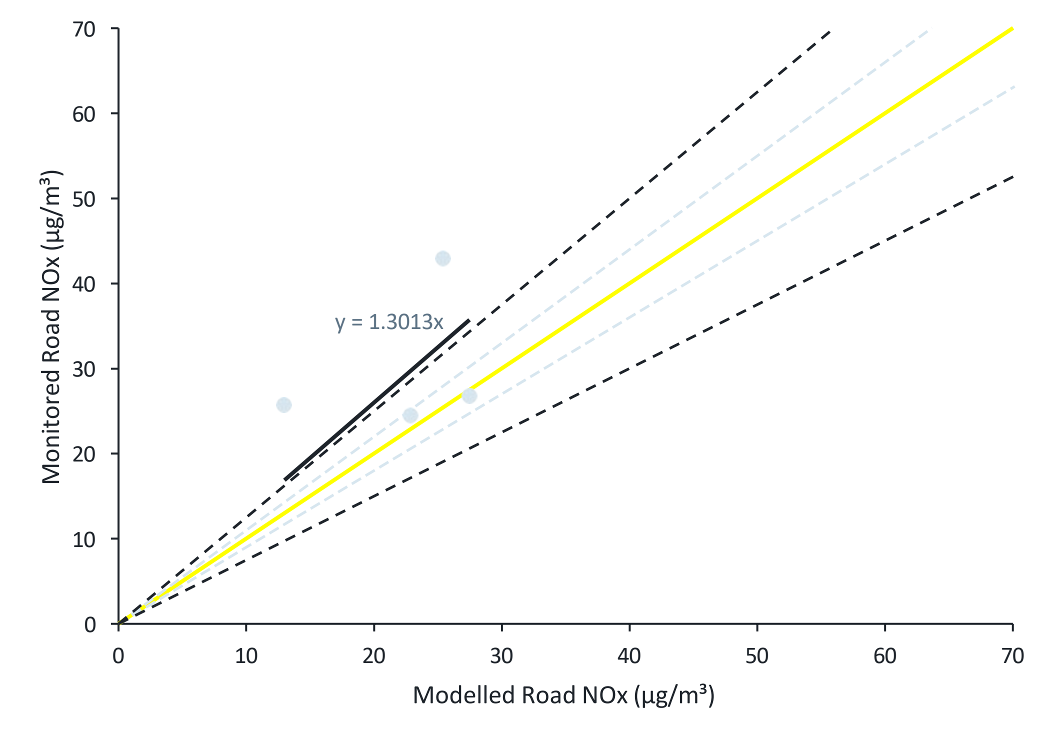


Table D3 – Data Used in Model Verification After Adjustment

Monitoring Site	2019 Measured Data (µg/m³)	Modelled Annual Mean NO_2 Concentration (µg/m³) – After Adjustment	% Difference (Measured vs Monitored NO_2)
Cambridge Rd - UT018	24.4	28.3	15.94
Silver St - UT019	31.9	27.0	-15.23
Grove Hill - UT020	24.7	19.7	-20.10
Chapel Hill - UT033	23.8	26.0	9.33

With the adjustment of modelled road-NO_x applied, the resulting annual mean NO_2 concentrations at each monitoring site were within +/- 25% of the monitored equivalents.

Statistical analyses undertaken for the results presented in **Table D4** demonstrates the following:

- An RMSE value equal to **4.13** µg/m³ which is slightly above the ideal 4.0µg/m³, which is 10% of the annual mean objective, but within 25%.
- A Fractional Bias value equal to 0.04 which is close to the ideal value of 0.0, indicating no significant tendency for the model to under or over predict when compared to monitored data.
- A correlation coefficient of 0.26 which is close to the ideal value of 0.0.

PM_{10} AND $PM_{2.5}$

There are no local PM_{10} or $PM_{2.5}$ monitoring data against which the model could be verified. Consequently, the verification factor determined above for adjusting the road-NO_x contribution has been applied to the predicted road-PM_{10} and road-$PM_{2.5}$ contributions, consistent with guidance set out in LAQM.TG22[13].

Ammonia

There is no monitoring of NH_3 available for the purposes of model verification, and no project specific monitoring was undertaken. Furthermore, the relationship between NH_3 and vehicle emissions is not the same as for NO_x and PM, and NH_3 also reacts differently in ambient air as it is a reduced compound. As such no correction factors were applied to the model outputs for NH_3.

Appendix E

DETAILED DISPERSION MODEL RESULTS

APPENDIX E – DETAILED HUMAN RECEPTOR DISPERSION MODEL RESULTS

Table E1 – Predicted Annual Mean NO_2 Concentrations (µg/m³)

Receptor ID	2019 Base (µg/m³)	2027 Without Development (µg/m³)	2027 With Development (µg/m³)	% of AQAL	Change (µg/m³)	Change as a % of AQO	Impact
A1	13.8	10.2	10.3	26.0	0.2	0.4	Negligible
A2	14.4	10.6	10.8	27.0	0.2	0.6	Negligible
A3	14.9	10.9	11.1	28.0	0.2	0.5	Negligible
A4	15.9	11.6	11.9	30.0	0.3	0.8	Negligible
A5	17.4	12.2	12.5	31.0	0.3	0.6	Negligible
A6	19.9	13.5	13.7	34.0	0.2	0.6	Negligible
R1	21.75	12.54	12.56	31	0.02	0.05	Negligible
R2	18.29	11.34	11.37	28	0.03	0.075	Negligible
R3	11.93	8.83	8.83	22	0	0	Negligible
R4	13.17	9.68	9.78	24	0.1	0.25	Negligible
R5	16.62	11.79	12	30	0.21	0.525	Negligible
R6	14.16	10.15	10.21	26	0.06	0.15	Negligible
R7	16.36	11.37	11.52	29	0.15	0.375	Negligible
R8	15.02	10.21	10.23	26	0.02	0.05	Negligible
R9	17.56	11.71	11.78	29	0.07	0.175	Negligible
R10	20.88	13.35	13.48	34	0.13	0.325	Negligible
R11	19.99	13.78	14.11	35	0.33	0.825	Negligible
R12	24.75	16.14	16.47	41	0.33	0.825	Negligible
R13	21.55	14.33	14.58	36	0.25	0.625	Negligible
R14	17	11.61	11.74	29	0.13	0.325	Negligible
R15	16.52	11.1	11.17	28	0.07	0.175	Negligible
R16	26.74	16.16	16.31	41	0.15	0.375	Negligible
R17	21.19	13.4	13.49	34	0.09	0.225	Negligible
R18	17.06	11.31	11.38	28	0.07	0.175	Negligible

R19	15.25	10.62	10.65	27	0.03	0.075	Negligible
R20	16.96	11.61	11.63	29	0.02	0.05	Negligible
R21	39.02	21.74	21.73	54	-0.01	0.025	Negligible
R22	17.13	13.78	13.82	35	0.04	0.1	Negligible
R23	16.91	13.67	13.71	34	0.04	0.1	Negligible
R24	17.9	14.42	14.46	36	0.04	0.1	Negligible
R25	16.05	11.27	11.31	28	0.04	0.1	Negligible
R26	14.06	10.12	10.14	25	0.02	0.05	Negligible
R27	18.57	13.08	13.2	33	0.12	0.3	Negligible
R28	21.71	13.66	13.77	34	0.11	0.275	Negligible
R29	21.17	14.5	14.87	37	0.37	0.925	Negligible
R30	18.34	11.75	11.76	29	0.01	0.025	Negligible
R31	14.36	10.15	10.19	25	0.04	0.1	Negligible
R32	13.48	9.63	9.65	24	0.02	0.05	Negligible
R33	13.43	9.72	9.75	24	0.03	0.075	Negligible
R34	11.93	8.87	8.88	22	0.01	0.025	Negligible
R35	12.07	8.83	8.84	22	0.01	0.025	Negligible
R36	18.41	11.97	12.02	30	0.05	0.125	Negligible
R37	11.68	8.59	8.61	22	0.02	0.05	Negligible
R38	18.84	12.74	12.93	32	0.19	0.475	Negligible
R39	13.89	9.87	9.89	25	0.02	0.05	Negligible
R40	25.48	15.78	15.78	39	0	0	Negligible
R41	17.68	11.42	11.42	29	0	0	Negligible
R42	13.06	9.36	9.37	23	0.01	0.025	Negligible
R43	17.99	11.89	11.94	30	0.05	0.125	Negligible
R44	27.15	18.17	18.74	47	0.57	1.425	Negligible
R45	14.94	10.12	10.14	25	0.02	0.05	Negligible
R46	15.06	10.2	10.23	26	0.03	0.075	Negligible
P1	12.91	9.17	9.18	23	0.01	0.025	Negligible
P2	12.11	8.92	8.96	22	0.04	0.1	Negligible

P3	11.99	9.35	9.67	24	0.32	0.8	Negligible
P4	12.05	9.35	9.66	24	0.31	0.775	Negligible
P5	12.1	9.64	10.1	25	0.46	1.15	Negligible
P6	12.11	9.37	9.68	24	0.31	0.775	Negligible
P7	12.23	9.36	9.64	24	0.28	0.7	Negligible
P8	12.33	9.52	9.87	25	0.35	0.875	Negligible
P9	12.33	9.49	9.84	25	0.35	0.875	Negligible
P10	12.3	9.34	9.62	24	0.28	0.7	Negligible
P11	12.19	8.84	8.87	22	0.03	0.075	Negligible
P12	12.88	9.08	9.09	23	0.01	0.025	Negligible
P13	12.48	8.88	8.89	22	0.01	0.025	Negligible
P14	12.08	8.75	8.76	22	0.01	0.025	Negligible

Table E2 – Predicted Annual Mean PM_{10} Concentrations (µg/m³)

Receptor ID	2019 Base (µg/m³)	2027 Without Development (µg/m³)	2027 With Development (µg/m³)	% of AQAL	Change (µg/m³)	Change as a % of AQO	Impact
A1	15.7	14.8	14.9	37.0	0.1	0.2	Negligible
A2	15.9	15.1	15.2	38.0	0.1	0.2	Negligible
A3	16.1	15.2	15.3	38.0	0.1	0.3	Negligible
A4	16.3	15.6	15.8	40.0	0.2	0.5	Negligible
A5	17.0	16.2	16.4	41.0	0.2	0.5	Negligible
A6	17.4	16.6	16.8	42.0	0.2	0.5	Negligible
R1	18.9	17.6	17.6	44	0	0	Negligible
R2	18.1	16.9	16.9	42	0	0	Negligible
R3	15.7	14.6	14.6	37	0	0	Negligible
R4	15.6	14.5	14.6	37	0.1	0.25	Negligible
R5	16.5	15.7	15.8	40	0.1	0.25	Negligible
R6	16	15	15	38	0	0	Negligible
R7	16.6	15.6	15.7	39	0.1	0.25	Negligible

R8	16.5	15.3	15.3	38	0	0	Negligible
R9	16.1	15	15	38	0	0	Negligible
R10	17.7	16.7	16.8	42	0.1	0.25	Negligible
R11	17.2	16.4	16.5	41	0.1	0.25	Negligible
R12	18.7	17.8	17.9	45	0.1	0.25	Negligible
R13	17.9	16.9	17.1	43	0.2	0.5	Negligible
R14	17.1	16	16.1	40	0.1	0.25	Negligible
R15	16.4	15.3	15.3	38	0	0	Negligible
R16	18.9	17.7	17.8	45	0.1	0.25	Negligible
R17	18.7	17.6	17.7	44	0.1	0.25	Negligible
R18	17.2	16	16.1	40	0.1	0.25	Negligible
R19	16.6	15.4	15.4	39	0	0	Negligible
R20	17.7	16.5	16.5	41	0	0	Negligible
R21	22	20.4	20.4	51	0	0	Negligible
R22	15.7	14.6	14.7	37	0.1	0.25	Negligible
R23	16	14.9	14.9	37	0	0	Negligible
R24	16.5	15.4	15.4	39	0	0	Negligible
R25	16.6	15.6	15.6	39	0	0	Negligible
R26	16.1	14.9	15	38	0.1	0.25	Negligible
R27	16.7	15.7	15.7	39	0	0	Negligible
R28	18.6	17.5	17.6	44	0.1	0.25	Negligible
R29	17.4	16.7	16.9	42	0.2	0.5	Negligible
R30	18.3	17	17	43	0	0	Negligible
R31	16.8	15.6	15.6	39	0	0	Negligible
R32	15.7	14.5	14.5	36	0	0	Negligible
R33	15.7	14.6	14.6	37	0	0	Negligible
R34	16.1	14.9	15	38	0.1	0.25	Negligible
R35	15.4	14.2	14.2	36	0	0	Negligible
R36	17.1	15.9	15.9	40	0	0	Negligible
R37	15.5	14.4	14.4	36	0	0	Negligible

R38	18.3	17.4	17.6	44	0.2	0.5	Negligible
R39	16.7	15.6	15.6	39	0	0	Negligible
R40	18.5	17.1	17.1	43	0	0	Negligible
R41	18.2	16.9	16.9	42	0	0	Negligible
R42	15.5	14.4	14.4	36	0	0	Negligible
R43	17.4	16.2	16.2	41	0	0	Negligible
R44	19.2	18.6	18.8	47	0.2	0.5	Negligible
R45	16.6	15.4	15.5	39	0.1	0.25	Negligible
R46	16.6	15.4	15.4	39	0	0	Negligible
P1	15.8	14.7	14.7	37	0	0	Negligible
P2	15.3	14.1	14.2	36	0.1	0.25	Negligible
P3	15.4	14.4	14.5	36	0.1	0.25	Negligible
P4	15.4	14.4	14.6	37	0.2	0.5	Negligible
P5	15.5	14.6	14.7	37	0.1	0.25	Negligible
P6	15.6	14.6	14.7	37	0.1	0.25	Negligible
P7	15.7	14.7	14.8	37	0.1	0.25	Negligible
P8	15.8	14.8	14.9	37	0.1	0.25	Negligible
P9	15.8	14.8	15	38	0.2	0.5	Negligible
P10	15.8	14.8	14.9	37	0.1	0.25	Negligible
P11	15.9	14.7	14.7	37	0	0	Negligible
P12	16	14.8	14.8	37	0	0	Negligible
P13	16.2	15	15	38	0	0	Negligible
P14	16	14.8	14.8	37	0	0	Negligible

Table E3 – Predicted Annual Mean $PM_{2.5}$ Concentrations (μg/m³)

Receptor ID	2019 Base (μg/m³)	2027 Without Development (μg/m³)	2027 With Development (μg/m³)	% of AQAL	Change (μg/m³)	Change as a % of AQO	Impact
A1	9.8	8.9	9.0	45.0	0.1	0.5	Negligible
A2	9.9	9.0	9.1	46.0	0.1	0.5	Negligible

A3	9.9	9.1	9.1	46.0	0.0	0.0	Negligible
A4	10.0	9.2	9.3	47.0	0.1	0.5	Negligible
A5	10.2	9.4	9.5	48.0	0.1	0.5	Negligible
A6	10.4	9.6	9.7	49.0	0.1	0.5	Negligible
R1	10.9	9.9	9.9	50	0	0	Negligible
R2	10.4	9.5	9.5	48	0	0	Negligible
R3	9.6	8.6	8.6	43	0	0	Negligible
R4	9.7	8.8	8.8	44	0	0	Negligible
R5	10.1	9.2	9.3	47	0.1	0.5	Negligible
R6	9.9	9	9	45	0	0	Negligible
R7	10.2	9.3	9.3	47	0	0	Negligible
R8	10.1	9.1	9.2	46	0.1	0.5	Negligible
R9	9.9	9	9	45	0	0	Negligible
R10	10.6	9.7	9.7	49	0	0	Negligible
R11	10.4	9.5	9.6	48	0.1	0.5	Negligible
R12	11	10.1	10.2	51	0.1	0.5	Negligible
R13	10.7	9.8	9.9	50	0.1	0.5	Negligible
R14	10.3	9.4	9.4	47	0	0	Negligible
R15	10	9.1	9.1	46	0	0	Negligible
R16	11	10	10	50	0	0	Negligible
R17	10.8	9.8	9.9	50	0.1	0.5	Negligible
R18	10.3	9.4	9.4	47	0	0	Negligible
R19	10.1	9.2	9.2	46	0	0	Negligible
R20	10.6	9.6	9.6	48	0	0	Negligible
R21	12.2	10.9	10.9	55	0	0	Negligible
R22	9.6	8.7	8.7	44	0	0	Negligible
R23	9.7	8.8	8.8	44	0	0	Negligible
R24	9.9	8.9	8.9	45	0	0	Negligible
R25	10	9.1	9.1	46	0	0	Negligible
R26	9.8	8.9	8.9	45	0	0	Negligible

R27	10.2	9.3	9.3	47	0	0	Negligible
R28	10.8	9.9	9.9	50	0	0	Negligible
R29	10.5	9.6	9.7	49	0.1	0.5	Negligible
R30	10.7	9.7	9.7	49	0	0	Negligible
R31	10.3	9.4	9.4	47	0	0	Negligible
R32	9.8	8.9	8.9	45	0	0	Negligible
R33	9.8	8.9	8.9	45	0	0	Negligible
R34	10	9.1	9.1	46	0	0	Negligible
R35	9.7	8.7	8.7	44	0	0	Negligible
R36	10.2	9.3	9.3	47	0	0	Negligible
R37	9.6	8.7	8.7	44	0	0	Negligible
R38	10.7	9.8	9.8	49	0	0	Negligible
R39	10.3	9.4	9.4	47	0	0	Negligible
R40	10.9	9.8	9.8	49	0	0	Negligible
R41	10.7	9.7	9.7	49	0	0	Negligible
R42	9.8	8.8	8.8	44	0	0	Negligible
R43	10.6	9.6	9.6	48	0	0	Negligible
R44	11.3	10.6	10.7	54	0.1	0.5	Negligible
R45	10.1	9.1	9.1	46	0	0	Negligible
R46	10.1	9.1	9.1	46	0	0	Negligible
P1	9.8	8.9	8.9	45	0	0	Negligible
P2	9.6	8.7	8.7	44	0	0	Negligible
P3	9.6	8.8	8.8	44	0	0	Negligible
P4	9.7	8.8	8.8	44	0	0	Negligible
P5	9.7	8.8	8.9	45	0.1	0.5	Negligible
P6	9.7	8.8	8.9	45	0.1	0.5	Negligible
P7	9.7	8.9	8.9	45	0	0	Negligible
P8	9.8	8.9	9	45	0.1	0.5	Negligible
P9	9.8	8.9	9	45	0.1	0.5	Negligible
P10	9.8	8.9	9	45	0.1	0.5	Negligible

P11	9.8	8.9	8.9	45	0	0	Negligible
P12	9.8	8.8	8.8	44	0	0	Negligible
P13	9.9	8.9	8.9	45	0	0	Negligible
P14	9.8	8.9	8.9	45	0	0	Negligible

Appendix F

MITIGATION

APPENDIX F – MITIGATION

Table F1 – Construction Phase Mitigation

Mitigation Measure	High Risk Advisory	Medium Risk Advisory
Communications		
1. Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	Highly Recommended	Highly Recommended
2. Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	Highly Recommended	Highly Recommended
3. Display the head or regional office contact information	Highly Recommended	Highly Recommended
4. Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in the IAQM Guidance. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real-time PM10 continuous monitoring and/or visual inspections.	Highly Recommended	Highly Recommended
Site Management		
5. Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	Highly Recommended	Highly Recommended
6. Make the complaints log available to the local authority when asked.	Highly Recommended	Highly Recommended
7. Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.	Highly Recommended	Highly Recommended
8. Hold regular liaison meetings with other high risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.	Highly Recommended	n/a
Monitoring		

9. Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.	Highly Recommended	Desirable
10. Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked	Highly Recommended	Highly Recommended
11. Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	Highly Recommended	Highly Recommended
12. Agree dust deposition, dust flux, or real-time PM10 continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.	Highly Recommended	Highly Recommended
Preparing and Maintaining the Site		
13. Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	Highly Recommended	Highly Recommended
14. Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.	Highly Recommended	Highly Recommended
15. Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period	Highly Recommended	Highly Recommended
16. Avoid site runoff of water or mud.	Highly Recommended	Highly Recommended
17. Keep site fencing, barriers and scaffolding clean using wet methods.	Highly Recommended	Highly Recommended
18. Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.	Highly Recommended	Highly Recommended
19. Cover, seed or fence stockpiles to prevent wind whipping.	Highly Recommended	Highly Recommended
Operating vehicle/machinery and sustainable travel		

20. Ensure all on-road vehicles comply with the local or national emission limit value requirements	Highly Recommended	Highly Recommended
21. Ensure all vehicles switch off engines when stationary – implement a no idling policy.	Highly Recommended	Highly Recommended
22. Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.	Highly Recommended	Highly Recommended
23. Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate)	Highly Recommended	Desirable
24. Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	Highly Recommended	Highly Recommended
25. Implement a construction employee Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)	Highly Recommended	Desirable
Operations		
26. Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems	Highly Recommended	Highly Recommended
27. Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate	Highly Recommended	Highly Recommended
28. Use enclosed chutes and conveyors and covered skips.	Highly Recommended	Highly Recommended
29. Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	Highly Recommended	Highly Recommended
30. Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	Highly Recommended	Highly Recommended
Waste management		
31. Avoid bonfires and burning of waste materials.	Highly Recommended	Highly Recommended
Measures Specific to Demolition		

33. Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	Highly Recommended	Highly Recommended
34. Avoid explosive blasting, using appropriate manual or mechanical alternatives.	Highly Recommended	Highly Recommended
35. Bag and remove any biological debris or damp down such material before demolition.	Highly Recommended	Highly Recommended
Measures Specific to Earthworks		
36. Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable	Highly Recommended	Desirable
37. Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as is practicable.	Highly Recommended	Desirable
38. Only remove the cover in small areas during work and not all at once.	Highly Recommended	Desirable
Measures Specific to Construction		
39. Avoid scabbling (roughening of concrete surfaces) if possible.	Desirable	Desirable
40. Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.	Highly Recommended	Highly Recommended
41. Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.	Desirable	Desirable
42. For smaller supplies of fine powder materials, ensure bags are sealed after use and stored appropriately to prevent dust.	Desirable	Desirable
Measures Specific to Trackout		
43. Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.	Highly Recommended	Highly Recommended
44. Avoid dry sweeping of large areas.	Highly Recommended	Highly Recommended

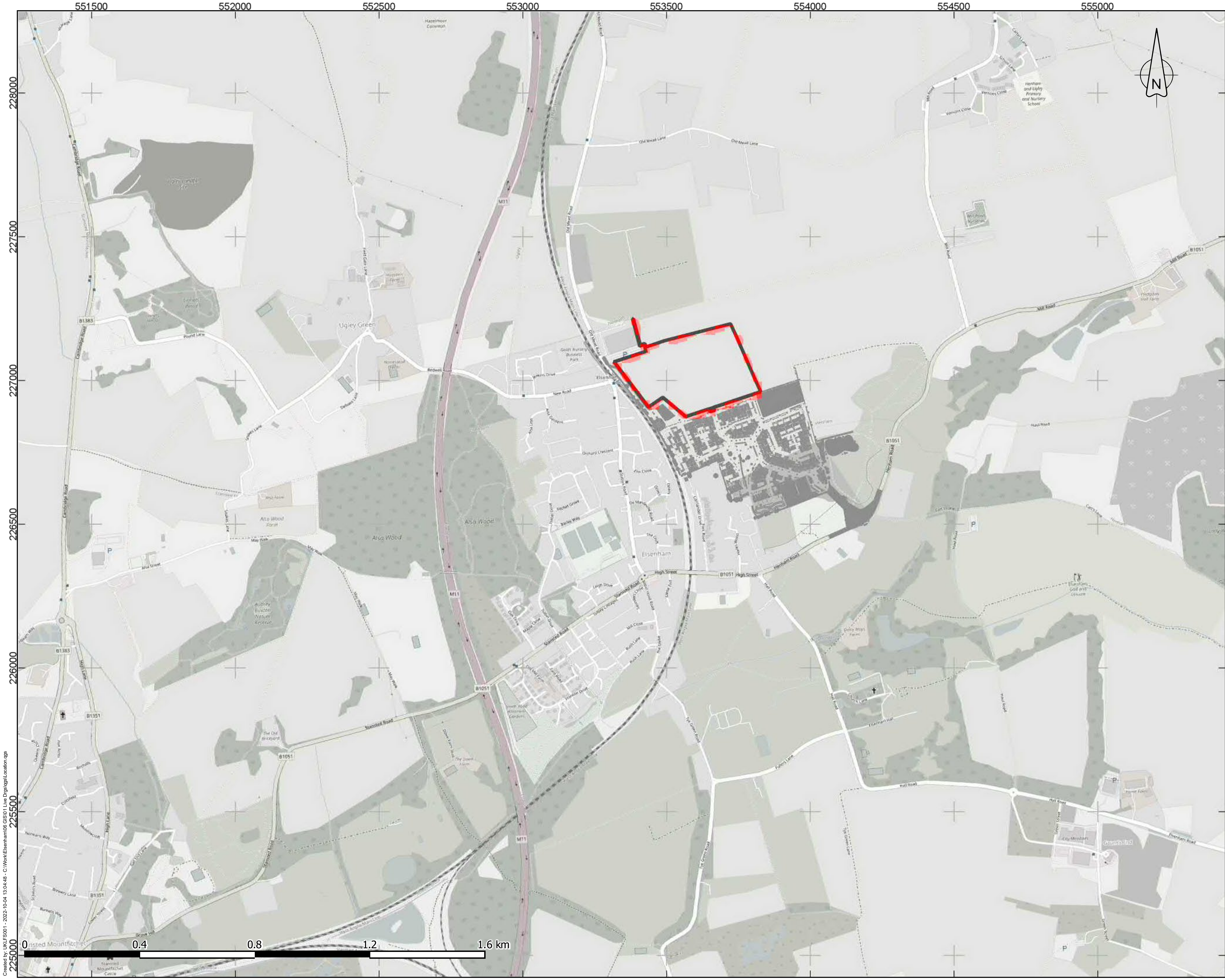
45. Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	Highly Recommended	Highly Recommended
46. Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	Highly Recommended	Highly Recommended
47. Record all inspections of haul routes and any subsequent action in a site log book.	Highly Recommended	Highly Recommended
48. Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	Highly Recommended	Highly Recommended
49. Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	Highly Recommended	Highly Recommended
50. Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.	Highly Recommended	Highly Recommended
51. Access gates to be located at least 10m from receptors where possible.	Highly Recommended	Highly Recommended

Appendix G

FIGURES

APPENDIX G - FIGURES

Figure G-1 - Site Location



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Site Location (Red Line Boundary)
- Land North-west of Henham Road

Revision Details	By / Check	Date	Suffix

Drawing Status

FINAL

Job Title

Bloor Homes Limited
Land East of Station Road,
Elsenham (Phase II)

Drawing Title

Air Quality Assessment
Site Location

Scale at A3

1:12,000

Drawn			
UKLFS001			
Stage 1 check	Stage 2 check	Originated	Date
XX	XX	XX	04/10/2022

Drawing Number

Figure G-1

Created by: UKLFS001 - 2022-10-04 13:04:48 - C:\Work\Elsenham\06 GIS\01 Live Drgs\qgis\Location.qgs

Figure G-2 - Construction Dust Risk Assessment Buffers

Legend

- Site Location (Red Line Boundary)
- Land North-west of Henham Road

IAQM Dust Assessment Buffers

- 0-20m
- 0-50m
- 0-100m
- 0-200m
- 0-350m

Revision Details	By / Check	Date	Suffix

Drawing Status: FINAL

Job Title: Bloor Homes Limited Land East of Station Road, Elsenham (Phase II)

Drawing Title: Air Quality Assessment Construction Dust Risk Assessment Buffers

Scale at A3: 1:6,000

Drawn: UKLFS001

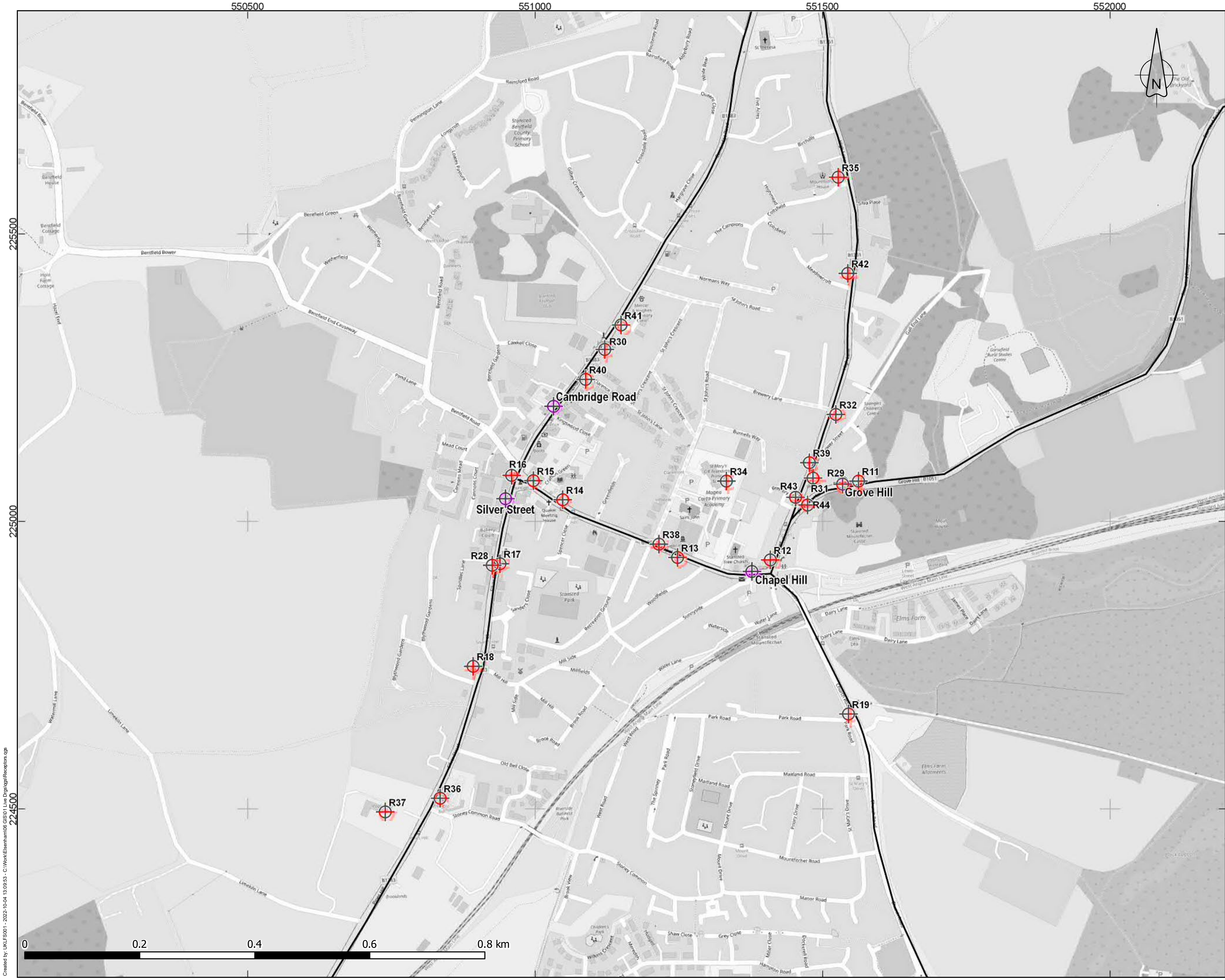
Stage 1 check	Stage 2 check	Originated	Date
XX	XX	XX	04/10/2022

BLOOR HOMES

WSP

Drawing Number: Figure G-2

Figure G-3 – Modelled Roads and Receptors



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Affected Road Network
- Uttlesford NO_2 DiffusionTubes
- Human Receptors

Revision Details	By / Check	Date	Suffix

Drawing Status
FINAL

Job Title
Bloor Homes Limited
Land East of Station Road,
Elsenham (Phase II)

Drawing Title
Air Quality Assessment
Receptor Locations 1 of 3

Scale at A3
1:6,000

Drawn
UKLFS001

Stage 1 check	Stage 2 check	Originated	Date
XX	XX	XX	04/10/2022

Drawing Number
Figure G-3

Created by: UKLFS001 - 2022-10-04 13:09:57 - C:\Work\Elsenham\06 GIS\01 Live Drgs\qgs\Receptors.qgs

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Legend

- Affected Road Network
- Human Receptors

Revision Details	By / Check	Date	Suffix

Drawing Status: FINAL

Job Title: Bloor Homes Limited Land East of Station Road, Elsenham (Phase II)

Drawing Title: Air Quality Assessment Receptor Locations 2 of 3

Scale at A3: 1:6,000

Drawn: UKLFS001

Stage 1 check	Stage 2 check	Originated	Date
XX	XX	XX	04/10/2022

Drawing Number: Figure G-3

THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Affected Road Network
- Uttlesford NO_2 DiffusionTubes
- Human Receptors
- Site of Special Scientific Interest (SSSI)

Revision Details	By / Check	Date	Suffix

Drawing Status: FINAL

Job Title: Bloor Homes Limited
Land East of Station Road,
Elsenham (Phase II)

Drawing Title: Air Quality Assessment
Receptor Locations 3 of 3

Scale at A3: 1:30,000

Drawn: UKLFS001

Stage 1 check	Stage 2 check	Originated	Date
XX	XX	XX	04/10/2022

BLOOR HOMES

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Drawing Number: Figure G-3

Figure G-4 - NO_2 Dispersion Contours

Created by: UKLFS001 - 2022-10-04 13:17:59 - C:\Work\Elsenham\06 GIS\01 Live Drgs\qgs\Contours.qgs

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Legend

OS Openmap Local Buildings

NO_2 Concentration (µg/m³)

- 10 - 12
- 12 - 14
- 14 - 16
- 16 - 18
- 18 - 20
- 20 - 22
- 22 - 24

Revision Details	By / Check	Date	Suffix

Drawing Status: FINAL

Job Title: Bloor Homes Limited Land East of Station Road, Elsenham (Phase II)

Drawing Title: Air Quality Assessment NO_2 Dispersion Contours 1 of 2 Standstead Mountfichet

Scale at A3: 1:4,000

Drawn: UKLFS001

Stage 1 check	Stage 2 check	Originated	Date
XX	XX	XX	04/10/2022

BLOOR HOMES

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Drawing Number: Figure G-4

THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

OS Openmap Local Buildings

NO_2 Concentration (µg/m³)

- 10 - 12
- 12 - 14
- 14 - 16
- 16 - 18
- 18 - 20
- 20 - 22
- 22 - 24

Revision Details	By / Check	Date	Suffix

Drawing Status

FINAL

Job Title

Bloor Homes Limited
Land East of Station Road,
Elsenham (Phase II)

Drawing Title

Air Quality Assessment
NO_2 Dispersion Contours 2 of 2
Elsenham

Scale at A3

1:4,000

Drawn	
UKLFS001	

Stage 1 check	Stage 2 check	Originated	Date
XX	XX	XX	04/10/2022

BLOOR HOMES

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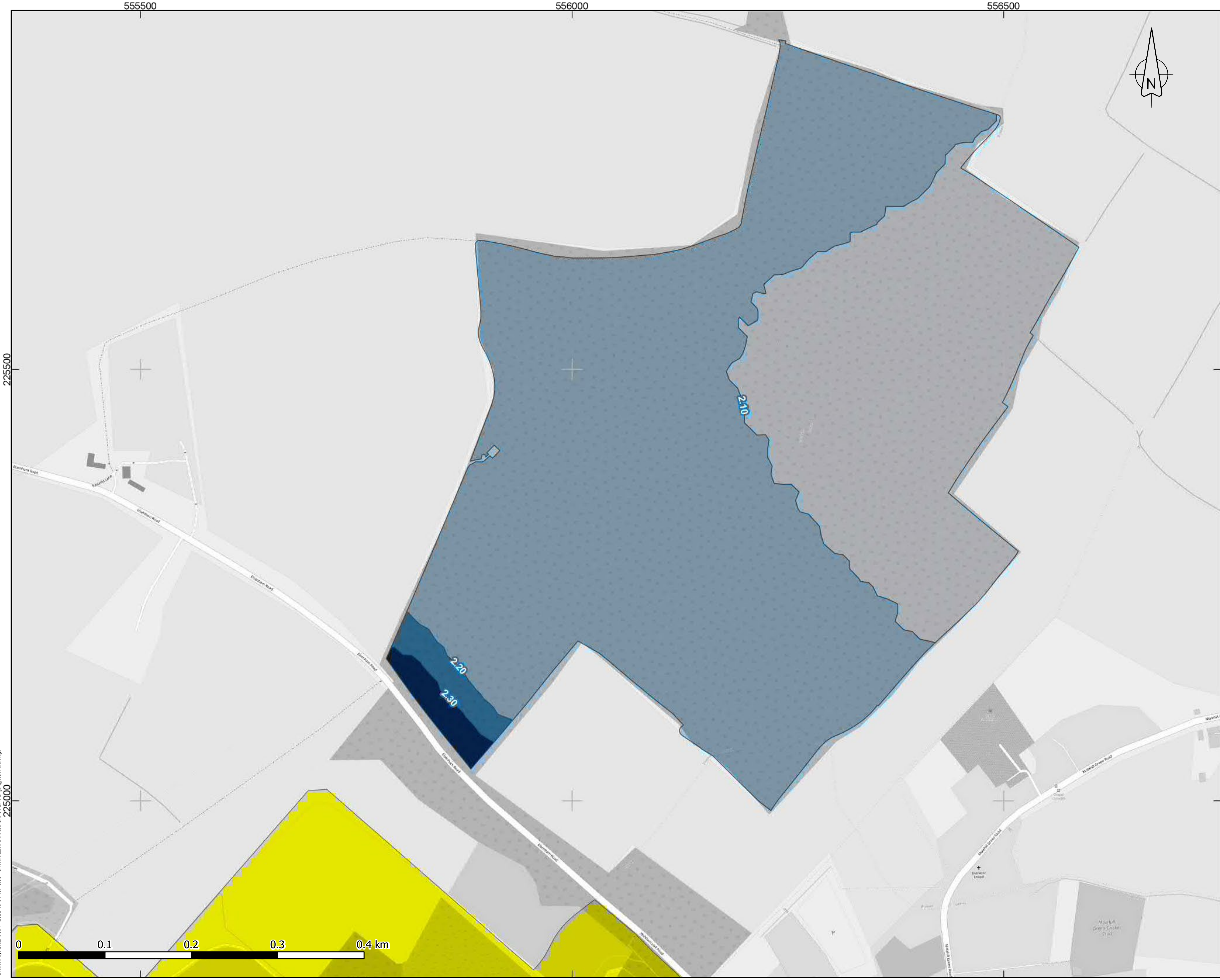
Drawing Number

Figure G-4

Created by: UKLFS001 - 2022-10-04 13:18:05 - C:\Work\Elsenham\06 GIS\01 Live Drgs\qgs\Contours.qgs

Figure G-5 - Elsenham Woods SSSI NH_3 Contours



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Stanstead Airport

NH_3 concentration (µg/m³)

- 2.1 - 2.1
- 2.1 - 2.2
- 2.2 - 2.3
- 2.3 - 2.4

Revision Details	By / Check	Date	Suffix

Drawing Status

FINAL

Job Title

Bloor Homes Limited
Land East of Station Road,
Elsenham (Phase II)

Drawing Title

Air Quality Assessment
Elsenham Woods SSSI NH_3
Contours

Scale at A3

1:4,000

Drawn	
UKLFS001	

Stage 1 check	Stage 2 check	Originated	Date
XX	XX	XX	04/10/2022

BLOOR HOMES

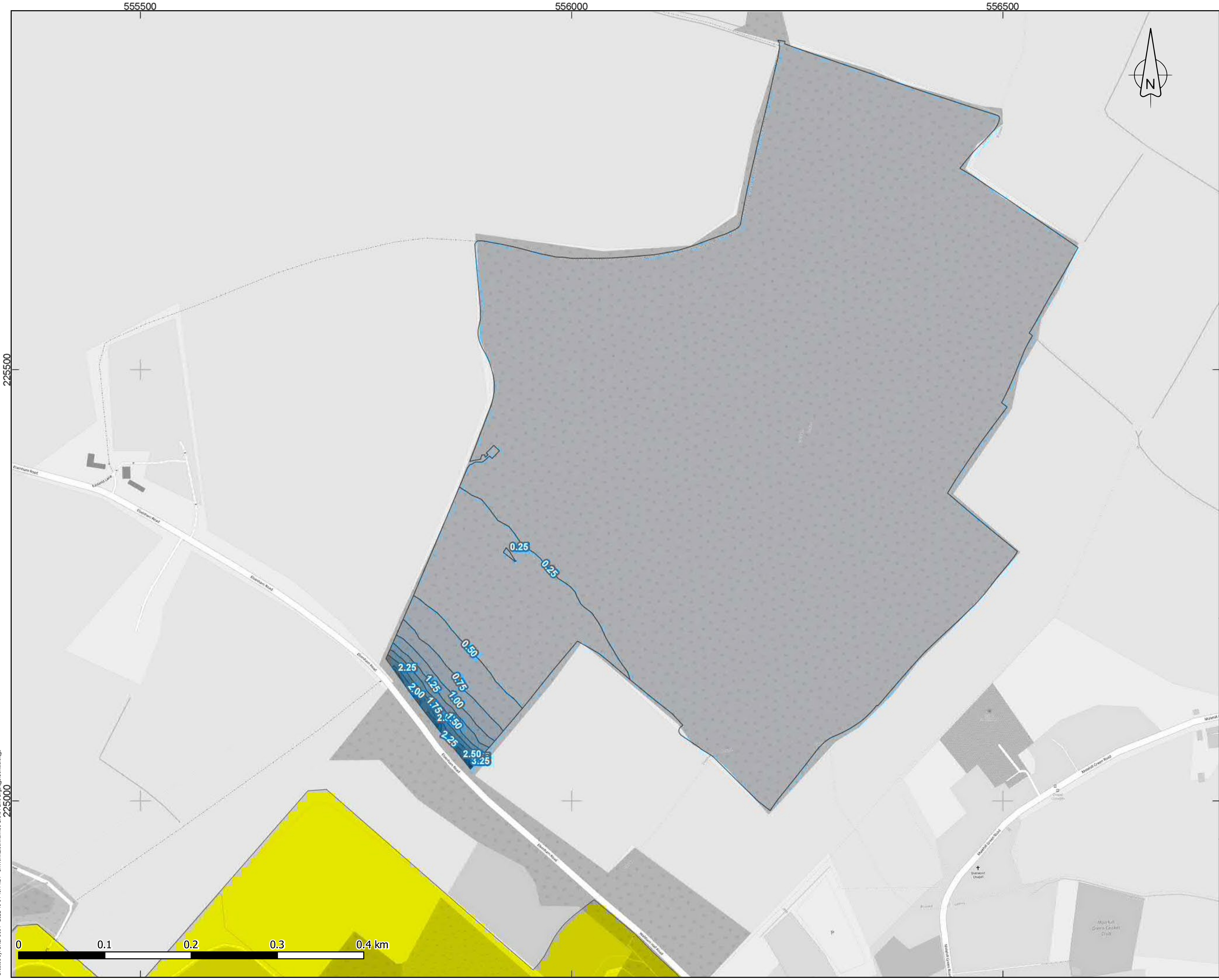
wsp

Drawing Number

Figure G-5

Created by: UKLFS001 - 2022-10-04 13:15:35 - C:\Work\Elsenham\06 GIS\01 Live Drgs\qgs\Contours.qgs

Figure G-6 - Elsenham Woods SSSI NH_3 Cumulative Percent Change



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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Stanstead Airport

NH_3 Percent Change

- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.25
- 1.25 - 1.5
- 1.5 - 1.75
- 1.75 - 2
- 2 - 2.25
- 2.25 - 2.5
- 2.5 - 2.75
- 2.75 - 3
- 3 - 3.25
- 3.25 - 3.5

Revision Details | By / Check | Date | Suffix

Drawing Status: FINAL

Job Title: Bloor Homes Limited
Land East of Station Road, Elsenham (Phase II)

Drawing Title: Air Quality Assessment
Elsenham Woods SSSI NH_3 Cumulative Percent Change

Scale at A3: 1:4,000

Drawn: UKLFS001

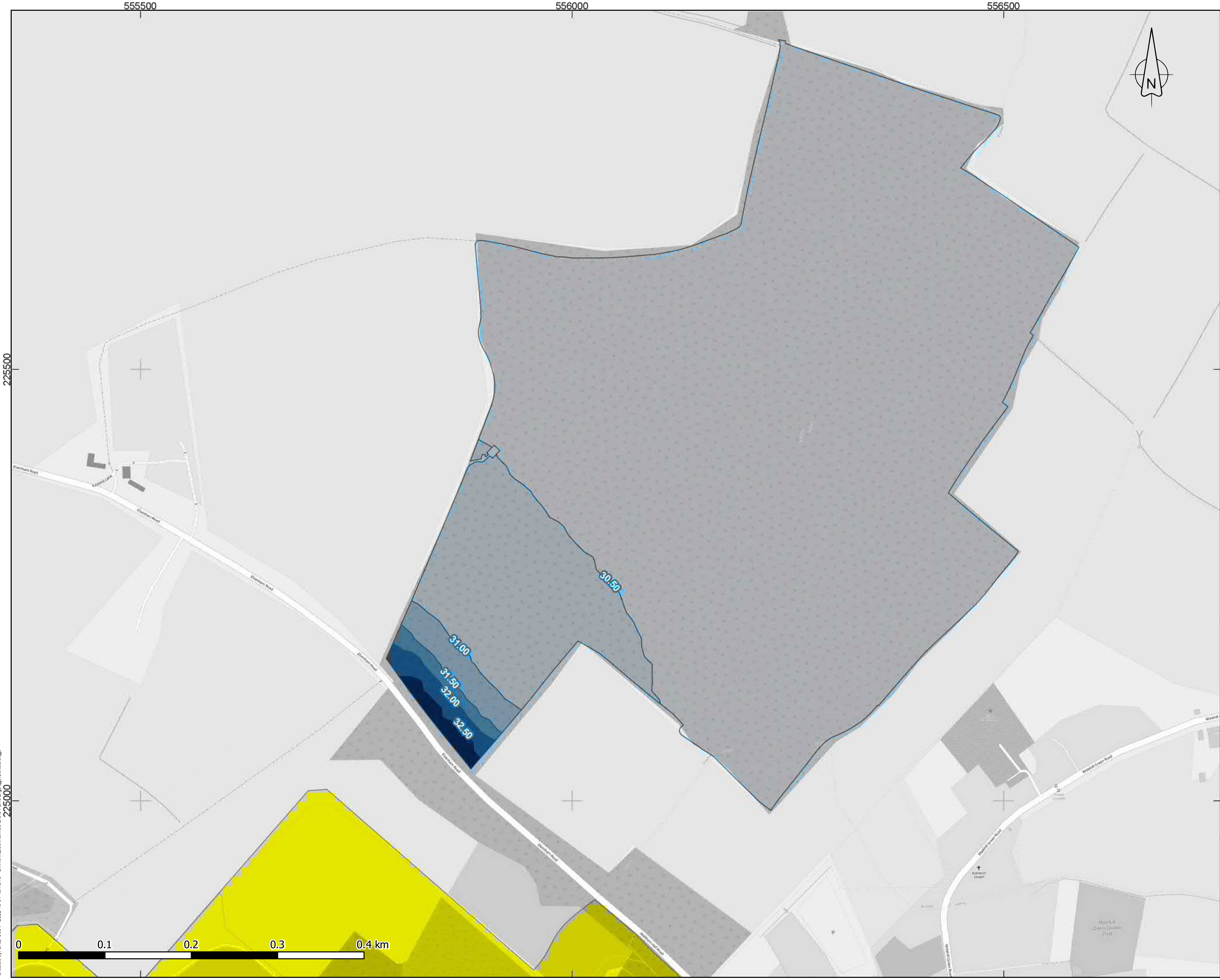
Stage 1 check	Stage 2 check	Originated	Date
XX	XX	XX	04/10/2022

BLOOR HOMES

WSP

Drawing Number: Figure G-6

Figure G-7 - Elsenham Woods SSSI Nutrient Nitrogen Deposition



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Legend

- Stanstead Airport

Nutrient Nitrogen Deposition (kg N/ha/yr)

- 30.5 - 30.75
- 30.75 - 31
- 31.25 - 31.5
- 31.75 - 32
- 32.25 - 32.5
- 32.75 - 33

Revision Details | By / Check | Date | Suffix

Drawing Status: FINAL

Job Title: Bloor Homes Limited Land East of Station Road, Elsenham (Phase II)

Drawing Title: Air Quality Assessment Elsenham Woods SSSI Nutrient Nitrogen Deposition

Scale at A3: 1:4,000

Drawn: UKLFS001

Stage 1 check	Stage 2 check	Originated	Date
XX	XX	XX	04/10/2022

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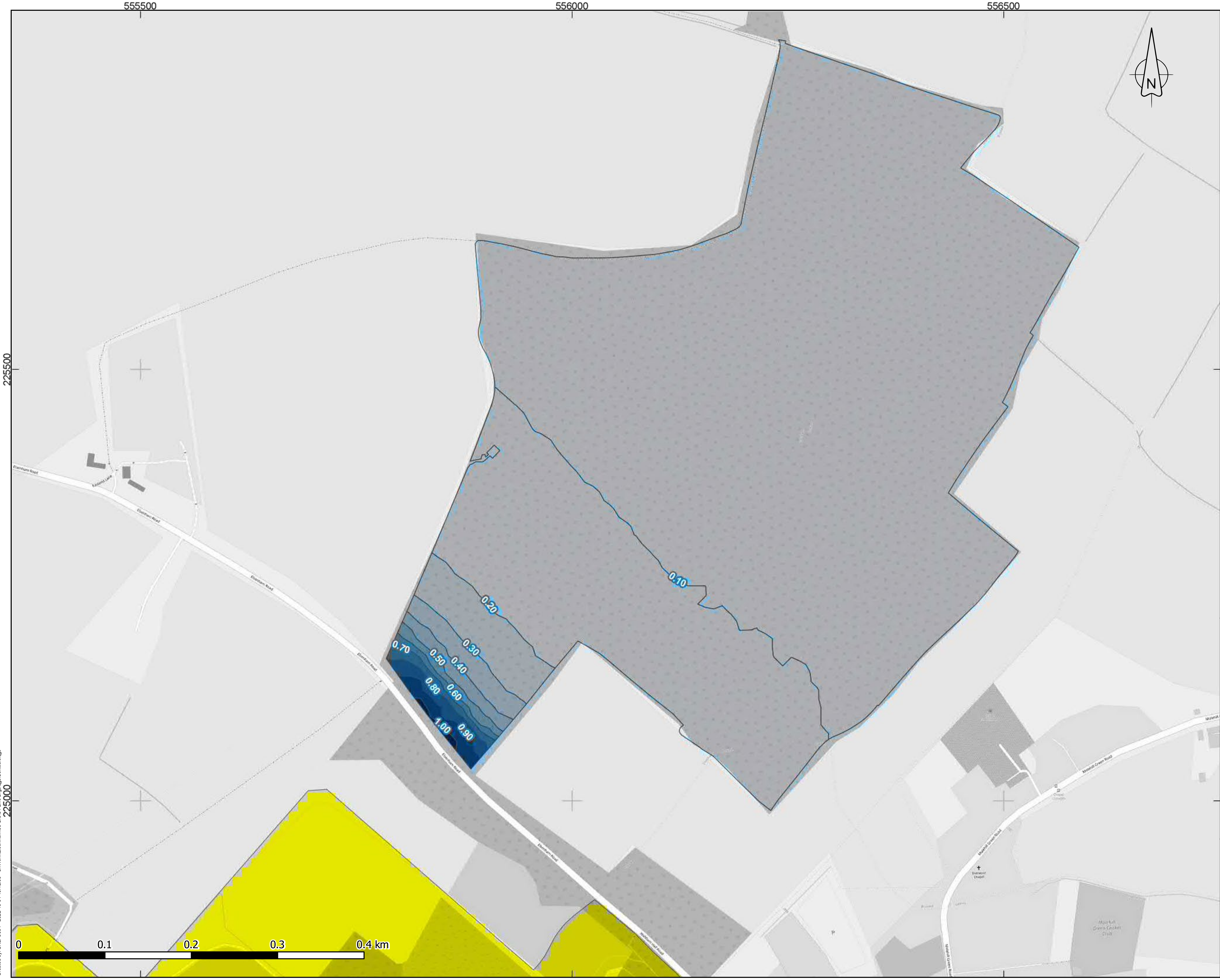
Drawing Number: Figure G-7

Created by: UKLFS001 - 2022-10-04 13:13:19 - C:\Work\Elsenham\06 GIS\01 Live Drgs\qgs\Contours.qgs

Figure G-8 - Elsenham Woods SSSI Nutrient Nitrogen Cumulative Percent Change



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Stanstead Airport

Nutrient Nitrogen Deposition Percent Change

- 0.1 - 0.2
- 0.2 - 0.3
- 0.3 - 0.4
- 0.4 - 0.5
- 0.5 - 0.6
- 0.6 - 0.7
- 0.7 - 0.8
- 0.8 - 0.9
- 0.9 - 1
- 1 - 1.1

Revision Details	By / Check	Date	Suffix

Drawing Status

FINAL

Job Title

Bloor Homes Limited
Land East of Station Road, Elsenham (Phase II)

Drawing Title

Air Quality Assessment
Elsenham Woods SSSI Nutrient Nitrogen Cumulative Percent Change

Scale at A3

1:4,000

Drawn	
UKLFS001	

Stage 1 check	Stage 2 check	Originated	Date
XX	XX	XX	04/10/2022

BLOOR HOMES

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Drawing Number

Figure G-8

Created by: UKLFS001 - 2022-10-04 13:12:03 - C:\Work\Elsenham\06 GIS\01 Live Drgs\qgis\Contours.qgs

Figure G-9 - Street Canyons

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Legend

- Affected Road Network
- Street Canyons
- OS Openmap Local Buildings

Revision Details	By / Check	Date	Suffix

Drawing Status

FINAL

Job Title

Bloor Homes Limited
Land East of Station Road, Elsenham (Phase II)

Drawing Title

Air Quality Assessment
Street Canyons 1 of 3

Scale at A3

1:6,000

Drawn

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Stage 1 check	Stage 2 check	Originated	Date
XX	XX	XX	04/10/2022

BLOOR HOMES

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Drawing Number

Figure G-9

Created by: UKLFS001 - 2022-10-04 13:08:05 - C:\Work\Elsenham\06 GIS\01 Live Drgs\qgs\Canyons.qgs

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Legend

- Red Line Boundary
- Affected Road Network
- Street Canyons
- OS Openmap Local Buildings

Revision Details	By / Check	Date	Suffix

Drawing Status: FINAL

Job Title: Bloor Homes Limited, Land East of Station Road, Elsenham (Phase II)

Drawing Title: Air Quality Assessment, Street Canyons 2 of 3

Scale at A3: 1:6,000

Drawn: UKLFS001

Stage 1 check	Stage 2 check	Originated	Date
XX	XX	XX	04/10/2022

BLOOR HOMES

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Drawing Number: Figure G-9

Created by: UKLFS001 - 2022-10-04 13:08:10 - C:\Work\Elsenham\06 GIS\01 Live Drgs\qgs\Canyons.qgs

Legend

- Red Line Boundary
- Affected Road Network
- Street Canyons
- OS Openmap Local Buildings

Revision Details	By / Check	Date	Suffix

Drawing Status

FINAL

Job Title

Bloor Homes Limited
Land East of Station Road,
Elsenham (Phase II)

Drawing Title

Air Quality Assessment
Street Canyons 3 of 3

Scale at A3

1:30,000

Drawn	
UKLFS001	

Stage 1 check	Stage 2 check	Originated	Date
XX	XX	XX	04/10/2022

BLOOR HOMES

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Drawing Number

Figure G-9

3 Wellington Place
Leeds
LS1 4AP

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