

12. Noise and Vibration

12.1 Introduction

- 12.1.1 This chapter of the proposed development reports the findings of an assessment of the likely significant effects on noise and vibration as a result of the proposed A40 Smart Corridor (hereafter referred to as the 'proposed development') in Oxfordshire. It details the methodology followed for the assessment, summarises the regulatory and policy framework related to noise and vibration, and describes the existing environment in the area surrounding the proposed development. Following this, the design, mitigation and residual effects of the proposed development are discussed, along with the limitations of the assessment.
- 12.1.2 This chapter concerns the potential noise and vibration effects resulting from the proposed development. Human health impacts are reported in the population and health assessment (see *ES Volume I Chapter 14: Population and Human Health*). Noise impacts on cultural heritage assets have been considered as part of the cultural heritage assessment (see *ES Volume I Chapter 9: Cultural Heritage*), any impacts on tranquillity have been considered in the landscape assessment (see *ES Volume I Chapter 11: Landscape and Visual*), whilst impacts on ecologically sensitive receptors as part of the biodiversity assessment (see *ES Volume I Chapter 7: Biodiversity*), incorporating data produced as part of the noise and vibration assessment.
- 12.1.3 The potential for effect interactions on a single receptor ('in-combination effects') and combined cumulative noise and vibration effects are discussed in *ES Volume I Chapter 16: Cumulative Effects*.

12.2 Legislation and Planning Policy Context

- 12.2.1 This assessment has been undertaken taking into account relevant legislation and guidance set out in national, regional and local planning policy (summarised in the sections below).

National Legislation

Environmental Noise (England) Regulations

- 12.2.2 Directive 2002/49/EC, known as the Environmental Noise Directive (hereafter referred to as the END) (Ref 12-1), is transcribed into UK legislation by the Environmental Noise (England) Regulations (Ref 12-2) and sets out the requirement for the strategic noise mapping of major roads, railways, airports and agglomerations (urbanised areas with over 100,000 inhabitants) across the UK every five years. The aims of the END are to define a common approach in order to avoid, prevent or reduce the harmful effects of environmental noise. The mapping includes the A40 and A34 within the vicinity of the proposed development. Round 3 of the noise mapping process was completed in 2017 and published in 2019.
- 12.2.3 Noise Important Areas (NIAs), which are those areas most exposed to noise, have been identified in Noise Action Plans, published by Defra (Ref 12-3) and (Ref 12-4), that are informed from the strategic noise mapping process. The END also contains provisions for Local Authorities to propose 'quiet areas' for formal designation. Such areas should be quiet or relatively quiet, and generate significant benefits (in terms of health, wellbeing, and quality of life) for the communities they serve because of their quietness.

Land Compensation Act 1973

- 12.2.4 In general, noise and vibration are recognised as both a common law nuisance (either private or public) and a statutory nuisance. However, this does not apply to noise and vibration from road traffic. As a result, in the UK, the Land Compensation Act 1973 (Ref 12-5) and the Noise Insulation Regulations 1975 (as amended 1988) (Ref 12-6) are used in respect of road traffic noise.
- 12.2.5 The Land Compensation Act 1973 Part I provides a means by which compensation can be paid to owners of land or property which has experienced a loss in value due to the use of public works, such as new or altered roads. Noise and vibration are two of the factors which would be considered in any

claims for compensation; however, the claim should consider all changes and effects, including betterment.

Noise Insulation Regulations 1975 (as amended 1988)

- 12.2.6 The Noise Insulation Regulations 1975 were made under Part II of the Land Compensation Act 1973. These regulations set out the duty (Regulation 3) and power (Regulation 4) for the relevant Highway Authority to undertake or make a grant in respect of the cost of undertaking noise insulation work in eligible buildings affected by a new or altered highway. This is subject to meeting a range of criteria on road traffic noise levels as specified in the Regulations. Regulation 5 also provides a discretionary power to undertake or make a grant in respect of the cost of undertaking noise insulation work in eligible buildings with respect to construction noise.

Control of Pollution Act 1974

- 12.2.7 Under Section 60 of the Control of Pollution Act 1974 (CoPA) (Ref 12-7), the local authority can serve a notice specifying how construction works should be carried out, including working hours and noise/vibration limits. Breaching the terms of the notice is an offence.
- 12.2.8 Section 61 of the CoPA can be used by a contractor completing demolition or construction works to apply to the local authority for 'prior consent' in advance of works. Complying with the requirements of the Section 61 prior consent acts as a defence against a Section 60 notice. The application must detail how noise and vibration is to be managed on-site based on the principles of Best Practicable Means (BPM).

National Planning Policy and Guidance

- 12.2.9 The following planning guidance and legislation has been taken into account as part of identifying the assessment methodology, receptor selection and sensitivity, potential significant environmental effects and mitigation:
- National Planning Policy Framework (NPPF) (Ref 12-8);
 - Noise Policy Statement for England (NPSE) (Ref 12-9); and
 - Web-based resource "Planning Practice Guidance on Noise" (PPG-N) (Ref 12-10).

National Planning Policy Framework

- 12.2.10 At a national level, the UK Government published the National Planning Policy Framework (NPPF) in 2012. The NPPF supersedes previous national planning policy guidance (PPGs) and planning policy statements (PPSs). The NPPF summarises in a single document the Government planning policies for England, and how these are expected to be applied. The NPPF was revised in July 2021 (Ref 12-1), superseding the previous update published in February 2019. The NPPF states that planning policies and decisions should *"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. In doing so they should:*

a) mitigate and reduce to a minimum, potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."

- 12.2.11 With regards to 'adverse impacts' and 'significant adverse impacts', the NPPF refers to the NPSE.

Noise Policy Statement for England

- 12.2.12 The Explanatory Note to the NPSE informs the assessment methodology in terms of the guidance on *adverse impacts* and *significant adverse impacts* through the introduction of the following concepts:
- No Observed Effect Level (NOEL): the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;

- Lowest Observed Adverse Effect Level (LOAEL): the level above which adverse effects on health and quality of life can be detected; and
 - Significant Observed Adverse Effect Level (SOAEL): the level above which significant adverse effects on health and quality of life occur.
- 12.2.13 The NPSE sets out the governments Noise Policy Vision to: *“Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development”*.
- 12.2.14 The long-term vision is supported by the Noise Policy Aims: *“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*
- *avoid significant adverse impacts on health and quality of life;*
 - *mitigate and minimise adverse impacts on health and quality of life; and*
 - *where possible, contribute to the improvement of health and quality of life.”*
- 12.2.15 At the time of writing, The NPSE recognises that ‘*it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations*’. The levels are likely to be different for different noise sources, for different receptors and at different times of the day, therefore the assessment methodology outlines the proposed LOAEL and SOAEL for each potential impact. The setting of these levels has been informed by the additional guidance in the PPG-N.

Planning Practice Guidance on Noise

- 12.2.16 The web-based resource Department for Communities and Local Government PPG-N supports the NPPF. The guidance provides additional details on the concepts of NOEL, LOAEL and SOAEL in terms of the perception of noise at each level, example outcomes due to noise at each level, and the action which should be considered at each level, as detailed in Table 12-1, which is based on the guidance. It also introduces the additional concepts of No Observed Adverse Effect Level (NOAEL) and Unacceptable Adverse Effect Level (UAEL).

Table 12-1: Planning Practice Guidance on Noise – Noise Exposure Hierarchy

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that	Observed Adverse Effect	Mitigate and reduce to a minimum

there is a small actual or perceived change in the quality of life.

Significant Observed Adverse Effect Level

<i>Present and disruptive</i>	<i>The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.</i>	<i>Significant Observed Adverse Effect</i>	<i>Avoid</i>
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Unacceptable Adverse Effect Level

<i>Present and very disruptive</i>	<i>Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening, loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.</i>	<i>Unacceptable Adverse Effect</i>	<i>Prevent</i>
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Local Planning Policy and Guidance

West Oxfordshire Local Plan 2011-2031, adopted 2018

- 12.2.17 At the time of writing, the development plan for Eynsham currently consists of The West Oxfordshire Local Plan (Ref 12-11). This was adopted on 27 September 2018 and sets out the overall planning framework for the district from 2011 to 2031.
- 12.2.18 The plan considers noise in a number of areas, including Policy EH2 which states that:
- “Proposed development should avoid causing pollution, especially noise and light, which has an adverse impact upon landscape character and should incorporate measures to maintain or improve the existing level of tranquillity...”*
- 12.2.19 Additionally, Paragraph 8.73 identifies the A40 as a significant source of noise and states that *“Wherever possible, significant and intrusive sources of noise should be kept away from property and areas sensitive to noise.”*
- 12.2.20 Policy EH8 states that *“Housing and other noise sensitive development should not take place in areas where the occupants would experience significant noise disturbance from existing or proposed development. New development should not take place in areas where it would cause unacceptable nuisance to the occupants of nearby land and buildings from noise or disturbance.”*

Cherwell Local Plan 2011-2031, adopted 2016

- 12.2.21 The Adopted Cherwell Local Plan 2011-2031 (Part 1) (Ref 12-12) contains strategic planning policies for development and the use of land. It forms part of the statutory Development Plan for Cherwell District Council (CDC) to which regard must be given in the determination of planning applications.
- 12.2.22 Cherwell's development plan also includes saved policies from the 1996 Cherwell Local Plan (Ref 12-13), which were saved in 2007.
- 12.2.23 Matters of relevance to the noise assessment include:

Policy BSC 8, Paragraph B.145 states that “*Planning decisions can have an effect on travel to work, schools, noise and air quality, access to services, climate change and social networks which can all contribute to health and well-being.*”

Oxford Local Plan 2036

- 12.2.24 The Oxford Local Plan 2036, adopted on the 8th June 2020 (Ref 12-14), and linked to the City Council’s Oxford Vision 2050, gives consideration to how best to address the development challenges in Oxford including giving due consideration to the environment.
- 12.2.25 In particular Policy RE8 specifically addresses noise and vibration and states that:
- “Planning permission will not be granted for development sensitive to noise in locations which experience high levels of noise, unless it can be demonstrated, through a noise assessment, that appropriate attenuation measures will be provided to ensure an acceptable level of amenity for end users and to prevent harm to the continued operation of existing uses.”*

Eynsham Neighbourhood Plan 2018-2031, adopted 2020

- 12.2.26 A Neighbourhood Plan has been adopted for Eynsham (Ref 12-15), which runs from 2018 until 2031 to align with the end dates of the West Oxfordshire Local Plan 2031.
- 12.2.27 The Eynsham Neighbourhood Plan, submitted to West Oxfordshire District Council for inspection in December 2018, makes reference to noise in Policy ENP7 on Sustainable Transport. It states that: “*Link Roads between main roads or connecting main roads to residential streets intended for more than 20 mph use shall have pedestrian and cycle paths where appropriate and suitable noise-reduction measures to protect residents from noise pollution.*”
- 12.2.28 The plan also highlights, in Appendix A, Eynsham Parish Council’s desire for air and noise monitoring close to the A40.

Other Relevant Policy, Standards and Guidance

Oxfordshire Local Transport Plan 2015-2031

- 12.2.29 The Oxfordshire Local Transport Plan 2015-2031 (Ref 12-16) recognises the issue of traffic noise, stating that: “*Growing road traffic levels risk a deterioration in quality of life for many residents, for example due to noise...*”. It also acknowledges that developments may necessitate a detailed assessment of noise impacts.

12.3 Consultation

- 12.3.1 The EIA Scoping Report was submitted in March 2021 and the OCC Scoping Opinion was received in April 2021, these documents are provided in *ES Volume II Appendix 2-A and 2-B*. A summary of the noise and vibration related response is included in Table 12-2.

Table 12-2: Comments raised in Scoping Opinion

Comments Raised	Response Provided in the ES / Planning Application
WODC EHO requesting operational vibration is scoped into the assessment. (WODC EHO)	<p>Noted. AECOM contacted the WODC EHO to discuss the scope of the operational noise assessment. It was agreed that as the maintained road surface will be free of irregularities (meaning that operation vibration will not have the potential to lead to significant adverse effects) and since the vibration calculation methodology requires information that may only be available at detailed design stage, that the operational vibration assessment could only include high level commentary:</p> <ul style="list-style-type: none"> That the road surfaces used for the dualling and bus lane should free from the levels of imperfection that

could give rise to vibration impacts from traffic (e.g. no potholes etc)

- If vibration from existing roads outside the scheme corridor is not an issue already, it will not be expected to become an issue as a result of some traffic redistribution.

WODC responded on Fri 23 Apr 2021 confirming that this approach was suitable.

Whilst there is only one residential property in our district near to the proposed road upgrade this should not be overlooked in terms of noise or vibration impacts. I therefore request that noise from both the operational and construction phases are scoped into the EIA. (CDC Environmental Protection)

A qualitative construction noise and vibration assessment, quantitative construction traffic noise assessment and a quantitative operational traffic noise assessment have been scoped into the assessment.

- 12.3.2 The approach to the construction assessment, operational vibration assessment and the 2021 noise monitoring survey has been discussed and agreed with West Oxfordshire District Council (WODC) as the overwhelming majority of the noise and vibration study area, and all baseline monitoring sites, are situated within their district.

12.4 Assessment Methodology

- 12.4.1 This section of this ES chapter presents the following:

- Information sources that have been consulted throughout the preparation of this chapter
- The methodology used to identify the likely noise and vibration effects due to construction and operation of the proposed development
- An explanation as to how the identification and assessment of potential noise and vibration effects has been reached; and
- The significance criteria and terminology for the assessment of residual noise and vibration effects.

- 12.4.2 The proposed scope and methodology of the assessment is based on the DMRB guidance set out within *DMRB LA 111 Noise and vibration Revision 2* ('*DMRB LA 111 Noise and vibration*') (Ref 12-17).

Methodology for Determining Baseline Conditions and Sensitive Receptors

Baseline conditions

- 12.4.3 A baseline sound survey was undertaken in November and December 2018 at six locations in the vicinity of a nearby proposed development. Monitored noise levels at these locations, primarily close to the A40 in the vicinity of Eynsham, were reported as part of the ES supporting a previous planning application for the proposed Eynsham Park and Ride and Bus Lane Scheme submitted by Oxfordshire County Council (OCC) in May 2019. A further survey was undertaken in June 2021 at three locations in the vicinity of Barnard Gate, although the primary purpose of the latter was to collect information to support the assessment of potential future claims under Part 1 of the Land Compensation Act 1973.
- 12.4.4 These monitoring locations are shown on Figure 12-1 and the results of the survey are presented in section 12.5 of this ES chapter.
- 12.4.5 Baseline conditions at these monitoring locations have also been modelled from traffic data and compared to the survey results to help inform the validity of the traffic noise model. Future baseline conditions are described through calculation of traffic noise levels at noise sensitive receptors (NSRs) within the study area, based on a Future Do Minimum scenario. These baseline conditions are presented in section 12.5 of this ES chapter.
- 12.4.6 Specific information on existing and future road surfacing as provided by the OCC Highways Team has been incorporated into the traffic noise modelling during the assessment.

Study area

Construction

- 12.4.7 In terms of the study area for construction noise impacts, *DMRB LA 111 Noise and vibration* states that “300 m from the closest construction activity is normally sufficient to encompass noise sensitive receptors”. At this stage, there is no detailed information available regarding the construction methods and location of plant, therefore it assumed that the 300 m construction noise study area from the proposed development is appropriate.
- 12.4.8 The guidance in *DMRB LA 111 Noise and vibration* for the study area for construction vibration impacts is 100m from the construction activities. At this stage, again due to lack of information about construction methods, 100m study area for construction vibration assessment is considered appropriate.
- 12.4.9 For the construction traffic assessment, *DMRB LA 111 Noise and vibration* requires a study area of 50m from any existing roads identified as being potentially affected to be identified. Affected roads are defined as roads where the addition of construction traffic will potentially increase the Calculation of Road Traffic Noise (CRTN) (Ref 12-18) basic noise level (BNL) of existing traffic by 1 dB or more. In addition, where the project requires full carriageway closures at night (23:00 to 07:00), an additional “diversion route study area shall be defined to include a 25m width from the kerb line of the diversion route”.
- 12.4.10 However, there is no information currently available on construction traffic flows and routes or diversion routes due to construction of the proposed development. Therefore, it is not possible to define the study area associated with construction traffic impacts or determine the impacts of construction traffic and diversion routes from the construction of the proposed development.

Operation

- 12.4.11 For the operational traffic noise assessment, the study area comprises an area 600m from the proposed development and the existing roads which are physically altered by it. No additional areas beyond 600m have been identified to be included. This ‘calculation area’ is shown on Figure 12-1. Additional areas that will also be included in the study area will be areas within 50m of other road links that are predicted to be subject to a change in traffic noise level as a result of the proposed development of:
- 1 dB or more in the short term (Do-Minimum opening year to Do-Something opening year); or
 - 3 dB or more in the long term (Do-Minimum opening year to Do-Something 15 years after opening), subject to a minimum change of 1 dB between the Do-Minimum and Do-Something 15 years after opening.
- 12.4.12 These ‘affected routes’ have been identified by analysis of the traffic data using the CRTN BNL to determine the likely change in traffic noise levels. The identification of these affected routes has considered all surrounding existing roads with 18-hour (06:00-00:00) weekday traffic flows above the 1,000-lower cut-off from the CRTN prediction methodology in all scenarios.

Sensitive receptors

- 12.4.13 Sensitive receptors that are most likely to be affected by the proposed development have been determined from a range of data sources including OS mapping and OS AddressBase data. *DMRB LA 111 Noise and vibration* defines residential properties, educational buildings, medical buildings, community facilities (such as places of worship), quiet areas or potential quiet areas, designated ecological sites (such as SAC, SPA and SSSI), cultural heritage assets (such as scheduled monuments (SM)) and Public Rights of Way (PRoW) as potentially sensitive to noise. Commercial uses such as offices and industrial premises are not normally considered to be noise sensitive.

Methodology for Determining Construction Impacts

Construction noise

- 12.4.14 As the construction of the proposed development will be the responsibility of the appointed contractor, detailed information on the construction activities, programme or number and type of construction plant is still to be confirmed. Therefore, detailed construction noise predictions at specific NSRs have not been possible. Instead, as agreed with WODC, a qualitative assessment has been adopted, focussing on the guidance in BS 5228:2009+A1:2014 ‘Code of practice for noise and vibration control on construction and open sites’ (Ref 12-19), considering the proximity of receptors to the works, the potential works involved, potential working hours/duration, existing noise levels from the baseline measurement survey, and best practice mitigation measures.

- 12.4.15 *DMRB LA 111 Noise and vibration* uses the 'ABC' method as described in Annex E of BS 5228-1 for identifying the threshold of potentially significant construction noise effects. This approach is based on setting the threshold for the onset of potentially significant adverse effects (i.e. the SOAEL) depending on the existing ambient noise level, receptors with low existing ambient noise levels (Category A) have a lower threshold than those with high existing ambient noise levels (Category C). Higher thresholds are set for normal daytime construction working hours, compared to the more sensitive evening, weekend and night-time periods. As a conservative approach, *DMRB LA 111 Noise and vibration* sets the threshold for the onset of any adverse effect (i.e. the LOAEL) at a construction noise level equal to the existing ambient noise levels. Construction noise levels between the LOAEL and SOAEL have the potential to result in adverse noise effects but would not normally be classed as significant adverse effects. However, noise mitigation measures are still considered and applied in such locations to seek to keep all noise effects to a minimum. Table 12-3 which is adapted from Table E.1 in BS 5228 sets out the construction noise SOAEL and LOAEL used for this assessment.

Table 12-3: Construction noise LOAEL and SOAEL for sensitive receptors

Time of Day	SOAEL $L_{Aeq,T}$ dB (façade)			LOAEL $L_{Aeq,T}$ dB (façade)
	A ¹	B ²	C ³	
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75	Existing ambient
Evenings (19:00 – 23:00 weekdays) and Weekends (13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays)	55	60	65	Existing ambient
Night-time (23:00 – 07:00)	45	50	55	Existing ambient

¹ Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values

² Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as the category A values

³ Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than the category A values

NOTE: if the ambient noise level exceeds the Category C threshold values then the SOAEL and LOAEL are defined as equal to the existing ambient

Construction vibration

- 12.4.16 A number of construction activities, such as earthworks requiring vibratory rollers, may lead to vibration impacts experienced by nearby sensitive receptors. The passage of vibration through the ground is highly dependent on site-specific ground conditions. BS 5228 provides a range of measured historical data for a variety of different construction works.
- 12.4.17 For human receptors BS 5228-2 defines a Peak Particle Velocity (PPV) of 0.3 mms^{-1} (millimetres per second), as being the point at which construction vibration is likely to become perceptible and a PPV of 1.0 mms^{-1} , as being the level at which construction vibration can be tolerated with prior warning. Therefore, and in accordance with *DMRB LA 111 Noise and vibration*, these levels are defined as the LOAEL and SOAEL, respectively, for construction vibration.
- 12.4.18 In addition to human annoyance, building structures may be damaged by high levels of vibration. BS 7385-2 (Ref 12-20) states that for transient vibration, such as from individual impacts, the probability of building damage tends towards zero at levels less than 12.5 mms^{-1} PPV. For continuous vibration, such as from vibratory rollers, the threshold is around half this value. It is also noted that these values refer to the likelihood of cosmetic damage. Minor damage is described as occurring at a vibration level twice that of cosmetic damage and major damage at a vibration level twice that of minor damage. The levels of vibration that may cause building damage are far in excess of those that may cause annoyance. Consequently, if vibration levels within buildings are controlled to those relating to annoyance (i.e. 1.0 mms^{-1}), then it is highly unlikely that buildings would be damaged by construction vibration.

Methodology for Determining Operational Impacts

Operational noise

- 12.4.19 Traffic noise levels have been calculated using Calculation of Road Traffic Noise (CRTN) with modifications to determine the traffic noise change due to the Scheme for:

- a. Short term: Do-Minimum Opening Year (DM 2024) compared against the Do-Something Opening Year (DS 2024).
 - b. Long-term: Do-Minimum Opening Year (DM 2024) compared against the Do-Something Future Year (DS 2031).
 - c. Non-project noise change: Do-Minimum Opening Year (DM 2024) compared against the Do-Minimum future year (DM 2031).
- 12.4.20 Noise from a flow of road traffic is generated by both the vehicle engines and the interaction of tyres with the road surface. The traffic noise level at a receptor, such as an observer at the roadside or residents within a property, is influenced by a number of factors including traffic flow, speed, composition (percentage of heavy duty vehicles (HDV) greater than 3.5 tonnes), road gradient, the type of road surface, the distance from the road and the presence of any obstructions between the road and the receptor.
- 12.4.21 Noise from a stream of traffic is not constant, but to assess the traffic noise impact a single figure estimate of the overall noise level is necessary. The index adopted by CRTN to assess traffic noise is $L_{A10,18h}$. This value is determined by taking the highest 10% of noise readings in each of the 18 one-hour periods between 06:00 and 00:00, and then calculating the arithmetic mean.
- 12.4.22 The CRTN methodology applies a 'low flow' correction between 18-hour vehicle flows of 1,000 and 4,000. The low flow correction procedure amplifies the impact of changes in traffic flows that are already low, in particular at receptors very close to the road. The 1,000 18-hour flow cut off is the lower limit of the reliability of the CRTN prediction methodology.
- 12.4.23 Although the main focus of the assessment is on daytime impacts, *DMRB LA 111 Noise and vibration* also requires an assessment of night-time traffic noise levels using the parameter $L_{night,outside}$, which is the traffic noise level over the period 23:00 to 07:00. However, this parameter is not calculated by the standard CRTN methodology. *DMRB LA 111 Noise and vibration* refers to three methods for calculating night-time traffic noise levels developed by TRL (Ref 12-21). 'Method 3', which factors the $L_{night,outside}$ from the $L_{A10,18h}$, is based on the typical diurnal pattern of traffic flows in the UK and provides reliable results for most UK roads. This method has been used to derive $L_{night,outside}$ reported in this assessment.
- 12.4.24 Predicted daytime and night-time traffic noise levels at noise sensitive receptors within the calculation area have been generated using noise modelling software. Predictions have been carried out for the opening year (2024) and future year (2031) for the Do-Minimum (Without Scheme) and Do-Something (with Scheme) scenarios. The model is based on traffic data generated by a traffic model of the Scheme and the surrounding area. The traffic flow and % HDV are taken directly from the traffic model. However, the traffic speeds are subject to a process called 'speed pivoting', as required by *DMRB LA 111 Noise and vibration* which adjusts the modelled speed based on measured speed data.
- 12.4.25 The noise level predictions have also been corrected to account for the effect of the road surface types which will be in place in the different scenarios. The model also includes the ground topography, ground type and buildings to form a 3D representation of the study area.
- 12.4.26 The approach to road surfacing and its effects on traffic noise levels as set out in *DMRB LA 111 Noise and vibration* has been adopted in the assessment. As such, the impact of the road surface is only modelled at mean traffic speeds $\geq 75\text{km/h}$. This only occurs on the dualling section which has been assumed to be surfaced with a Hot Rolled Asphalt (HRA) material. The potential benefits of using a Stone Mastic Asphalt (SMA) surface material, planned for the IBL section, are discussed qualitatively where appropriate.
- 12.4.27 For road links more remote from the proposed development (i.e. outside the 600m study area), *DMRB LA 111 Noise and vibration* recommends an assessment based on the change in the CRTN BNL (i.e. the traffic noise level at 10m from the kerb), taking into account the flow, composition, speed and road surface.
- 12.4.28 Different façades of the same property can experience different changes in traffic noise level depending on their orientation to the noise source. *DMRB LA 111 Noise and vibration* requires that the assessment is based on the façade that experiences the greatest magnitude of change i.e. the largest numerical change whether this is an increase or decrease. Where this change is equal on more than one façade, the façade experiencing the highest DS traffic noise level is chosen.

- 12.4.29 The SOAEL and the LOAEL used in the assessment for road traffic noise has been defined in Table 3.49.1 in *DMRB LA 111 Noise and vibration*. This has been reproduced in Table 12-4.

Table 12-4: Operational LOAEL and SOAEL for sensitive receptors

Time period	SOAEL	LOAEL
Daytime	68 dB $L_{A10,18h}$ (façade)	55 dB $L_{A10,18h}$ (façade)
	63 dB $L_{Aeq,16h}$ (free-field)	50 dB $L_{Aeq,16h}$ (free-field)
Night	55 dB $L_{night,outside}$ (free-field)	40 dB $L_{night,outside}$ (free-field)

- 12.4.30 For daytime, the SOAEL is set at 68 dB $L_{A10,18h}$ (façade), which is consistent with the daytime trigger level in The Noise Insulation Regulations 1975 (Ref 12-6). The Noise Insulation Regulation threshold has a history of use in UK noise policy as it has previously been incorporated into planning guidance on the acceptability of sites for new residential developments. It is the external level that corresponds to an internal level with a closed single glazed window, which would meet the internal daytime criteria of 35 dB $L_{Aeq,16h}$ specified in BS 8233 (Ref 12-22) as desirable for resting in living rooms. It also correlates with the results of Defra Study NANR316 (Ref 12-23) and is supported by the guidance in the Professional Practice Guidance: Planning and Noise produced by the Association of Noise Consultants, Institute of Acoustic and Chartered Institute of Environmental Health (Ref 12-24).
- 12.4.31 The daytime LOAEL is set at 50 dB $L_{Aeq,16h}$ (free-field), based on the guidance provided in the 1999 World Health Organisation (WHO) Guidelines for Community Noise regarding the onset of moderate community annoyance (Ref 12-25). The WHO published the Environmental Noise Guidelines for the European Region in 2018 (Ref 12-26) which provides guidelines for specific noise sources including road traffic. These guidelines suggest a recommended 53 dB L_{den} for road traffic noise (note L_{den} correlates approximately to $L_{A10,18h}$) based on a 10% risk of being Highly Annoyed. The guidelines state they are “not meant to identify effect thresholds”. Instead, they are based on the “smallest relevant risk increase” for various effects, and therefore lie slightly above the LOAEL. On this basis a LOAEL of 50 dB $L_{Aeq,16h}$ (free-field) is consistent with the latest WHO Guidelines.
- 12.4.32 For night-time, the SOAEL is set at 55 dB $L_{night,outside}$ (free field), which corresponds to an internal level with a closed single glazed window, which would be slightly below the night time criteria of 30 dB $L_{Aeq,8h}$ specified in BS 8233 as desirable for sleeping in bedrooms. It also correlates well with the results of Defra Study NANR316 (Ref 12-23) and is supported by the Professional Practice Guidance: Planning and Noise guidance (Ref 12-24). The WHO 2009 Night Noise Guidelines for Europe (Ref 12-26) explicitly identify the night-time LOAEL as 40 dB $L_{Aeq,8h}$ (free-field). Therefore, this LOAEL has been adopted in the assessment. Levels between 40 and 55 dB are identified in the guidelines as ‘adverse’ but not significant adverse, where health effects are observed among the exposed population. 55 dB is identified in the guidelines as when the risk of cardiovascular disease increases.
- 12.4.33 The 2018 WHO Guidelines complement the WHO 2009 Night Noise Guidelines for Europe and suggest a recommended 45 dB L_{night} for road traffic noise based on a 3% risk of being Highly Sleep Disturbed. However, as discussed above the 2018 WHO guidelines state they are “not meant to identify effect thresholds”. Instead, they are based on the “smallest relevant risk increase” for various effects, and therefore lie slightly above the LOAEL, as explicitly defined in the WHO 2009 Night Noise Guidelines for Europe.
- 12.4.34 The operational road traffic noise SOAELs and LOAELs have been used successfully for numerous road schemes in recent years. The same approach to the setting of SOAELs and LOAELs the been adopted on other major infrastructure schemes such as the High Speed 2 rail project.
- 12.4.35 No special circumstances have been identified for the proposed development that suggest an alternative SOAEL or LOAEL should be adopted.
- 12.4.36 A preliminary indication of any properties likely to qualify under the Noise Insulation Regulations has been made. A full assessment will be completed once the detailed design of the proposed development is finalised and in accordance with the timescales set out in the Noise Insulation Regulations.

Significance Criteria

Significance of effect - construction

- 12.4.37 The key factors in identifying whether construction noise will result in significant effects are the magnitude of the impact and the duration. The magnitude of the impact is considered on a scale from negligible to major, as detailed in Table 3.16, Table 3.17 and Table 3.33 of *DMRB LA 111 Noise and vibration* for construction noise, construction traffic noise and construction vibration respectively, reproduced in Table 12-5.

Table 12-5: Construction magnitude of impact

Magnitude of impact	Construction noise level	Construction traffic noise increase in BNL	Construction vibration level
Major	Above or equal to the SOAEL +5 dB	Greater than or equal to 5 dB	Above or equal to 10 mms ⁻¹ PPV
Moderate	Above or equal to the SOAEL and below +5 dB	Greater than or equal to 3 dB and less than 5 dB	Above or equal to the SOAEL and below 10 mms ⁻¹ PPV
Minor	Above or equal to the LOAEL and below the SOAEL	Greater than or equal to 1 dB and less than 3 dB	Above or equal to the LOAEL and below the SOAEL
Negligible	Below LOAEL	Less than 1 dB	Below LOAEL

- 12.4.38 With regards to duration, *DMRB LA 111 Noise and vibration* states that construction noise, construction traffic noise or construction vibration will constitute a significant effect where a major or moderate magnitude of impact will occur for a duration of:

- 10 or more days (or evenings/weekends or nights) in any 15 consecutive days; or
- more than 40 days (or evenings/weekends or nights) in any 6 consecutive months.

- 12.4.39 As detailed information on construction activity durations is not available, a conservative judgement has been made of the likelihood of the duration criteria being exceeded based on the available information.

Significance of effect - operation

- 12.4.40 *DMRB LA 111 Noise and vibration* provides two classifications for the magnitude of the operational traffic noise impact of a proposed road scheme, in Table 3.54a and 3.54b, reproduced in Table 12-6. These relate to short-term changes in noise levels (i.e. comparing traffic noise levels in the opening year with and without the proposed development) and long-term changes in noise levels (i.e. comparing traffic noise levels in the opening year without the proposed development with levels in the design year with the proposed development in operation).

Table 12-6: Magnitude of operational traffic noise impacts

Short-term change		Long-term change	
Noise level change (rounded to 0.1dB) L _{A10,18h} dB	Magnitude of impact	Noise level change (rounded to 0.1dB) L _{A10,18h} dB	Magnitude of impact
0	No Change	0	No Change
0.1 – 0.9	Negligible	0.1 – 2.9	Negligible
1.0 – 2.9	Minor	3.0 – 4.9	Minor
3.0 – 4.9	Moderate	5.0 – 9.9	Moderate
5.0+	Major	10.0+	Major

- 12.4.41 As proposed in *DMRB LA 111 Noise and vibration*, an initial identification of significant effects has been carried out based on the magnitude of change in traffic noise levels due to the proposed development in the short term.
- 12.4.42 Negligible changes in the short term will not cause changes to behaviour or response to noise, and as such, will not give rise to significant effects. For minor, moderate and major changes *DMRB LA 111 Noise and vibration* outlines a range of additional factors which will be considered in identifying significant effects:
- where the magnitude of change in the short-term lies relatively close to the boundaries between the change classifications. In some circumstances a change within 1 dB of the top of the minor range may be appropriate to be considered a likely significant effect. Conversely a change within 1 dB of the bottom of the moderate range, may in some circumstances be more appropriate to be considered as not a likely significant effect;
 - if the magnitude of change in the long-term is different to that in the short-term. If the short-term change is minor (not significant), but the long-term change is moderate (significant) it may be more appropriate to be considered as a likely significant effect. Conversely, a smaller magnitude of change in the long term compared to the short term may indicate that it is more appropriate to be considered as not a likely significant effect;
 - the absolute noise levels relative to the SOAEL. If the DS traffic noise levels are high i.e. above the SOAEL, a traffic noise change in the short-term opening year of 1.0 dB or more may be more appropriate to be considered as a likely significant effect;
 - the location of noise sensitive parts of a receptor. A receptor may contain areas which are more or less sensitive than others e.g. office spaces or kitchens in a school would be considered less sensitive than classrooms. Or a residential property may have no windows/doors on the façade expected to experience the highest magnitude of change in noise level. Alternatively, a receptor may be particularly vulnerable, such as a school for hearing impaired children, or a residential property may have most of the windows/doors on the most affected façade;
 - the acoustic context. If the proposed development changes the acoustic character of an area. If a scheme introduces road noise into an area where road noise is not currently a major source, it may be appropriate to conclude a minor short-term change is a likely significant effect; and
 - the likely perception of a traffic noise change. If the proposed development results in obvious changes to the landscape or setting of a receptor it is likely the traffic noise level changes would be more acutely perceived, and it may be more appropriate to conclude a minor short-term change is a likely significant effect. Conversely if the proposed development is not visible it can be more appropriate to conclude a moderate change is not a likely significant effect.

Policy compliance

- 12.4.43 With regard to significant policy effects, the traffic noise SOAEL and LOAEL have been used to consider how the proposed development complies with the policy aims detailed in the NPSE as referenced by the NPPF, within the context of government policy on sustainable development, namely to:
- avoid significant adverse impacts on health and quality of life (i.e. reduce traffic noise levels at receptors to below the SOAEL);
 - mitigate and minimise adverse impacts on health and quality of life (i.e. reduce traffic noise levels at receptors which are between the LOAEL and the SOAEL); and
 - where possible, contribute to the improvement of health and quality of life.
- 12.4.44 The three aims, and how the proposed development complies with them are discussed in Section 12.11.

Limitations and Assumptions

- 12.4.45 Specific details of construction plant and programme are not available, therefore only a qualitative assessment of the likely construction noise and vibration impacts has been possible at this stage, using professional judgement. Typical best practice mitigation measures are described in Section 12.6.
- 12.4.46 The operational noise impacts of the proposed development are dependent upon the traffic data outputs used in the modelling. The traffic modelling is discussed in the Transport Assessment report and any limitations therein will carry over to the assessment of operational noise impacts. In particular it is noted that the modelled traffic data outputs, including developments that form part of the local plan, are provided for the years 2024 and 2031. Therefore, although 2031 is not 15 years after opening as recommended in *DMRB LA 111 Noise and vibration*, it is considered inclusive of the major developments in the area prior to 2039. Further background growth along the A40 corridor between 2031 and 2039 is expected to be minimal since the route will be close to capacity and as such no noticeable changes in road traffic noise are expected over this period.
- 12.4.47 OS Address Base data detailing building usage and OS building height data have generally been used as provided. However, the heights of residential buildings have been standardised, and a limited check for errors (such as buildings with 0m height) has been completed using information available online, such as aerial photography, and adjustments made accordingly.
- 12.4.48 In the absence of a finalised 3-D design for the Joint Bus Lane (IBL), the vertical alignment of this section of the proposed development has been assumed to be at existing ground level.
- 12.4.49 The impact on noise and vibration of the proposed development has been assessed with the Western (developer) roundabout and Eynsham underpass included. A brief discussion of any potential change to the assessment should they not go ahead is provided in paragraphs 12.7.53 and 12.7.54 respectively.
- 12.4.50 All roads in the study area are assumed to be surfaced with standard hot rolled asphalt in all scenarios. Based on the advice in *DMRB LA 111 Noise and vibration*, a road surface correction of -1.0 dB is applied at speeds below 75 km/h and -0.5 dB at and above 75 km/h. It is noted that a SMA material is intended for the IBL section and potentially parts of the dualling and this is taken into account qualitatively when describing potential significant effects in Section 12.7.

12.5 Baseline Conditions

- 12.5.1 The existing noise environment is characterised as follows:
- In the vicinity of all three elements of the proposed development, environmental noise is dominated by traffic on the A40. Some residential receptors in the wider operational noise study area have a noise environment influenced by traffic from other roads as well as the A40. For example, in south Eynsham and north Cassington, traffic on local minor roads contribute to the noise environment and for residents in the vicinity of Wolvercote, traffic on the A34 contribute to the noise environment.
 - A total of 2294 NSR address points have been identified and modelled within the 600 m calculation area. Of these, all but 14 are identified as residential properties, consisting of residential properties located in Barnard Gate, Cassington and Eynsham, as well as isolated properties located close to the existing A40 to the west of Barnard Gate and to the north of Duke's Cut. The 14 other noise sensitive receptors within the 600m calculation area include schools and community facilities, primarily in Eynsham and Cassington. All residential receptors and Jury's Inn have been identified as sensitive to both daytime and night-time traffic noise. All other noise sensitive receptors have been assumed to be occupied during the daytime only.
 - There are seven NIAs for road traffic noise on the A40 within the 600m calculation area, with four of these being within the extents of the proposed development (Figure 12-1). NIA 13253 lies within the A40 Dualling to the west of Barnard Gate; the remaining NIAs lie within the A40 IBL to the north of Eynsham (NIAs 4224 and 4223) and the south of Cassington (NIA 4222). A further three NIAs are located to the east of the proposed development. Two are located on the A44 either side of the junction with the A34 (NIA 4210 and 4211) and the other (13257) located on the A44/A40 to the north west of Oxford.

- No Environmental Noise Directive (END) quiet areas or potential END quiet areas have been identified within the detailed study area. A number of PRow are located in the vicinity including paths crossing the A40 to the west of Cassington and running parallel to the northern edge of the A40 east of Cassington. There is also the Oxford Meadows SAC to the south of the A40 in the vicinity of the A40 IBL and A40 Duke's Cut. The Eynsham Hall Registered Park and Garden lies to the north of the study area in the vicinity of Barnard Gate.
- 12.5.2 Four 'other developments' have been identified through the preparation of the long list for the cumulative assessment (please refer to *ES Volume I Chapter 16: Cumulative Effects* for details). These four developments will be completed and operational prior to construction of the proposed development starting. These are:
- Application 15/03148/OUT: Residential development of up to 160 dwellings (means of access only);
 - Application 17/00609/FUL: Demolition of existing Dutch barns and erection of 10 dwellings together with associated works and formation of vehicular access;
 - Application 16/02369: Extension to existing manufacturing building, erection of two storey manufacturing and office building, two storey research and development building and two storey office building; and
 - Application 16/02667/CM: New weighbridge, five transportable units for use as office, stores and welfare facilities, replacement wheelwash and water storage tanks.
- 12.5.3 Application 15/03148/OUT and Application 17/00609/FUL are included within the Oxfordshire Strategic Model (OSM), and therefore have been considered within the opening year baseline as part of the assessment reported in this chapter. Application 16/02369 and Application 16/02667/CM have not been included within the OSM due to their limited potential to generate significant changes in strategic traffic flows. Therefore, these developments would be unlikely to have a notable impact on the results of this assessment, and so their omission from the opening year baseline assessment is considered acceptable.
- 12.5.4 No existing noise barriers have been identified within the noise modelling area.
- 12.5.5 A baseline noise monitoring survey was completed in November and December 2018 at six locations in the vicinity of a nearby proposed development. Monitored noise levels at these locations, primarily close to the A40 in the vicinity of Eynsham, were reported as part of the ES supporting a previous planning application for the proposed Eynsham Park and Ride and Bus Lane Scheme submitted by OCC in May 2019. They indicated that noise levels close to the A40 were in the range 70-80 dB LA10,18h¹. A further noise monitoring survey was completed between 8th and 18th June 2021 at three locations in the vicinity of Barnards Gate. Although the primary purpose of the latter survey, was to provide supporting information with respect to any potential claims under the Land Compensation Act 1973, these results have been included in Table 12-7.
- 12.5.6 The results of the 2018 and 2021 baseline noise monitoring surveys are presented in Table 12-7 together with predicted noise levels at the same locations derived from noise modelling using 2018 traffic data. For the 2021 surveys, predicted noise levels derived from the 2024 Do-Minimum traffic data are shown in brackets. Locations are shown in Figure 12-1.
- 12.5.7 In Table 12-7, LT-1 to LT-6 and N1 to N3 consist of unattended long-term monitoring over 10 days (note that LT-3 is absent as permission for the stationing of the equipment was not forthcoming from the landowner) and ST-1 consists of a 3-hour attended measurement completed according to the shortened measurement procedure in CRTN.
- 12.5.8 In general, the recorded noise levels during the November 2018 survey are considerably higher than the predicted levels at the same locations. There are three primary reasons for this difference. Firstly, the period of the 2018 monitoring exercise was subject to adverse weather conditions including high winds and rain both of which lead to elevated noise levels. At LT-6, where the predicted and measured noise levels are much closer, the noise monitor was shielded from much of the adverse weather by vegetation. Secondly, the traffic speeds in the traffic model are derived from peak and inter-peak period

¹ The A-weighted noise level exceeded 10% of the time between 06:00 and 00:00 on a weekday.

data and therefore do not include consideration of the off-peak periods when speeds are likely to be higher. This would also lead to predicted traffic noise levels being lower than measured values. Finally, the traffic noise model assumes a default correction in CRTN, equivalent to a new Hot Rolled Asphalt surface, and the existing road surface on the A40 is older than this and therefore likely noisier.

- 12.5.9 For the June 2021 surveys, the predicted and measured levels are closely aligned at N1 and N3, although the predicted level is slightly lower than the measured at N1, with the predicted level approximately 2 dB lower than measured. This difference is likely due to differences between modelled and actual traffic speeds. The difference between the predicted and measured level is greater at N2, with a difference of 4-5 dB being observed. In addition to the potential difference in traffic speed the road surface in the vicinity of N2 is very worn and patched which would lead to higher traffic noise levels at this location. Calculated free-field 2024 Do-Minimum traffic noise levels are shown in Figure 12-2. This plot is based on free-field traffic noise levels at first floor level (4.0m above ground) using a 10m x 10m grid and is provided for illustration purposes.

Table 12-7: Baseline noise levels

Ref.	Monitoring date	Description	Measured $L_{A10, 18h}$ free-field	Predicted traffic noise $L_{A10, 18h}$ free-field
LT-1	November 2018	A40 WB – between P&R and Cuckoo Lane	79 – 80*	74.9
LT-2	November 2018	A40 EB west of P&R	83 – 83*	75.4
LT-4	November 2018	Cuckoo Lane – North of P&R	71 – 73*	64.2
LT-5	November 2018	A40 WB – Eynsham, Spareacre Lane	79 – 81*	73.1
LT-6	November 2018	A40 WB – Eynsham, Hanborough Road	72 – 74*	74.2
ST-1	November 2018	A40 EB – Cassington, east of Eynsham Road	75†	75.1
N1	June 2021	A40 - EB Eynsham Estate Farmland	74-74*	72.0 (71.4)‡
N2	June 2021	A40 EB - Eynsham Estate Woodland	78-79*	73.9 (73.4)‡
N3	June 2021	A40 WB – Land Parcel 36	69-73*	70.3 (69.8)‡

*range of weekday levels over the monitoring period provided

†result derived from 3 hour 'shortened CRTN' measurement taken on the 10th December 2018

‡results derived from 2024 data provided in brackets

Future baseline

- 12.5.10 Table 12-8 summarises the long-term change in predicted traffic noise levels between the 2024 DM and 2031 DM scenarios at NSRs in the calculation area. Further details of these NSRs is provided in paragraphs 12.5.13 to 12.5.15. The results are provided for the ground floor of each residential and non-residential NSR during the daytime and for the top floor at night. These floors have been chosen to represent where residents are likely to be during the day and night-time periods.

Table 12-8: Long term change in predicted Do-Minimum traffic noise levels (DM 2024 to DM 2031)

Change in traffic noise level		Magnitude of impact	Daytime		Night-time	
			Number of residential buildings	Number of other sensitive receptors	Number of residential buildings	Number of other sensitive receptors
Increase in noise level	0.1-2.9	Negligible	2088	14	2091	1
Daytime L _{A10,18h} dB	3.0-4.9	Minor	0	0	0	0
	5.0-9.9	Moderate	0	0	0	0
Night-time L _{night,outside} dB	≥10	Major	0	0	0	0
No change	0	No change	1	0	3	0
Decrease in noise level	0.1-2.9	Negligible	204	0	199	0
Daytime L _{A10,18h} dB	3.0-4.9	Minor	1	0	1	0
	5.0-9.9	Moderate	0	0	0	0
Night-time L _{night,outside} dB	≥10	Major	0	0	0	0

- 12.5.11 The traffic noise changes from DM 2024 to DM 2031 within the 600 m calculation area are presented as a noise difference contour plot in Figure 12-3.
- 12.5.12 The majority (approximately 91%) of residential NSRs within the calculation area would experience a negligible (0.1 - 2.9 dB) increase in daytime and night-time traffic noise levels from 2024 to 2031, in the absence of the proposed development. This is due to the general growth in traffic over time.
- 12.5.13 Approximately 9% of residential NSRs within the calculation area are predicted to experience a negligible (0.1 - 2.9 dB) decrease in daytime and night-time traffic noise levels from 2024 to 2031 in the absence of the proposed development. These decreases are predicted to occur at properties on Hanborough Road and Spareacre Lane in Eynsham, which are predicted to experience a decrease in HDV flow over the long-term. The one residential NSR predicted to experience a minor (3.0 – 4.9 dB) decrease in the long-term is Evenlode Farm on Cuckoo Lane opposite the proposed Park and Ride site. The reduction in traffic noise is expected as a result of the ‘stopping up’ of Cuckoo Lane, preventing direct access to the A40, as part of the Park and Ride development. This development has planning permission and will be operational before the future baseline year of 2031.
- 12.5.14 All identified affected routes, see Section 12.7, are predicted to result in either a negligible increase or decrease in traffic noise levels at the roadside in the absence of the proposed development. The increases are as a result of normal traffic growth over time and the decreases are a combination of slight traffic redistribution and some reduced speeds in places where traffic volume increases.

12.6 Environmental Design and Management

Construction

- 12.6.1 A Construction Environmental Management Plan (CEMP) will be prepared and implemented by the Principal Contractor appointed to construct the proposed development. The CEMP would include relevant noise criteria, proposed surveys and a range of best practice measures associated with mitigating potential noise and vibration impacts. Such measures may include:
- Implementation of a system of community engagement with local residents;
 - Implementation of a complaints management system to investigate any noise and vibration complaints and ensure appropriate action is taken as required;
 - The selection of quiet and low vibration equipment and methodologies;
 - A review of construction programme and methodology to consider low noise/low vibration methods (including non-vibratory compaction plant where required);

- The optimal location of equipment on site to minimise noise disturbance;
 - The provision of acoustic enclosures around static plant, where necessary;
 - The use of less intrusive alarms, such as broadband vehicle reversing warnings; and
 - Compliance with working hours, as agreed with the local authority.
 - Limiting out of hours works to those that cannot be reasonably carried out during the daytime.
 - Designation and enforcement of appropriate routes for construction traffic (HDVs and staff) including restricting HDV movements, outside the immediate vicinity of the works, to the strategic highway network.
- 12.6.2 BS 5228 advises that noise barriers can provide a reduction in noise levels of 5 dB when the top of the plant is just visible over the noise barrier and 10 dB when the plant is completely screened from a receptor. The effectiveness of a noise barrier depends upon its length, effective height, position relative to the noise source and to the receptors, and the material from which it is constructed. Therefore, the potential attenuation provided by any such barriers cannot be quantified at this stage.
- 12.6.3 There may be a requirement to undertake works on evenings/ weekends/ nights, such as to tie the proposed development into existing roads or working on existing roads. This would be determined by the contractors and agreed with the local authority.
- 12.6.4 During the construction phase of the proposed development, appropriate mechanisms to communicate with local residents would be set up to highlight potential periods of disruption (e.g. web-based, newsletters, newspapers, radio announcements etc.). Residents would be provided with a point of contact for any queries or complaints. Any noise and vibration complaints would be investigated, and appropriate action taken as required. The complainant would be provided with a response outlining the results of the investigation and any action taken.
- 12.6.5 The CEMP will also present the road management procedures used to manage traffic movements within the works and on the local road network in the vicinity of the closest NSRs. Designated construction traffic routes will be used, which will avoid the use of residential streets near the construction site.
- 12.6.6 The construction contractor will undertake and report noise and vibration surveys, if required by West Oxfordshire District Council to validate compliance with all noise and vibration commitments and the requirements of the final CEMP.
- 12.6.7 Regular on-site observation surveys and checks/audits would be undertaken to ensure that best practice Best Practicable Means (BPM) are being employed at all times. The site reviews would be logged, and any remedial actions recorded. Such checks would include:
- Compliance with working hours
 - Presence of mitigation measures e.g. engine doors closed, airlines not leaking and plant switched off if not being used
 - Compliance with agreed working methods
 - Compliance with any specific requirements of the CEMP.
- 12.6.8 The survey and compliance assurance process would be set out in the noise and vibration management plan(s) as part of the CEMP.

Operation

- 12.6.9 The operation of the proposed development has the potential to result in both beneficial and adverse permanent traffic noise impacts.
- 12.6.10 The magnitude of the operational traffic noise impact at a receptor is dependent on a range of factors including changes to the road alignment, traffic flow, composition, speed, road surface, ground topography, presence of intervening buildings/structures and distance to the road.
- 12.6.11 The design includes reduced speed limits along most sections of the proposed development. Firstly, a 50 mph speed limit is proposed along the proposed dualled section between the Barnard Gate roundabout and the Western (developer) roundabout. Additionally, a 40 mph limit is proposed along the

proposed dual section between the developer roundabout and Park and Ride junction and along the entire IBL. The current speed limit along these sections is 60 mph. These speed limit reductions will contribute to the management of traffic noise levels at nearby NSRs.

- 12.6.12 The design of the proposed development includes a 4m high bund on the southern edge of the dualling section, in the vicinity of Ambury Stone Barn between the Western (developer) roundabout and the Barnard Gate roundabout. The sections of the proposed development with a 40 mph speed limit will also be surfaced with a stone mastic asphalt material that will provide further reductions in the traffic noise when compared to the current road surfacing.
- 12.6.13 Essential mitigation measures, to avoid significant adverse effects identified in the assessment, are discussed in Section 12.8.

12.7 Assessment of Effects and Significance

Effects during Construction

Construction Noise

- 12.7.1 The details of the activities required to construct the proposed development are not currently available. However, it is considered that there is the potential for an increase in ambient noise levels resulting in adverse noise and vibration impacts at the closest NSRs to the works, in particular if evening/weekend and night-time works are required.
- 12.7.2 In the absence of detailed information, assumptions have been made on the construction activities which are likely to be required to construct the proposed development. The following activities have been identified:
- A40 Dualling section
 - Earthworks, drainage, sheet piling and road pavement construction associated with the additional carriageways and roundabout construction at Barnard Gate.
 - Kerbing and surfacing works to both new carriageways and shared use lanes.
 - Installation of road markings and street furniture.
 - Tie in works on A40 at west of Hill Farm and on existing roads at Barnard Gate Junction;
 - A40 IBL section
 - Earthworks, drainage, sheet piling, Continuous Flight Auger (CFA) piling and road pavement construction associated with the additional carriageways and junction improvements/construction at Eynsham Park and Ride, Lower Road.
 - Kerbing and surfacing works to both new carriageways and shared use lanes.
 - Installation of road markings and street furniture.
 - Tie in works to existing roads including Lower Road, Eynsham Road, Witney, Cassington Road; and
 - A40 Duke's Cut section
 - Installation of new parapets to Wolvercote rail bridge.
 - Installation of road markings and street furniture.
- 12.7.3 The impact of these construction activities on NSRs will vary. For instance, earthworks, drainage installation and road pavement construction will be transitory, with high noise levels only experienced at nearby NSRs for a limited amount of time. However, other activities, such as installation of new parapets, will be confined to specific locations for longer periods and hence impacts of these activities on nearby NSRs may be greater due to the noise exposure.
- 12.7.4 The potentially worst affected NSRs are residential properties situated close to the existing A40. These properties (and their approximate distance from the proposed development) include:

- A40 Dualling section
 - residential properties at Hill Farm, Whitehouse Cottage and Salutation Farm (20-100m); and
 - residential properties in Barnard Gate, particularly those in close proximity to the A40 and Ambury Close Farm and Barnard Gate Farm to the east (50m);
- A40 IBL section
 - residential properties in Eynsham, particularly those on Spareacre Lane, Green's Road, Hanborough Road, Hanborough Close and the western extent of Old Witney Road (20-100m); and
 - residential properties in Cassington, particular on Eynsham Road close to its intersection with the A40 (20-100m); and
- A40 Duke's Cut section
 - Duke's Lock Cottage (150m).

12.7.5 There is the potential for these properties to experience **moderate** or **major** impacts during the daytime, evening/weekend and/or night as a result of these activities. Impacts of such magnitude have the potential to result in significant adverse effects at residential properties.

12.7.6 However, the exact significance, duration and frequency of any adverse noise impact resulting from the construction works will be highly dependent upon the methods, timing and duration of the works required. For instance, significant adverse effects due to construction noise are likely where moderate and/or major impacts are predicted to be above trigger thresholds for long durations (defined in BS 5228-1 as either 10 days out of 15 consecutive days, or 40 days in a consecutive 6 month period), or where very high noise levels prevail for short periods (for a few days/nights for example). Although exact durations and timings of the construction activities described in paragraph 12.7.2 are not available at this stage, their transitory and short-term nature are unlikely to result in these trigger thresholds being met with respect to evening/weekend or night-time works. Significant adverse effects are possible during the daytime at the residential properties described in paragraph 12.7.4 of this ES chapter. However, further consideration of the potential effects and identification of appropriate measures to minimise effects as far as practicable will be reviewed within the CEMP as detailed information relating to construction plant, timings and programme become available.

12.7.7 Construction traffic can have a temporary impact on NSRs located along existing roads used by these vehicles. The potential for such impacts is dependent on the volume and route of construction traffic. Although the routing has not been finalised at this stage, it has been assumed that the majority of the construction traffic will use the A40, as the major access points to the works will be directly off this route. Given the existing high volume of traffic on the A40 the additional construction traffic along the route is unlikely to result in a significant increase in the traffic noise.

Construction Vibration

12.7.8 There is the potential for some vibration impacts upon buildings, structures and their occupants within close proximity to the proposed development; particularly where vibratory equipment (including road rollers and earth compactors) are likely required for earthworks and road construction activities. It is considered unlikely that most typical construction/ demolition working routines would generate levels of vibration above which annoyance to occupants or building damage would be expected to be sustained (subject to final plant and working requirements).

12.7.9 The potentially worst affected NSRs are residential properties situated close to the existing A40. These properties (and their approximate distance from the proposed development) include:

- A40 Dualling section
 - residential properties at Hill Farm, Whitehouse Cottage and Salutation Farm (20-100m); and
 - residential properties in Barnard Gate, particularly those in close proximity to the A40 and Ambury Close Farm and Barnard Gate Farm to the east (50m).
- A40 IBL section

- residential properties in Eynsham, particularly those on Spareacre Lane, Green's Road, Hanborough Road, Hanborough Close and the western extent of Old Witney Road (20-100m); and
- residential properties in Cassington, particular on Eynsham Road close to its intersection with the A40 (20-100m).

12.7.10 No vibration sensitive properties have been identified within 100m of the A40 Duke's Cut works.

12.7.11 The residential properties identified in paragraph 12.7.9 have the potential to be affected by vibration should vibratory rollers be used for nearby earthworks and road construction compaction. In terms of annoyance due to vibration, there is the potential for these properties to experience minor impacts. However, due to the distance between these activities and the closest NSRs (typically around 50m), it is unlikely that the thresholds described in paragraph 12.4.17 will be met and hence the likelihood of damage to buildings as a result of the use of vibratory rollers is considered to be negligible. As a result, significant adverse effects due to vibration during construction are unlikely to occur. If vibratory rollers or other significant vibration producing operations are necessary in close proximity to any existing buildings, further consideration will be given to potential impacts once the contractor is appointed and the construction methods are developed. Potential measures to ensure that appropriate mitigation is in place during the works are discussed in Section 12.6.

Effects Once the proposed development is Complete and Operational

Operational Noise Impacts

12.7.12 All operational traffic noise comparisons reported herein are based on the façade at each building which undergoes the greatest magnitude of change in traffic noise level as a result of the proposed development. The results are provided for the ground floor of each residential and non-residential NSR during the daytime and for the top floor at night, except for blocks of flats/ apartments where the floor with the greatest magnitude of change is used. A contour plot of the absolute DS2024 traffic noise levels is shown in Figure 12-4. The short-term change in traffic noise levels (DM2024 to DS2024) is shown in Figure 12-5 and the long-term change in traffic noise levels (DM2024 to DS2031) is shown in Figure 12-6. All contour plots are based on free-field traffic noise levels at first floor level (4m above ground) after the inclusion of all embedded and essential mitigation (see Section 12.8), using a 10m x 10m grid and are provided for illustration purposes.

12.7.13 Table 12-9 summarises the short-term change in predicted traffic noise levels in 2024 between the DM (without proposed development) and the DS (with proposed development) scenarios at both residential buildings and other sensitive receptors. The long-term change in predicted traffic noise levels between the DM2024 (without proposed development) and the DS2031 (with proposed development) scenarios at both residential and non-residential NSRs are summarised in Table 12-10. Only one non-residential NSR, Jury's Inn, has been assessed as being in use during the daytime and the night-time.

Table 12-9: Short-term change in predicted Do-something traffic noise levels (DM 2024 to DS 2024)

Change in traffic noise level		Magnitude of impact	Daytime		Night-time	
			Number of residential buildings	Number of other sensitive receptors	Number of residential buildings	Number of other sensitive receptors
Increase in noise level	0.1-0.9	Negligible	240	1	223	1
Daytime L _{A10,18h} dB	1.0-2.9	Minor	60	1	59	0
	3.0-4.9	Moderate	6	0	0	0
Night-time L _{night,outside} dB	≥5	Major	0	0	0	0
No change	0	No change	2	0	4	0
Decrease in noise level	0.1-0.9	Negligible	1387	5	1548	0
Daytime L _{A10,18h} dB	1.0-2.9	Minor	591	7	458	0
	3.0-4.9	Moderate	7	0	2	0

Change in traffic noise level		Magnitude of impact	Daytime	Night-time		
			Number of residential buildings	Number of other sensitive receptors	Number of residential buildings	Number of other sensitive receptors
Night-time $L_{night,outside}$ dB	≥ 5	Major	2	0	0	0

Table 12-10: Long-term change in predicted Do-something traffic noise levels (DM 2024 to DS 2031)

Change in traffic noise level		Magnitude of impact	Daytime	Night-time		
			Number of residential buildings	Number of other sensitive receptors	Number of residential buildings	Number of other sensitive receptors
Increase in noise level	0.1-2.9	Negligible	466	2	458	1
Daytime $L_{A10,18h}$ dB	3.0-4.9	Minor	8	0	6	0
	5.0-9.9	Moderate	0	0	0	0
Night-time $L_{night,outside}$ dB	≥ 10	Major	0	0	0	0
No change	0	No change	1	0	2	0
Decrease in noise level	0.1-2.9	Negligible	1812	12	1826	0
Daytime $L_{A10,18h}$ dB	3.0-4.9	Minor	7	0	2	0
	5.0-9.9	Moderate	0	0	0	0
Night-time $L_{night,outside}$ dB	≥ 10	Major	0	0	0	0

- 12.7.14 In the short-term, 306 (13%) residential NSRs are expected to experience an increase in daytime traffic noise levels due to the proposed development. Of these, 6 (<1%) residential NSRs are predicted to experience a **moderate increase** in traffic noise level, resulting in an initial assessment of **significant adverse** effects in accordance with *DMRB LA 111 Noise and vibration*. 60 (3%) residential NSRs are expected to experience a **minor increase** in noise level resulting in an initial assessment of effects of **not significant** in accordance with *DMRB LA 111 Noise and vibration*. The remaining 240 (10%) residential NSRs are expected to experience a **negligible increase** in noise level, resulting in adverse effects that are **not significant**.
- 12.7.15 The NSRs predicted to experience a **moderate increase** in traffic noise level are located in Hill Farm and Barnard Gate. These increases in traffic noise are as a result of expected increases in both traffic volume and speed with the dualling in place.
- 12.7.16 Those predicted to experience a **minor increase** in traffic noise are located in Barnard Gate, Eynsham (some isolated properties on Hanborough Road) and south Cassington, adjacent to Eynsham Road and close to the A40 mainline. These increases are respectively as a result of increased traffic on the dualling section, a redistribution of traffic from west Eynsham to the B4449 and an increase in mean traffic speeds on part of the IBL section.
- 12.7.17 A total of 1987 residential NSRs are predicted to experience a decrease in daytime noise levels due to the proposed development. Of these, 9 (<1%) residential NSRs are predicted to experience a **major or moderate decrease** in traffic noise level, resulting in an initial assessment of **significant beneficial effects** in accordance with *DMRB LA 111 Noise and vibration*. 591 (26%) residential NSRs are expected to experience a **minor decrease** in noise level resulting in an initial assessment of effects of **not significant** in accordance with *DMRB LA 111 Noise and vibration*. The remaining 1387 (60%) residential NSRs are expected to experience a **negligible decrease** in noise level, resulting adverse effects that are **not significant**.
- 12.7.18 NSRs predicted to experience a **major decrease** in traffic noise are located at Whitehouse Cottage to the west of Barnard Gate and Ambury Stone Barn to the east of Barnard Gate. At Whitehouse Cottage

the reduction in traffic noise is as a result of the carriageway realignment moving the road further from the property and at Ambury Stone Barn the reduction in traffic noise is as a result of the protection afforded by the bund embedded in the design.

12.7.19 NSRs predicted to experience a **moderate decrease** in traffic noise level are located at:

- North Cassington, in the vicinity of Bell Lane; this results from a reduction in traffic speed on the IBL section east of Eynsham Road.
- Evenlode Farm on Cuckoo Lane; this is a result of the 'stopping up' of Cuckoo Lane and therefore as a result of the Park and Ride scheme and not the proposed development.
- Cassington Mill, to the south of Cassington Road; here reductions on the south-east facing façade result from a reduction in traffic speed on the IBL section east of Eynsham Road.

12.7.20 Those predicted to experience a minor decrease in traffic noise are located at:

- Salutation Farmhouse to the west of Barnard Gate; this results from the realignment of the dualling section that takes the road edge further from the property.
- Central and west Eynsham, in the vicinity of Witney Road and Back Lane; these result from the redistribution of traffic away from these roads and on to the B4449.
- The majority of properties in Cassington; these result from a reduction in traffic speed on the IBL section east of Eynsham Road.

12.7.21 A similar pattern of results are predicted for the night-time assessment.

12.7.22 In the short-term, two non-residential NSRs during the daytime and one non-residential NSR during the night-time within the 600m calculation area boundary are expected to experience increases in traffic noise levels. Of these one non-residential NSR is predicted to experience a **minor adverse** impact during the daytime, resulting in an initial assessment of effects that are **not significant** in accordance with *DMRB LA 111 Noise and vibration*. The remaining non-residential NSRs are predicted to experience a **negligible adverse** impact due to the proposed development and therefore predicted to experience adverse effects that are **not significant**.

12.7.23 The only non-residential NSR predicted to experience a **minor increase** in noise is Hill Farm Stables. This increase is from the increase in traffic volume and speed on the western end of the dualling section.

12.7.24 12 non-residential NSRs within the 600m calculation area boundary are predicted to experience reductions in road traffic noise. Of these, seven are predicted experience a **minor beneficial** impact during the daytime, resulting in an initial assessment of effects that are **not significant** in accordance with *DMRB LA 111 Noise and vibration*. The remaining five non-residential NSRs are predicted to experience a **negligible beneficial** impact due to the proposed development and therefore predicted to experience beneficial effects that are **not significant**.

12.7.25 The non-residential NSRs which are predicted to experience a minor decrease in noise include:

- The Oxford Nursery, Witney Road;
- Eynsham Cricket Club, Cassington Road;
- Village Hall, Back Lane, Eynsham;
- Scout Hut, Back Lane, Eynsham;
- St Peter's Church, Church Lane, Cassington;
- Village Hall, The Green, Cassington; and
- St Peter's Church of England Primary School, Cassington.

12.7.26 These decreases in traffic noise are expected as a result of the redistribution of traffic within Eynsham and the reduction in traffic speed on the IBL east of Eynsham Road.

12.7.27 In the long-term, the majority of residential buildings (approximately 79%) are predicted to experience negligible traffic noise decreases. 1812 residential buildings are expected to experience a **negligible decrease** in traffic noise level during the day and 1826 residential buildings during the night. Seven residential properties are predicted to experience a **minor decrease** in traffic noise level during the

- daytime and one (Ambury Stone Barn) is expected to experience a **moderate decrease** in daytime traffic noise in the long-term.
- 12.7.28 Eight residential NSRs are predicted to experience a **minor increase** in traffic noise in the long-term. These are in the same locations expected to experience a **moderate increase** in the short-term (i.e. Hill Farm and Barnard Gate).
- 12.7.29 All non-residential NSRs within the 600m calculation area boundary are expected to experience a **negligible change** in traffic noise in the long-term with the proposed development in place.
- 12.7.30 Across the wider study area, the proposed development is expected to result in some changes in traffic distribution that trigger the criteria to be identified as affected routes (see paragraphs 12.4.11 and 12.4.12). These include opening year reductions in traffic on Wroslyn Road and Lower Road to the north of Eynsham and the B4449 to the south of Eynsham and opening year increases in traffic on Blandford Avenue near the Wolvercote roundabout and in some parts of central Witney. The magnitude of change in traffic noise on all the identified affected routes is **minor**, resulting in an initial assessment of effects that are **not significant** in accordance with *DMRB LA 111 Noise and vibration*.

Determination of Overall Significance of Effects at NSRs

- 12.7.31 *DMRB LA 111 Noise and vibration* requires that the overall operational significance of effects on NSRs in the minor, moderate and major magnitude of change categories are determined taking into consideration the magnitude of the noise level change, together with an appropriate and proportionate review of local circumstances as listed in paragraph 12.4.39.
- 12.7.32 The results of the assessment are summarised in the sections below. The following discussion is based on changes in traffic noise in the short-term. Changes over the long-term are typically comparable and are only mentioned if they have a bearing on the determination of significance.

A40 Dualling section

- 12.7.33 NSRs within the dualling section of the proposed development are predicted to experience a range of impacts.

Effect of changes in road traffic noise on NSRs in the vicinity of the western end of the A40 Dualling

- 12.7.34 At the western extent of the dualling, three NSRs within Hill Farm are predicted to experience a moderate increase in traffic noise, although these increases are predicted on the north east facades which have an oblique view of the dualling section. However, minor increases in traffic noise are also predicted on the facades of these properties which face the A40, with absolute traffic noise levels close to the SOAEL with and without the dualling in place in the opening year. In addition, Hill Farm Barn is predicted to experience a minor increase in traffic noise due to the proposed dualling on the façade facing the A40, with minor increases also predicted on all other facades of the property. As a result, this property is predicted to experience levels above SOAEL both during the day and night with the dualling in place. Road traffic will continue to dominate the acoustic environment at all these properties once the dualling is operational, with these properties having a direct view of the dualled section. Taking these factors into consideration, significant adverse effects are likely at these four residential properties due to the dualling.
- 12.7.35 A minor increase in traffic noise is also predicted at Hill Farm Stables located within the Hill Farm grounds. However, this minor increase is in the lower half of the minor increase band and levels at the stables are predicted to remain between LOAEL and SOAEL once the dualling is in place. The view of the dualling is also partially obscured by intervening buildings. Taking these factors into consideration, significant adverse effects at this receptor are unlikely. **No significant effects** are predicted.
- 12.7.36 Between Hill Farm and Barnard Gate, the dualling results in the A40 moving further away from a number NSRs, including Whitehouse Cottage. This results in a major decrease in traffic noise on the façade facing the A40, with minor reductions predicted on the west facing facades. However, even with these reductions, the traffic noise levels remain above the SOAEL both during the day and night with the dualling in place and the property will still have a direct view of the road, even though the alignment is moving further away from this property. Taking these factors into consideration, significant beneficial effects are unlikely at this property.

- 12.7.37 Minor decreases in traffic noise are predicted at Salutation Barn and Salutation Farm as a result of the realignment of the A40 at this location. However, the dualling section would remain close to the properties and traffic noise will remain above SOAEL during the day and night with the dualling in place. Taking these factors into consideration, significant beneficial effects are unlikely at these properties. **No significant effects** are predicted.
- 12.7.38 Minor increases in traffic noise are predicted at Green Farm and Green Farm Cottages to the south of the dualling, which moves traffic slightly closer to these properties. These increases are predicted on facades facing the dualling. However, these properties are likely to have a limited view of the dualling section due to the road being located in excess of 250m to the north at its closest point and hence this increase is unlikely to be perceived. Taking these factors into consideration, significant adverse effects are unlikely at these residential properties. **No significant effects** are predicted.

Effect of changes in road traffic noise on NSRs in the vicinity of Barnard Gate

- 12.7.39 The dualling results in minor and moderate increases in traffic noise at a number of NSRs in Barnard Gate. However, the moderate increases are at the low end of the band (around 3 dB) and on north facing facades without a view of the dualling section. Absolute traffic noise levels on facades experiencing moderate increases are also well below the SOAEL in the opening year and for properties at the northern end of Barnard Gate below the LOAEL. Taking these factors into consideration, significant adverse effects are unlikely to occur at these properties due to the proposed development. **No significant effects** are predicted.
- 12.7.40 Minor increases in noise are also predicted at Lodge Cottage, Barnard Lodge Farm, Barnard Gate Farm and Barnard Gate Barn to the east of Barnard Gate, with a maximum increase of 2.1 dB predicted on facades facing the dualled section. However, the view of the road from these properties is restricted by the dualled section being in cutting close to these properties, with absolute noise levels remaining between LOAEL and SOAEL during both the day and night-time. Taking these factors into consideration, significant adverse effects are unlikely to occur at these properties. **No significant effects** are predicted.
- 12.7.41 The embedded bunding on the southern edge of the dualling results in a major decrease in traffic noise at Ambury Stone Barn which is considered a significant beneficial effect. The bunding is also expected to result in minor traffic noise reductions on the eastern façade of Ambury Close Farm but given that minor increases in traffic noise are still expected on the western façade significant beneficial effects are unlikely at this property. **No significant effects** are predicted.

A40 IBL section

Effect of changes in road traffic noise on NSRs in Eynsham

- 12.7.42 NSRs within the IBL section of the proposed development are predicted to experience both adverse and beneficial impacts although the number of beneficial impacts is expected to be greater than the number of adverse impacts.
- 12.7.43 Two NSRs on Cuckoo Lane to the north of Eynsham are predicted to experience moderate decreases in traffic noise. This reduction results from the 'stopping up' of Cuckoo Lane, preventing direct access to the A40. However, this 'stopping up' will be undertaken in conjunction with the wider development proposals in this area, which include the introduction of a new junction to the west of the proposed Park and Ride site and new road links introduced to carry through traffic. These impacts are therefore not likely to result in significant effects at these properties. **No significant effects** are predicted.
- 12.7.44 The majority of NSRs in Eynsham are predicted to experience either negligible or minor decreases in traffic noise in the short-term. The minor decreases are predominantly from small reductions in traffic on Witney Road and Back Lane and are all at the lower magnitude end of the band (around 1 dB) and are not considered significant beneficial effects. There are isolated minor increases in traffic noise in the short term at four properties in north-east Eynsham in the vicinity of Hanborough Road as result of an increase in traffic on the B4449. However, these increases are at the low end of the band (around 1 dB) and not typical for the area where negligible changes in traffic noise are expected for most NSRs. As such these impacts are not considered to give rise to likely significant adverse effects. **No significant effects** are predicted.

Effect of changes in road traffic noise on NSRs in Cassington

- 12.7.45 Minor decreases in traffic noise in the short term are expected for properties close to Cassington Road and south of the A40, such as Wharf Farm and Cassington Mill house. These are a result of small changes to traffic flow on Cassington Road, where traffic levels are very low. Given that the properties are around 300m from the proposed development with Cassington Road between them and the A40, significant beneficial effects are unlikely at these properties. **No significant effects** are predicted.
- 12.7.46 Further east along the IBL section, minor increases in traffic noise are predicted at NSRs in south Cassington. These increases are a result of predicted higher traffic speeds with the proposed development in place, as the IBL relieves some expected peak-hour congestion on the A40. However, these increases are at the lower end of the band (typically 1-2 dB, a maximum of 2.2 dB) with absolute traffic noise levels between the LOAEL and SOAEL. Additionally, even though mean traffic speeds are below 75 km/h, the use of a stone mastic asphalt surface on this section of the proposed development (see paragraph 12.6.12) may result in traffic noise levels being lower than currently predicted. Taking these factors into consideration, significant adverse effects are unlikely at these properties. **No significant effects** are predicted.
- 12.7.47 Minor decreases in traffic noise are predicted at NSRs further into Cassington as a result of reduced traffic speeds further east along the A40. These NSRs are between 80m and 600m from the proposed development and negligible changes in traffic noise are expected on Yarnton Road through Cassington. Taking these factors into account, significant beneficial effects are unlikely at these NSRs. **No significant effects** are predicted.

A40 Duke's Cut section

Effect of changes in road traffic noise on NSRs in Wolvercote

- 12.7.48 Changes in traffic noise at NSRs at the eastern edge of the proposed development, encompassing Duke's Lock House, Jury's Inn and residential properties in north Wolvercote, are all negligible. **No significant effects** are predicted.

Affected Routes outside of 600m calculation area

- 12.7.49 Changes in traffic noise on affected routes (see paragraph 12.7.30) are expected to be at the low end of the minor change band (i.e. close to 1 dB) and therefore are predicted to result in effects that are **not likely to be significant**.

Public Rights of Way

- 12.7.50 Within the study area, PRoWs are located in residential areas, across agricultural land and along the River Thames to the south of the proposed development. Minor and negligible changes in traffic noise are expected along the vast majority of these routes. In particular, negligible reductions in traffic noise are expected along PRoW within the Oxford Meadows SAC. However, given the linear nature of PRoWs, the range of noise impacts along them, and the transient usage of a PRoW, a material change in the experience of using the PRoWs as a whole, which could affect people's health or quality of life, it is not anticipated and **no significant adverse or beneficial effects** on PRoWs have been identified.

Noise Insulation Regulations

- 12.7.51 A preliminary assessment has identified that five residential buildings may be eligible for noise insulation works under the Noise Insulation Regulations. These buildings, located adjacent to the eastbound carriageway of the A40 in the vicinity of Barnard Gate and Cassington, are:
- Hill Farm Barn, Oxford Road, Witney;
 - Barnard Gate Barn, Barnard Gate;
 - The Willows, Eynsham Road, Cassington;
 - 69 Eynsham Road, Cassington; and
 - 1 Marlborough Drive, Cassington.
- 12.7.52 A full Noise Insulation Regulation assessment will be completed in accordance with the timescales set out in the Regulations, following the opening of the proposed development.

Effects without the Western Roundabout

- 12.7.53 In the absence of the proposed Developer (Western) Roundabout at the eastern end of the dualling section, traffic speeds in the immediate vicinity are likely to increase. However, there are no NSRs within 400m of this location and therefore **no new significant effects** would be expected.

Effects without the Eynsham Underpass

- 12.7.54 The Eynsham Underpass is not anticipated to alter traffic volume or speed on the A40 mainline and therefore in either situation with the Eynsham Underpass either constructed or not constructed it is expected to result in **no new significant effects** from operational traffic noise in the area.

Summary of Overall Effects (Pre-Mitigation) of the proposed development

- 12.7.55 The qualitative assessment of construction impacts indicates that there is the potential for significant adverse construction noise effects due to the construction of the proposed development. The risk of potentially significant adverse construction vibration annoyance effects, or building damage, is considered to be low.
- 12.7.56 The following significant noise effects have been identified as likely due to the operation of the proposed development:
- Significant adverse effects at four residential properties within Hill Farm.

12.8 Mitigation and Monitoring

- 12.8.1 Based on the assessment, this section outlines the mitigation measures proposed that are over-and-above the environmental design and management measures described previously. Where appropriate, future measures required to verify the performance of the mitigation, or ensure potential effects are adequately controlled, are also outlined.

Mitigation and Monitoring during Construction

- 12.8.2 No further mitigation or monitoring is proposed, at this stage, beyond that set out in paragraphs 12.6.1 to 12.6.9. If residual significant adverse effects are identified at a later stage, then there should, within the CEMP, exist a noise insulation or temporary rehousing policy for affected residents.

Mitigation Once the proposed development is Complete and Operational

- 12.8.3 Additional mitigation is proposed to address the significant adverse effects predicted at Hill Farm. Two mitigation options have been considered, however, a final decision on which will be adopted will be made at the detailed design stage. Option 1 is the installation of two 3m high noise barriers either side of the access road to the farm as shown in Figure 12-1. Although the barriers would not remove the increase in traffic noise on the rear façade of the properties, they would reduce traffic noise levels on the facades facing the A40. With the barriers in place the impact of the proposed development on these facades would be **minor beneficial (not significant)** at the two properties closest to the road and **negligible (not significant)** at the two properties set further back, removing any significant adverse effects.
- 12.8.4 Option 2 is to address the significant adverse effects on the south facing facades through the use of quieter surfacing between Hill Farm and Whitehouse Cottage. In this case the noise barriers described in 12.8.3 (Option 1) would not be required. It is understood that a dense stone mastic asphalt that meets OCC's specifications could be considered at the detailed design stage. If this material could be shown to result in noise changes at the properties that are no more than negligible, then it could be considered an acceptable alternative form of mitigation at this location to the noise barriers.
- 12.8.5 The performance specification of specific operational mitigation measures will be confirmed at the detailed design stage to ensure the performance assumed in the assessment is achieved. Surveys will be undertaken to ensure that measures are installed as required.

12.9 *Residual Effects and Conclusions*

12.9.1 The residual effects resulting from the proposed development are summarised in Table 12-11 below.

Table 12-11: Noise and vibration - Summary of Potential Effects

Description of Effect	Sensitivity of Receptor	Nature of Effect / Geographic Scale	Magnitude of Impact	Initial Classification of Effect (with embedded mitigation)	Additional Mitigation	Residual Effect Significance
Construction						
Effect of construction noise on NSRs	High	Temporary	Moderate/Major adverse	Significant	Best Practicable Means noted in Section 12.6	Potential for Significant adverse effects to remain
Effect of construction vibration on NSRs	High	Temporary	Minor adverse	Not significant	Best Practicable Means noted in Section 12.6	Not significant
Complete and Operational						
Effect of changes in road traffic noise on NSRs in the vicinity of the western end of the dualling section	High	Permanent	Minor to moderate adverse	Significant adverse effects at Hill Farm (4 properties)	Noise barriers or quieter surfacing (12.8.3-12.8.4)	Not significant
Effect of changes in road traffic noise on NSRs in the vicinity of Barnards Gate	High	Permanent	Major beneficial to moderate adverse	Not significant	None	Not significant
Effect of changes in road traffic noise levels on NSRs in Eynsham	High	Permanent	Minor beneficial to minor adverse	Not significant	None	Not significant
Effect of changes in road traffic noise levels on NSRs in Cassington	High	Permanent	Minor beneficial to minor adverse	Not significant	None	Not significant
Effect of changes in road traffic noise levels on NSRs in Wolvercote	High	Permanent	Negligible	Not significant	None	Not significant

Overall Summary of the Residual Effects of the proposed development

- 12.9.2 There is the potential for some properties close to the proposed development to experience significant effects from construction noise, especially if evening/weekend and/or night-time works are required. Best Practicable Means (BPM) will however be applied to minimise construction noise levels as far as reasonably practicable.
- 12.9.3 The anticipated routing of construction traffic along the A40, rather than on local routes, will minimise the potential for significant adverse effects from construction traffic noise on NSRs.
- 12.9.4 Residential properties close to activities involving vibratory rollers have the potential to be affected by vibration. However potential significant adverse effects due to vibration during construction are unlikely to occur.
- 12.9.5 Further consideration should be given to the potential construction noise and vibration impacts once the detailed design and associated construction methods are developed.
- 12.9.6 With the inclusion of additional mitigation at Hill Farm there are not expected to be any residual significant adverse effects from operational road traffic noise. Adverse (not significant) effects are expected in the vicinity of Barnard Gate and south Cassington while beneficial (not significant) effects are expected throughout most of Eynsham and north Cassington.

12.10 Compliance with National Noise Policy

- 12.10.1 As set out in Section 12.2, *DMRB LA 111 Noise and vibration* also requires assessments to report compliance of the proposed development with relevant sections of the NPSE, NPPF and the Government's associated planning guidance on noise. The discussion below demonstrates how the proposed development complies with the three aims in the NPSE during construction and operation, within the context of government policy on sustainable development. These aims are as follows:
- avoid significant adverse impacts on health and quality of life (i.e. reduce traffic noise levels at receptors to below the SOAEL);
 - mitigate and minimise adverse impacts on health and quality of life (i.e. reduce traffic noise levels at receptors which are between the LOAEL and the SOAEL); and
 - where possible, contribute to the improvement of health and quality of life.
- 12.10.2 This compliance with policy discussion complements but is separate to the environmental impact assessment reported above.

Construction

- 12.10.3 The construction contractors will review the proposed working methods to consider all sustainable mitigation measures, including identifying locations/activities/plant where site hoarding/enclosures will be installed to reduce the magnitude of the construction noise impact, with the aim of avoiding significant noise and vibration effects. However, there is the potential for some significant temporary adverse noise and/or vibration effects to remain. This is acceptable in the context of sustainable development as factors including engineering practicality and cost versus benefit must also be considered. On this basis, it is considered that, with the implementation of the mitigation measures outlined in the CEMP and in the context of sustainable development, the first aim of the NPSE will be met during construction of the proposed development.
- 12.10.4 With regard to the second NPSE aim, temporary adverse effects between the LOAEL and SOAEL are likely at a range of receptors. The mitigation measures outlined in Section 12.6 will be applied throughout the construction works, and therefore will benefit all receptors experiencing construction noise or vibration, including those with levels between the LOAEL and SOAEL. Construction impacts between the LOAEL and SOAEL are acceptable in the context of sustainable development as factors including engineering practicality and cost versus benefit must also be considered. On the basis of the above, with the effective implementation of the defined mitigation and minimisation measures, it is considered that the second NPSE aim will be met during construction of the proposed development.

- 12.10.5 With regard the NPSE third aim, construction by its nature introduces a new noise or vibration source into the existing environment and is temporary in duration. Therefore, the opportunities to improve existing noise levels during the construction phase are very limited.

Operation

- 12.10.6 For the purpose of assessing policy compliance, *DMRB LA 111 Noise and vibration* directs that significant adverse effects on health and quality of life from traffic noise occur above the SOAEL (aim 1), whilst adverse effects would occur where traffic noise levels are between the LOAEL and SOAEL (aim 2). The requirement of the third aim of the NPSE, to improve where possible, applies to all traffic noise levels. When identifying sustainable mitigation measures, factors including the cost versus the benefit, engineering practicality and any other impacts (such as landscape/visual) should be considered.
- 12.10.7 The first aim is to avoid significant adverse impacts on health and quality of life from noise as a result of a new development. The SOAEL is defined as being the level at which significant adverse effects on health and quality of life occur. However, some properties will experience noise levels above the SOAEL with or without the proposed development, so it is important to consider the extent to which these noise levels are occurring as a result of the proposed development. To help assess policy compliance with aim 1, this section explains which properties will experience noise levels above the SOAEL or change in noise levels from above the SOAEL to below it once the proposed development is operational.
- 12.10.8 Table 12-12 details the number of residential buildings in the calculation area which would have one or more facades above the daytime or night-time SOAEL for the four assessment scenarios.

Table 12-12: Number of residential buildings above the SOAEL

Scenario	Day	Night
2024 DM	19	27
2031 DM	24	31
2024 DS	19	25
2031 DS	11	24

- 12.10.9 An overall reduction in the number of residential buildings above the SOAEL is anticipated due to the proposed development. Two properties in east Eynsham and two properties in south Cassington are predicted to experience road traffic noise levels above the SOAEL only with the proposed development in place. However, noise increases at these locations are small (around 1 dB) and the use of stone mastic asphalt surfacing for the IBL is likely to mitigate these increases, especially for the properties in south Cassington. With respect to the properties in Eynsham, close to the B4449, mitigation is not considered practical or cost effective given that most properties in this area are expected to experience negligible changes in road traffic noise as a result of the proposed development.
- 12.10.10 There are also a number of residential buildings above the SOAEL both with and without the proposed development. These properties are located close to existing roads throughout the study area, including the A40, Witney Road and the B4449 in Eynsham and the A44 north of the Wolvercote Roundabout. It is likely that the road surfacing used on the proposed development will reduce some of these traffic noise levels below the SOAEL and further mitigation for the remaining isolated properties, which are largely outside the red line boundary and expected to experience negligible changes in traffic noise, is not considered sustainable. There are also several properties in west Eynsham expected to fall below the SOAEL as a result of the proposed development from the redistribution of traffic on to the B4449.
- 12.10.11 Based on the above discussion, it is considered that the first NPSE aim to avoid exceedances of the SOAEL as a result of the proposed development, within the context of sustainable development, has been met.
- 12.10.12 With regards to the second aim, a range of mitigation measures have been incorporated into the design of the proposed development (see paragraph 12.6.11) and further mitigation has also been incorporated

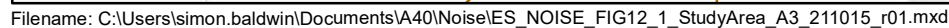
to address significant increases in traffic noise (see paragraph 12.8.3 and 12.8.4). The inclusion of these mitigation measures demonstrates that, within the context of sustainable development, at receptors between the LOAEL and the SOAEL, the proposed development meets the requirements of the second NPSE aim.

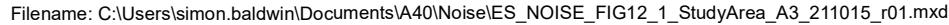
- 12.10.13 With regard to the third NPSE aim to '*contribute to the improvement of health and quality of life*' the proposed development results in reductions in traffic noise levels at the majority of NSRs in the study area including throughout most of Eynsham and Cassington as well as at Ambury Stone Barn and Ambury Close Barn (from the landscape bunding). On this basis, it is considered that the third NPSE aim has been met.

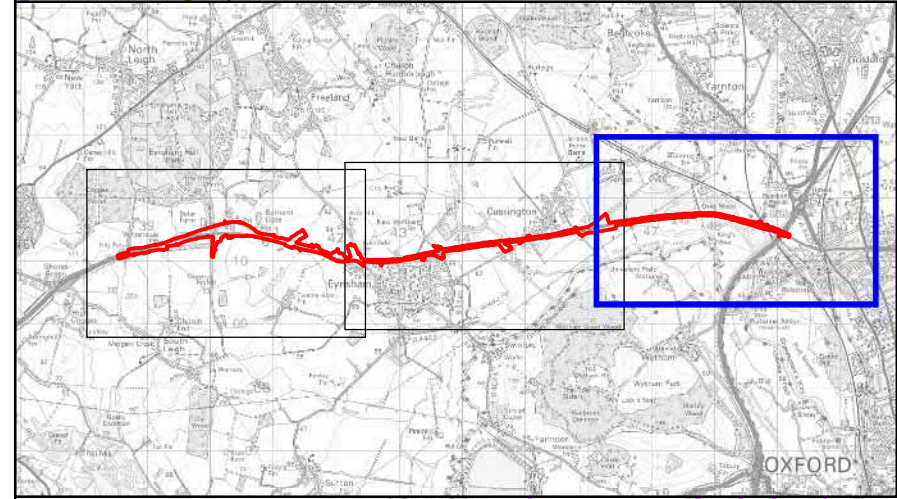
12.11 References

- Ref 12-1 The European Parliament and Council of the European Union (2002) Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise – Declaration by the Commission in the Conciliation Committee on the Directive relating to the assessment and management of environmental noise
- Ref 12-2 The Environmental Noise (England) Regulations (2006) Statutory Instrument No. 2238 (as amended 2008, 2009, 2010)
- Ref 12-3 Defra (2019) Noise Action Plan: Roads (Including Major Roads) Environmental Noise England Regulations 2006, as amended
- Ref 12-4 Defra (2019) Noise Action Plan: Agglomerations Environmental Noise England Regulations 2006, as amended
- Ref 12-5 HM Government (1973) Land Compensation Act 1973
- Ref 12-6 The Noise Insulation Regulations (1975), Statutory Instrument No. 1763 (as amended 1988)
- Ref 12-7 Her Majesty's Stationery Office (1974) Control of Pollution Act 1974
- Ref 12-8 Ministry of Housing, Communities and Local Government (MCHLG) (2021) National Planning Policy Framework (NPPF). Conserving and enhancing the historic environment. Ministry of Housing, Communities & Local Government. Available online at: www.gov.uk/government/publications/national-planning-policy-framework--2
- Ref 12-9 Department for Environment, Food and Rural Affairs (Defra) (2010) Noise Policy Statement for England (NPSE).
- Ref 12-10 Department for Communities and Local Government (DCLG) (2017) Planning Practice Guidance
- Ref 12-11 West Oxfordshire District Council, (2018); West Oxfordshire Local Plan 2031. Available at: <https://www.westoxon.gov.uk/media/feyjopen/local-plan.pdf>
- Ref 12-12 North Oxfordshire District Council, (2011); Cherwell Local Plan 2011-2031. Available at: <https://www.cherwell.gov.uk/info/83/local-plans/376/adopted-cherwell-local-plan-2011-2031-part-1>
- Ref 12-13 North Oxfordshire District Council; (1996); Cherwell Local Plan 1996. Available at: <https://www.cherwell.gov.uk/info/83/local-plans/373/adopted-local-plan-1996-november-1996>
- Ref 12-14 Oxford City Council; (2020); Oxford Local Plan 2036. Available at: https://www.oxford.gov.uk/downloads/file/7380/adopted_oxford_local_plan_2036
- Ref 12-15 West Oxfordshire District Council, (2018); Eynsham Neighbourhood Plan. Available at: <https://www.westoxon.gov.uk/planning-and-building/planning-policy/neighbourhood-planning/made-neighbourhood-plans/>
- Ref 12-16 Oxfordshire County Council (2015), Local Transport Plan 2015-2031
- Ref 12-17 Highways England, Design Manual for Roads and Bridges, Sustainability & Environment Appraisal, LA 111: Noise and Vibration, Rev 2, 2020.

- Ref 12-18 Department of Transport/Welsh Office (1998) Calculation of Road Traffic Noise (CRTN)
- Ref 12-19 British Standards Institute (2014) BS 5228-1:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites. Part 1: Noise
- Ref 12-20 British Standards Institute (1993) BS 7385-2 – Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration
- Ref 12-21 Transport Research Laboratory (TRL) (2002) Converting the UK traffic noise index LA10,18h to EU noise indices for noise mapping.
- Ref 12-22 BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings'. British Standards Institution (2014).
- Ref 12-23 NANR316 'Possible Options for the Identification of SOAEL and LOAEL in Support of NPSE'. Defra (2015).
- Ref 12-24 ProPG: Planning & Noise, Professional Practice Guidance on Planning & Noise, New Residential Development. Association of Noise Consultants, Institute of Acoustic and Chartered Institute of Environmental Health (2017).
- Ref 12-25 Guidelines for Community Noise. World Health Organisation (1999).
- Ref 12-26 Environmental Noise Guidelines for the European Region. World Health Organisation (2018).







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LEGEND

-  Site Boundary
 600m Calculation Area
 Residential Receptor

Other Receptor

-  Community Facility
 Hotel
 Noise Important Area
 Scheduled Monument
 Special Area of Conservation (SAC)
 Site of Special Scientific Interest (SSSI)
 Public Right of Way

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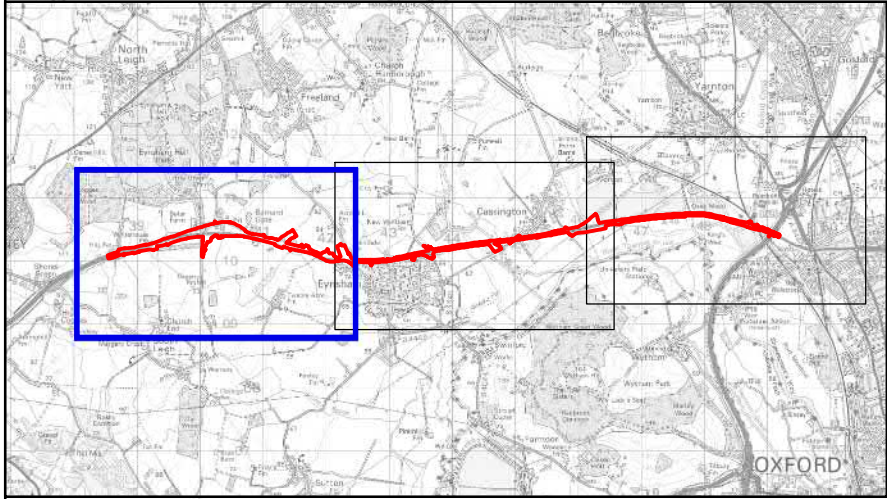
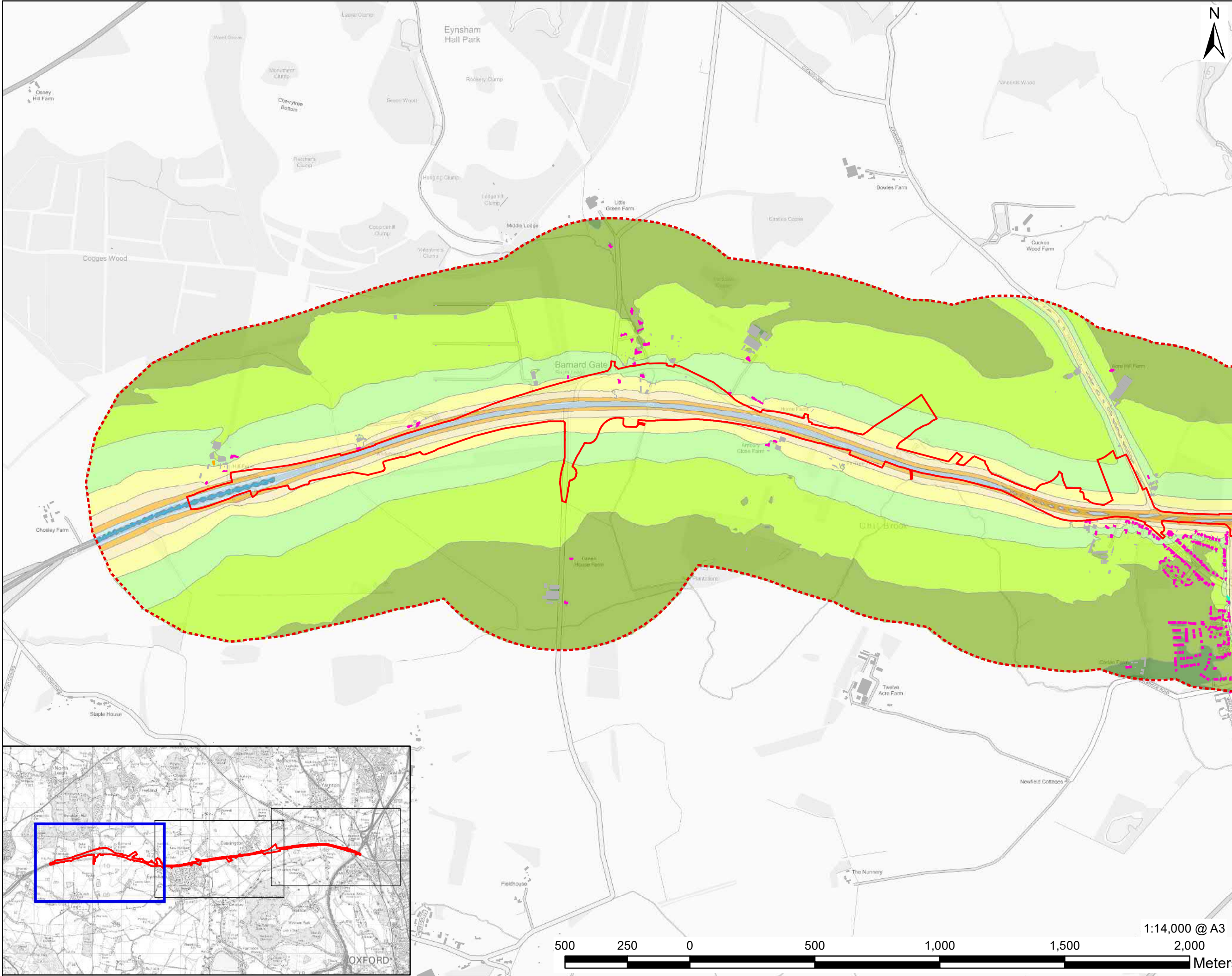
SHEET TITLE

Noise Location Plan

1:14,000 @ A3

NUMBER

Meters 12-1 Sheet 3 of 3



LEGEND

600m Calculation

Residential Receptor

Other Receptor

Community Facility

Education Facility

2024 Do-Minimum $L_{A10, 18h}dB$ at 4m (Free Field)

<=40
>40 to <=45
>45 to <=50
>50 to <=55
>55 to <=60
>60 to <=65
>65 to <=70
>70 to <=75
>80

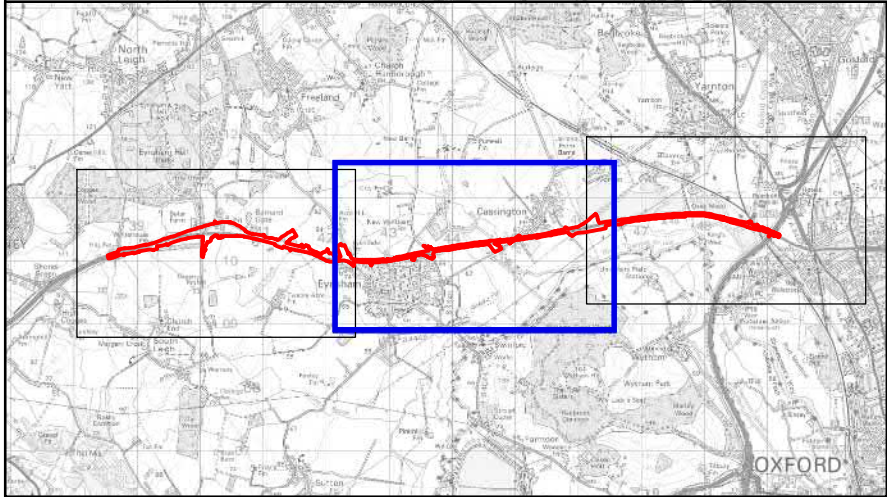
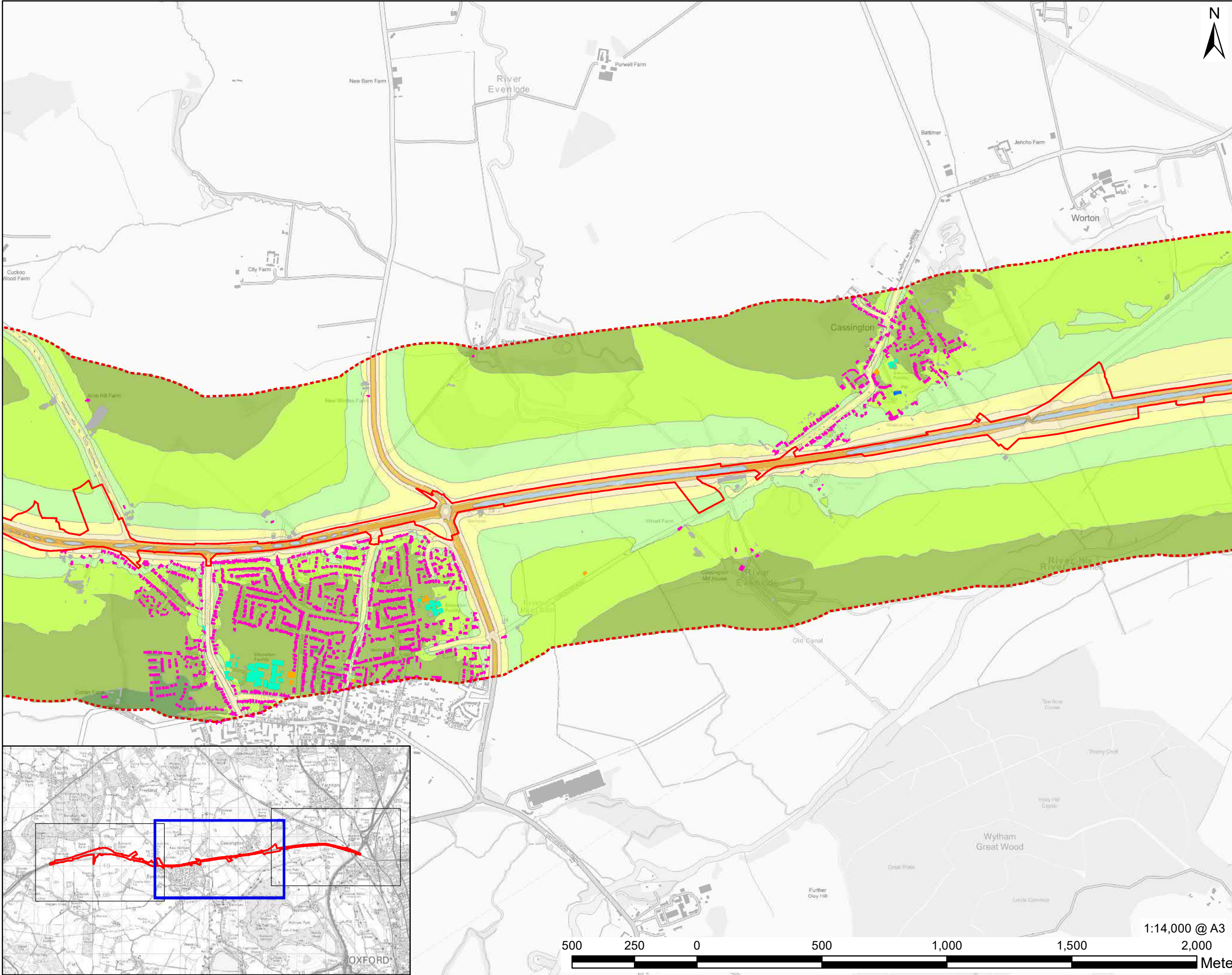
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Traffic Noise Levels 2024
Do-Minimum

SHEET NUMBER
Figure 12-2 Sheet 1 of 3



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- LEGEND**
- 600m Calculation
 - Residential Receptor
 - Other Receptor**
 - Community Facility
 - Education Facility
 - Place of Worship
 - 2024 Do-Minimum $L_{A10, 18h}dB$ at 4m (Free Field)**
 - ≤ 40
 - >40 to ≤ 45
 - >45 to ≤ 50
 - >50 to ≤ 55
 - >55 to ≤ 60
 - >60 to ≤ 65
 - >65 to ≤ 70
 - >70 to ≤ 75

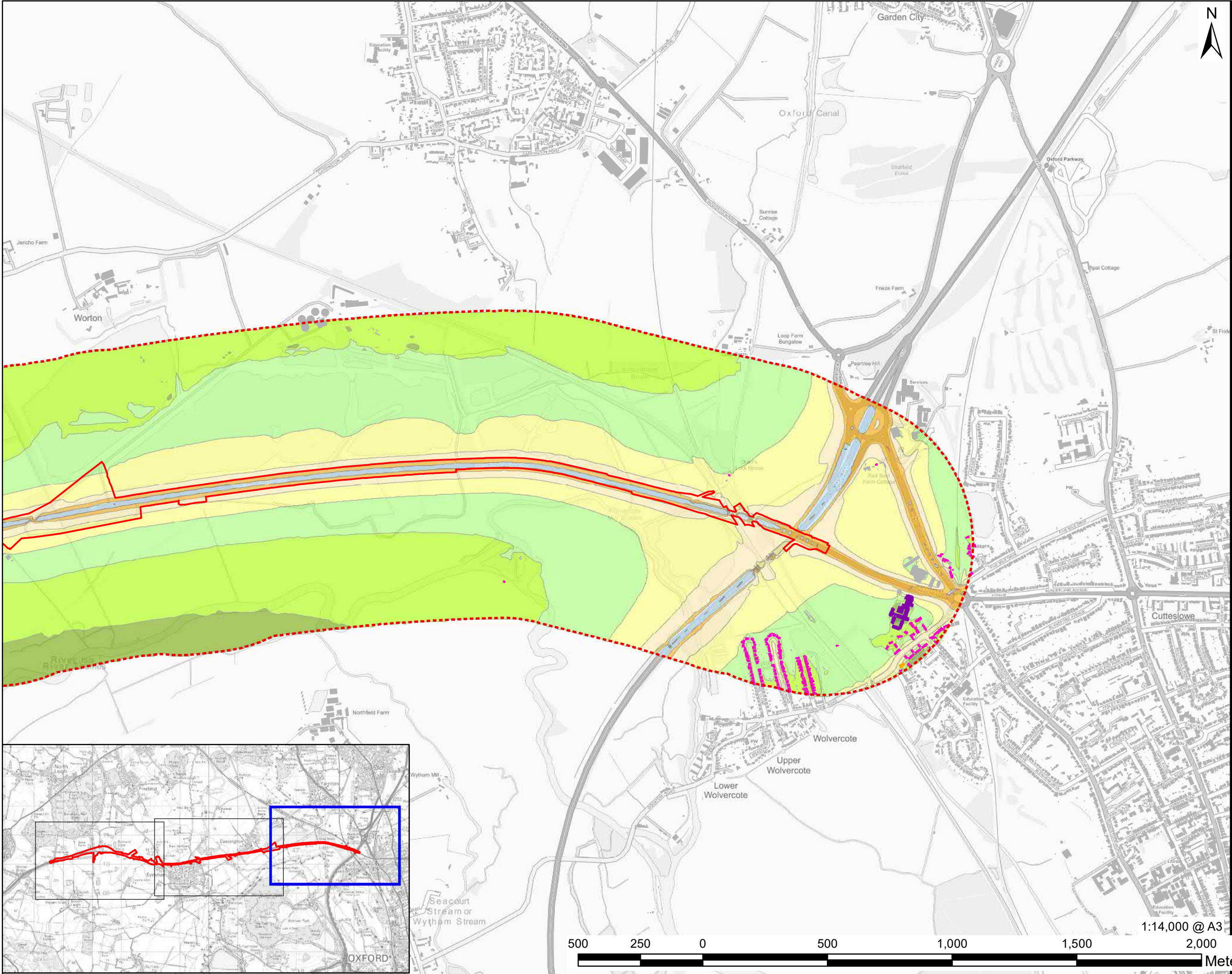
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LEGEND

600m Calculation

Residential Receptor

Other Receptor

Community Facility

Hotel

2024 Do-Minimum L_{A10}, 18h dB at 4m (Free Field)

<=40
>40 to <=45
>45 to <=50
>50 to <=55
>55 to <=60
>60 to <=65
>65 to <=70
>70 to <=75
>80

NOTES

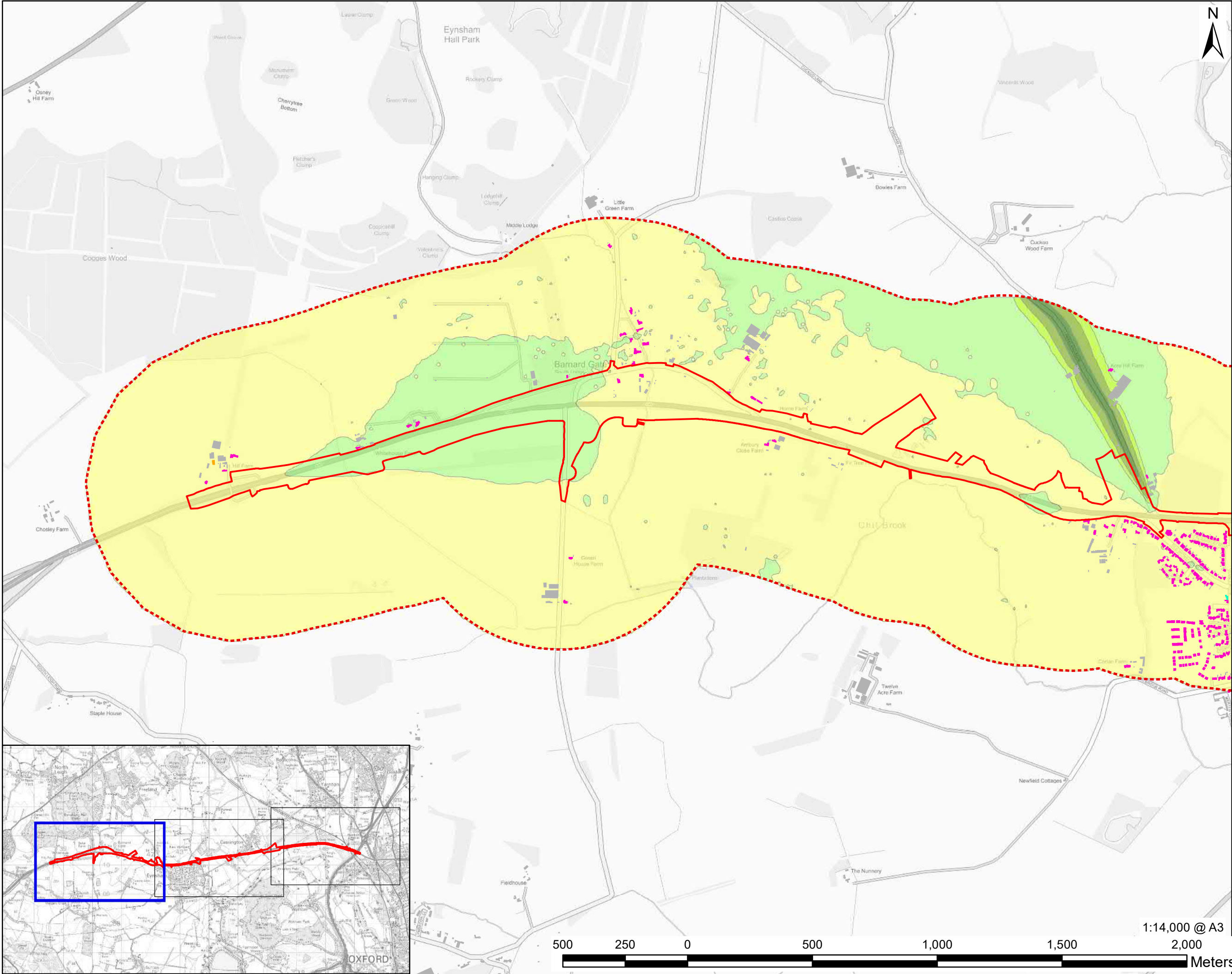
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Traffic Noise Levels 2024
Do-Minimum

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LEGEND

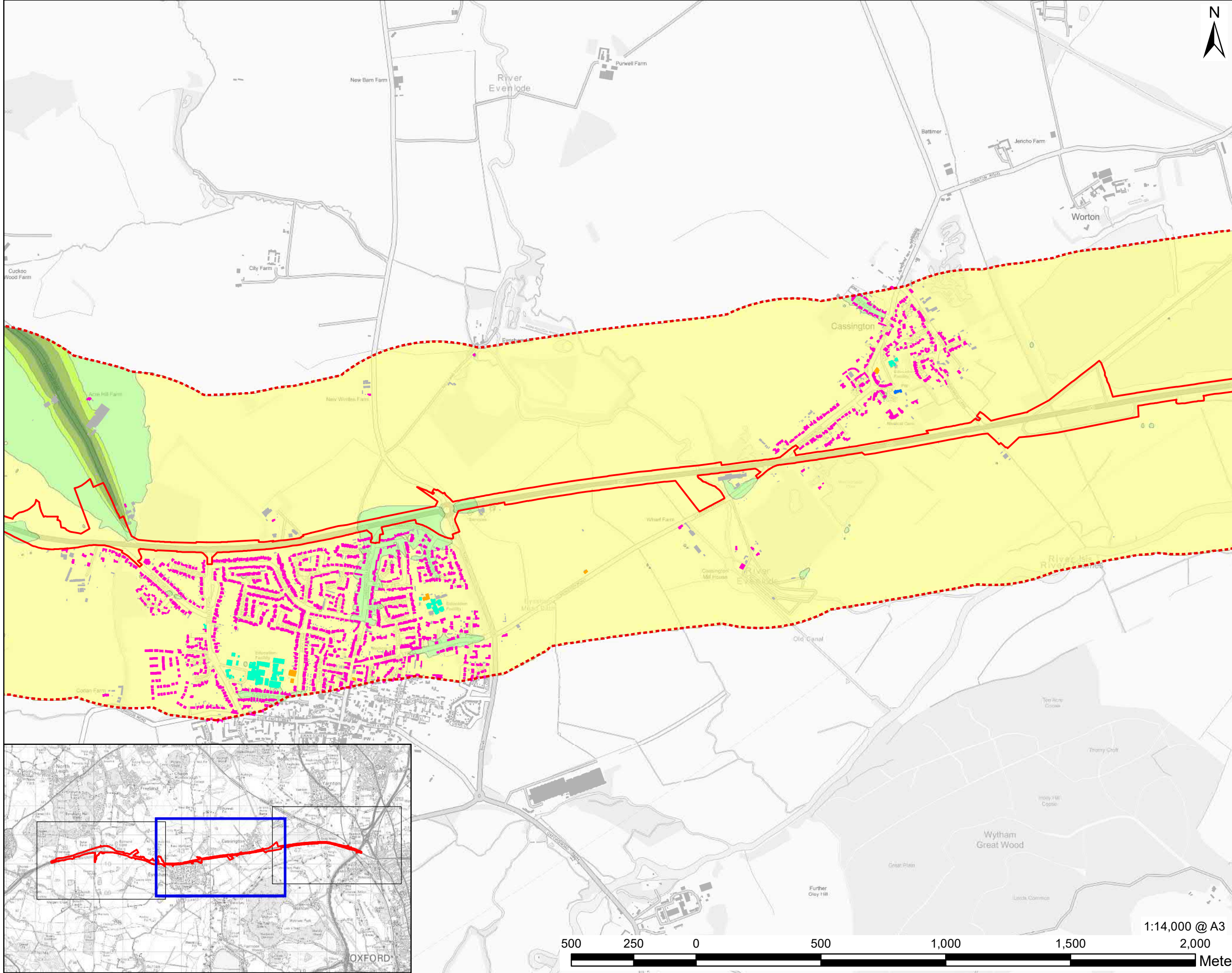
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600m Calculation
Residential Receptor

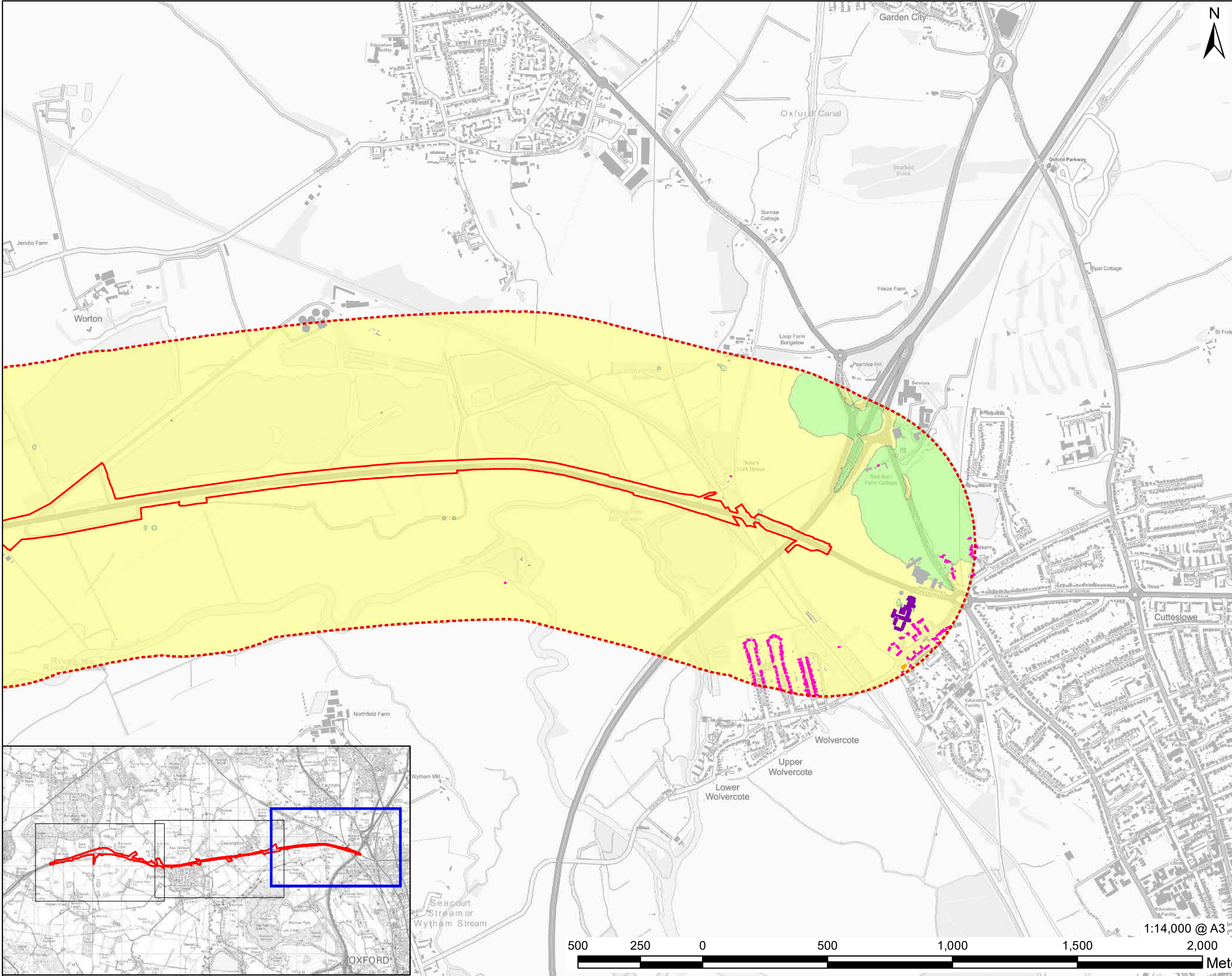
Other Receptor

Community Facility
Education Facility

Change in $L_{A10\ 18h}$ dB at 4m (Free Field)

≤ -10
-9.9 to -5
-4.9 to -3
-2.9 to 0
0.1 to 2.9
3 to 4.9
5 to 9.9
 >10





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- LEGEND**
- Site Boundary
 - 600m Calculation
 - Residential
 - Other Receptor**
 - Community Facility
 - Hotel
 - Change in L_{A10 18h} dB at 4m (Free Field)**
 - <=-10
 - 9.9 to -5
 - 4.9 to -3
 - 2.9 to 0
 - 0.1 to 2.9
 - 3 to 4.9
 - 5 to 9.9
 - >10

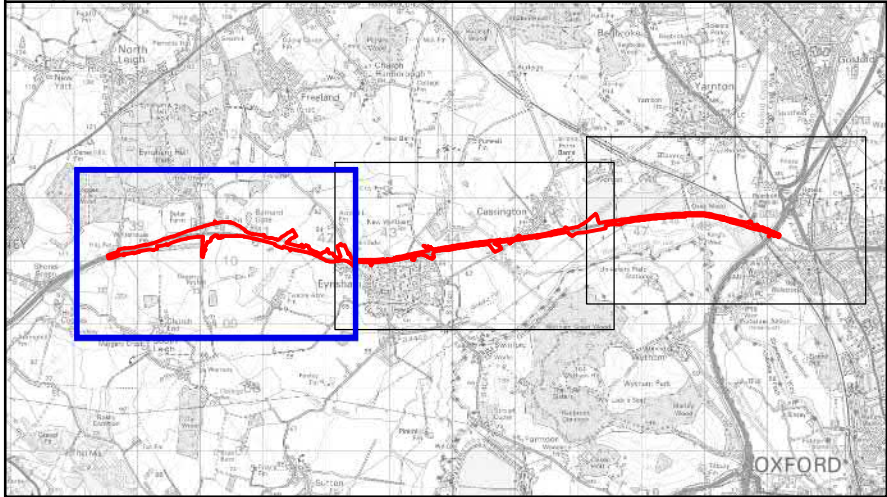
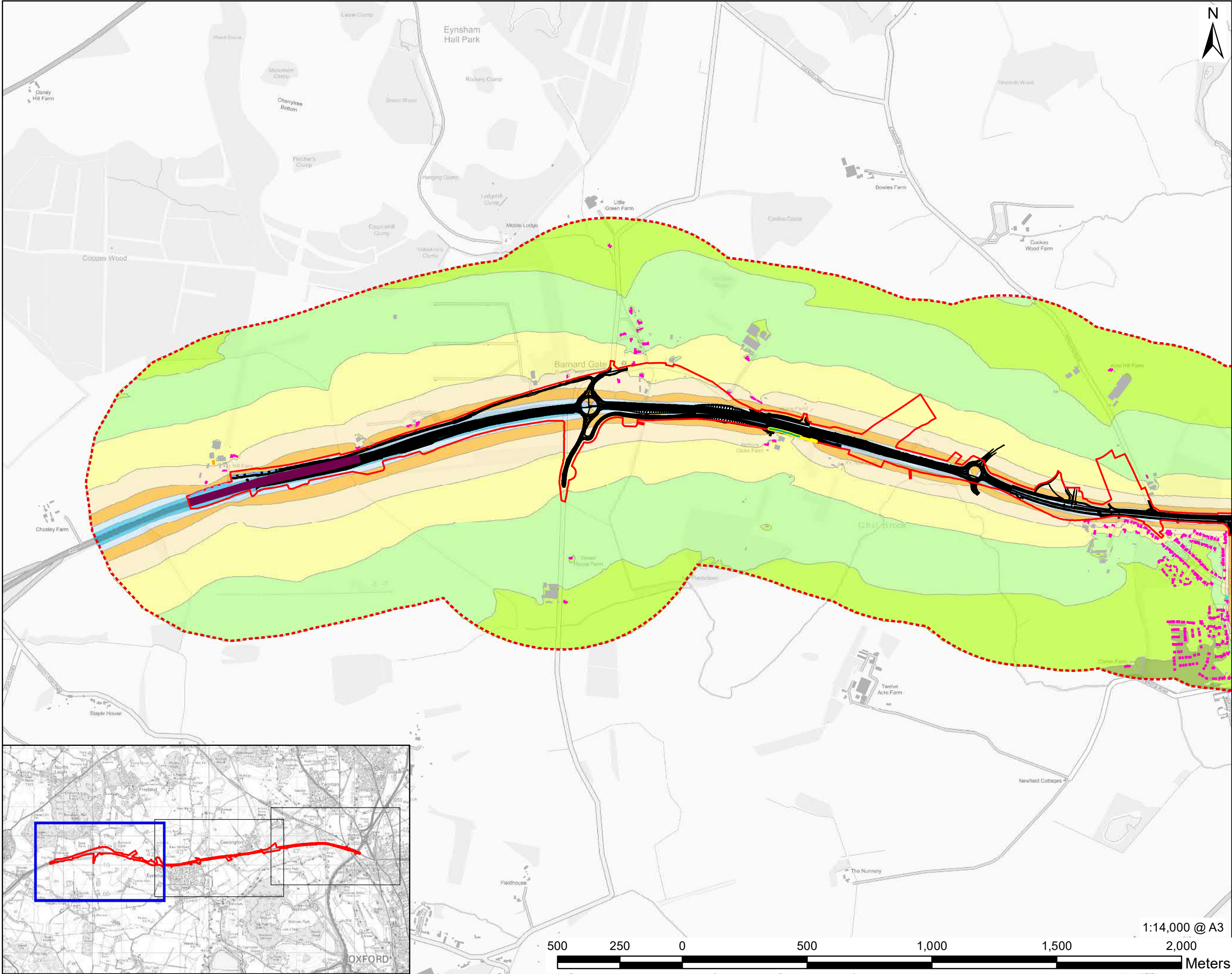
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Long Term Change in Traffic Noise Levels 2024 Do-Minimum to 2031 Do-Minimum

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- LEGEND**
- Site Boundary
 - 600m Calculation Area
 - Indicative Scheme Design
 - Noise Bund
 - Mitigation Option 1 - Noise Barrier
 - Mitigation Option 2 - Quieter Surfacing
 - Environmental Fence
 - Residential Receptor

- Other Receptor**
- Community Facility
 - Education Facility

- 2024 Do-Something $L_{A10\ 18h}$ dB at 4m (Free Field)**
- <40
 - 40 to <=45
 - 45 to <=50
 - 50 to <=55
 - 55 to <=60
 - 60 to <=65
 - 65 to <=70
 - 70 to <=75
 - 75 to <=80
 - >80

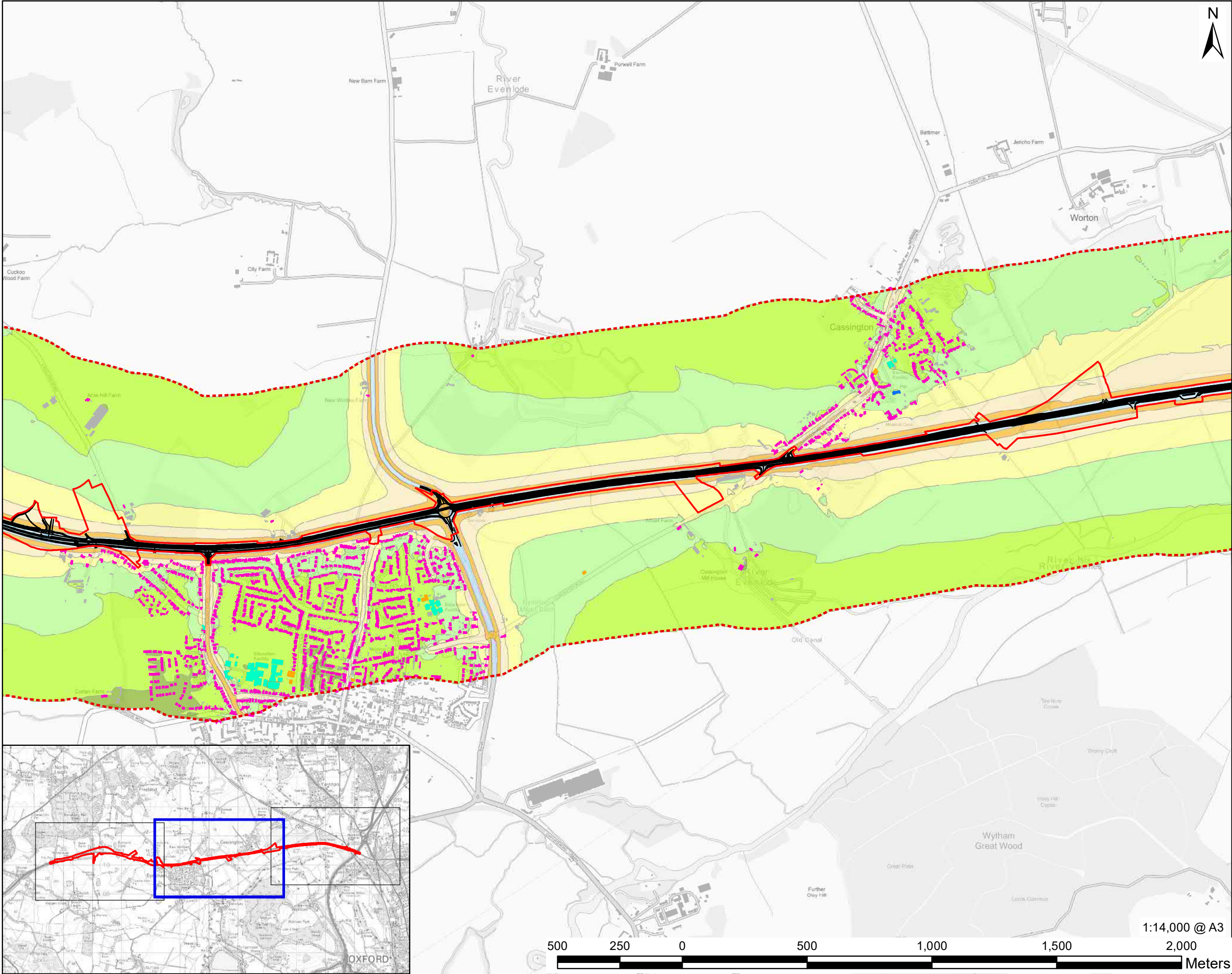
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Traffic Noise Levels 2024
Do-Something

SHEET NUMBER
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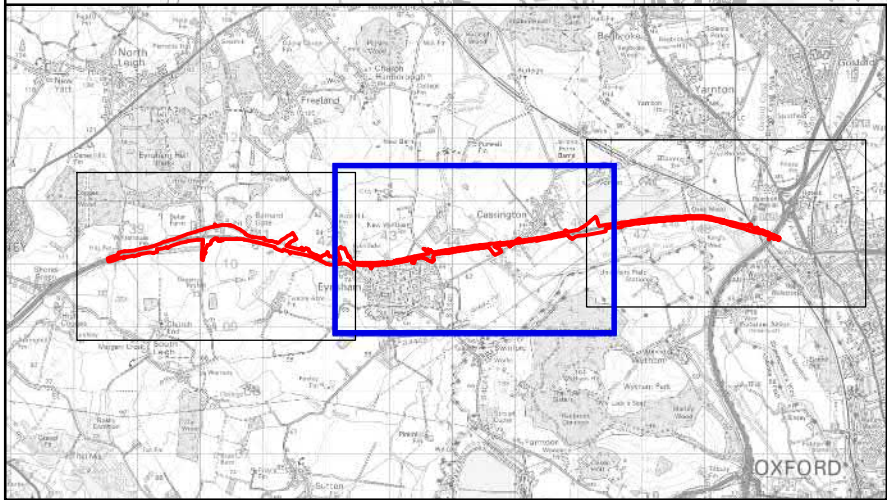


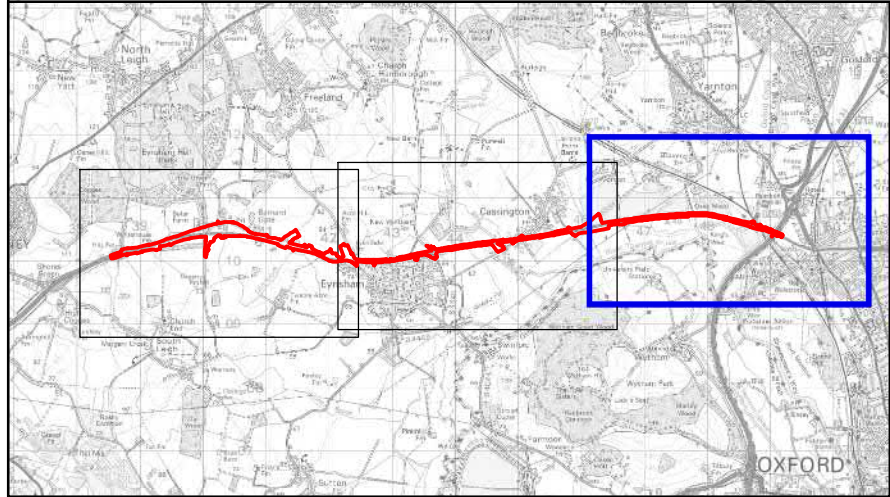
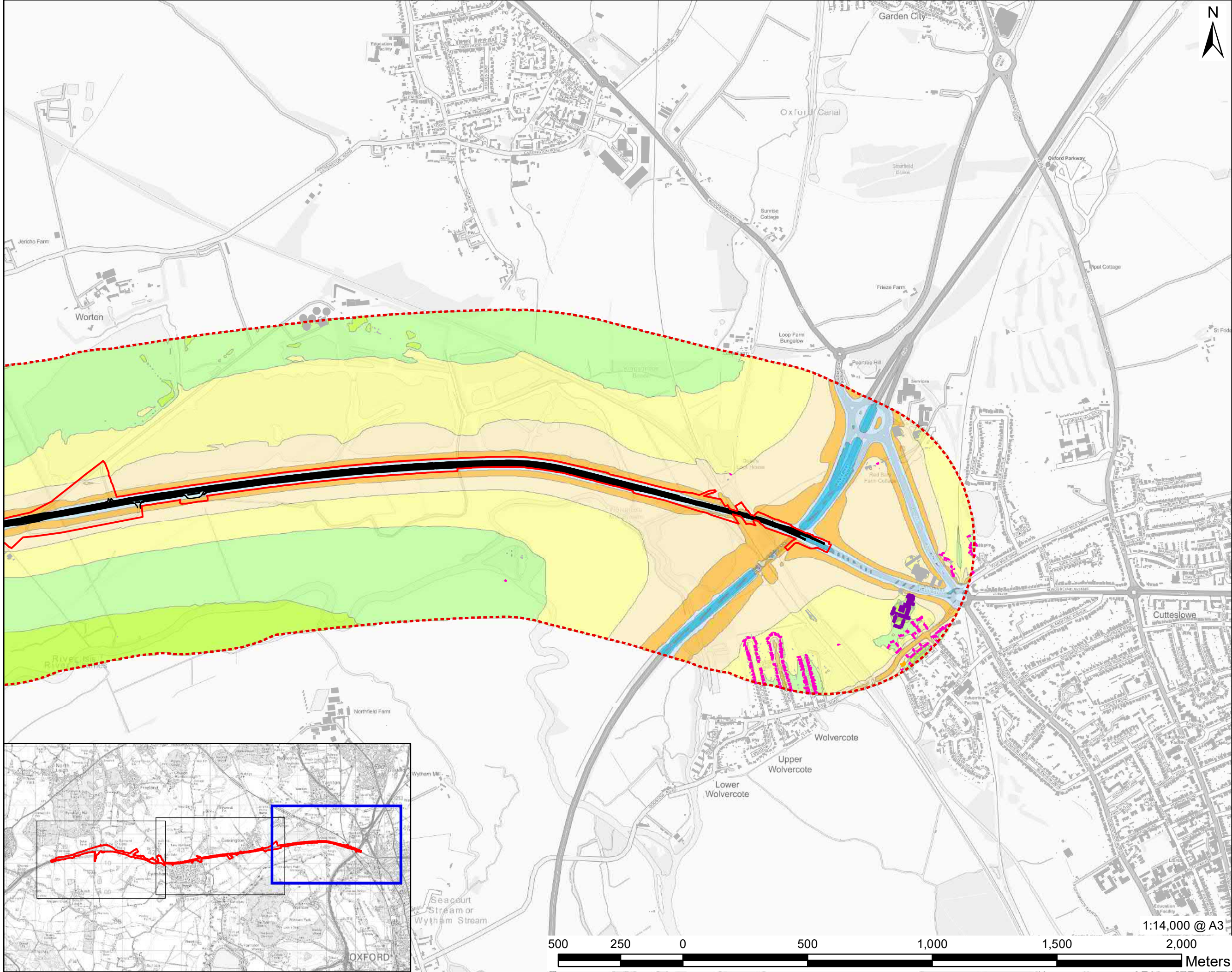
LEGEND

- Site Boundary
- 600m Calculation Area
- Indicative Scheme Design
- Residential Receptor
- Other Receptor**
 - Community Facility
 - Education Facility
 - Place of Worship

2024 Do-Something $L_{A10\ 18h}$ dB at 4m (Free Field)

<40
40 to <=45
45 to <=50
50 to <=55
55 to <=60
60 to <=65
65 to <=70
70 to <=75
75 to <=80





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LEGEND
Site Boundary
600m Calculation Area
Indicative Scheme Design
Residential Receptor
Other Receptor
Community Facility
Hotel
2024 Do-Something $L_{A10\ 18h}$
dB at 4m (Free Field)

- <40
- 40 to <=45
- 45 to <=50
- 50 to <=55
- 55 to <=60
- 60 to <=65
- 65 to <=70
- 70 to <=75
- 75 to <=80
- >80

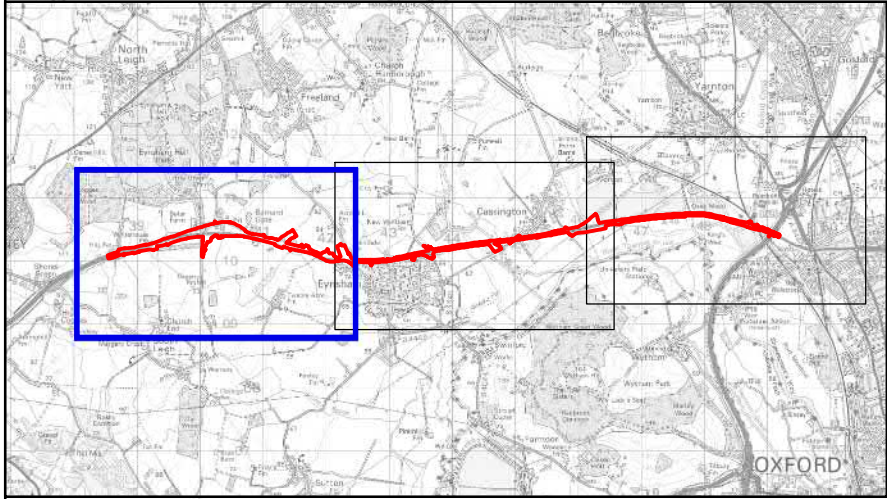
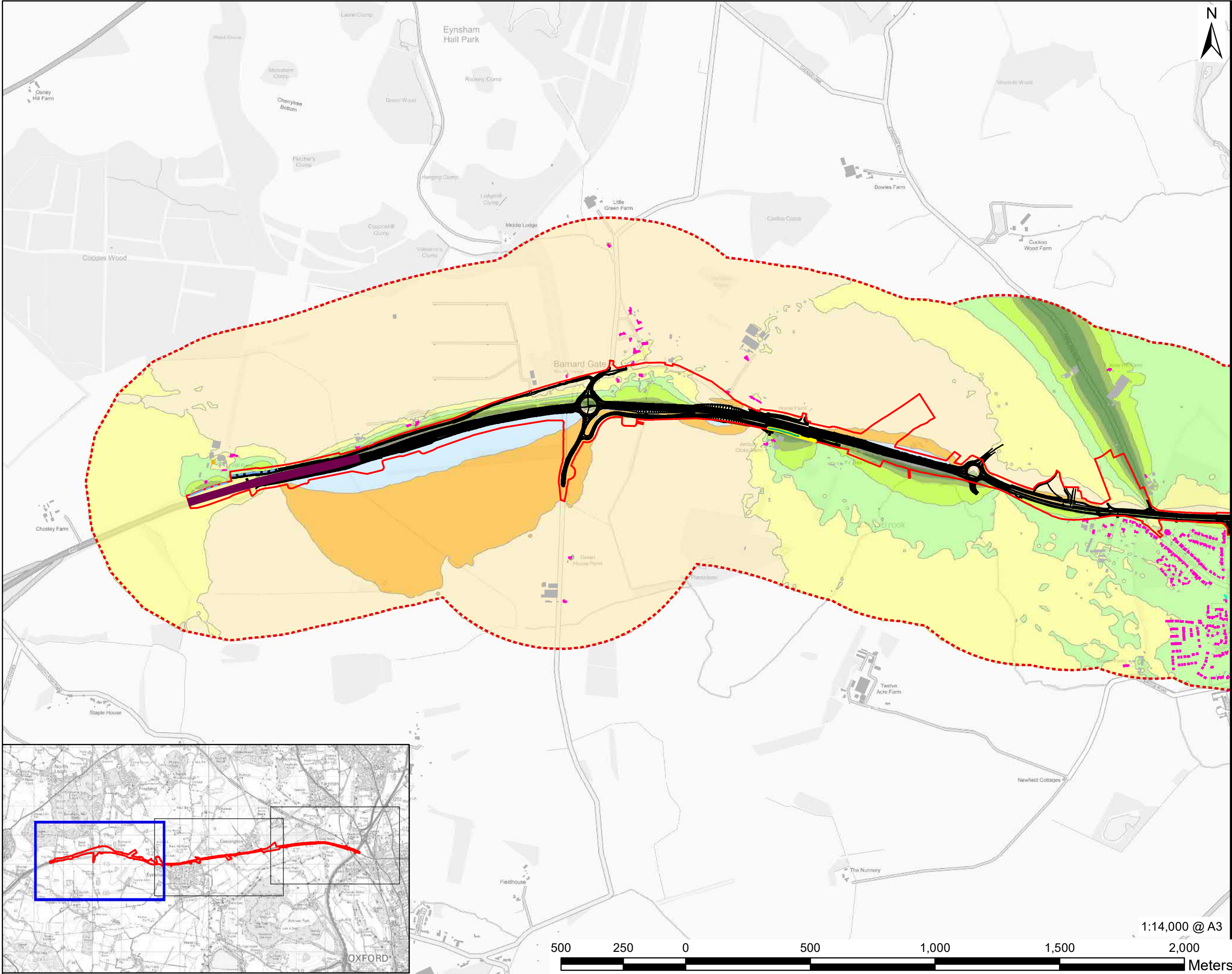
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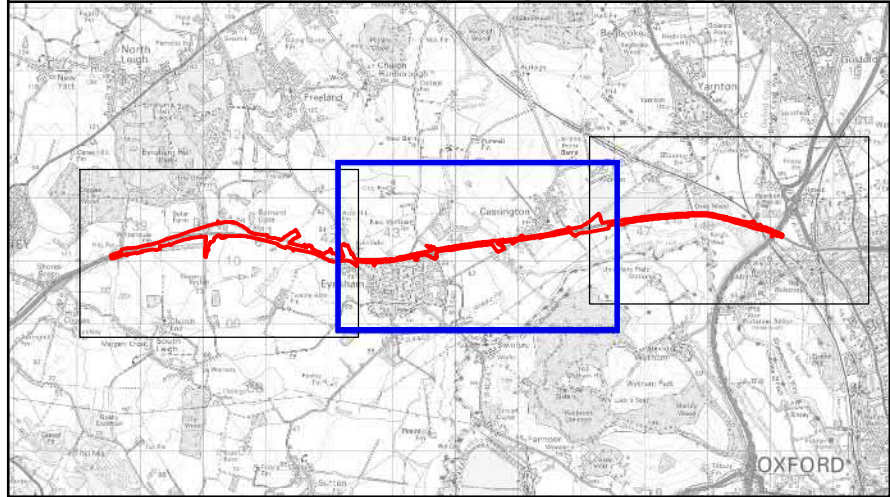
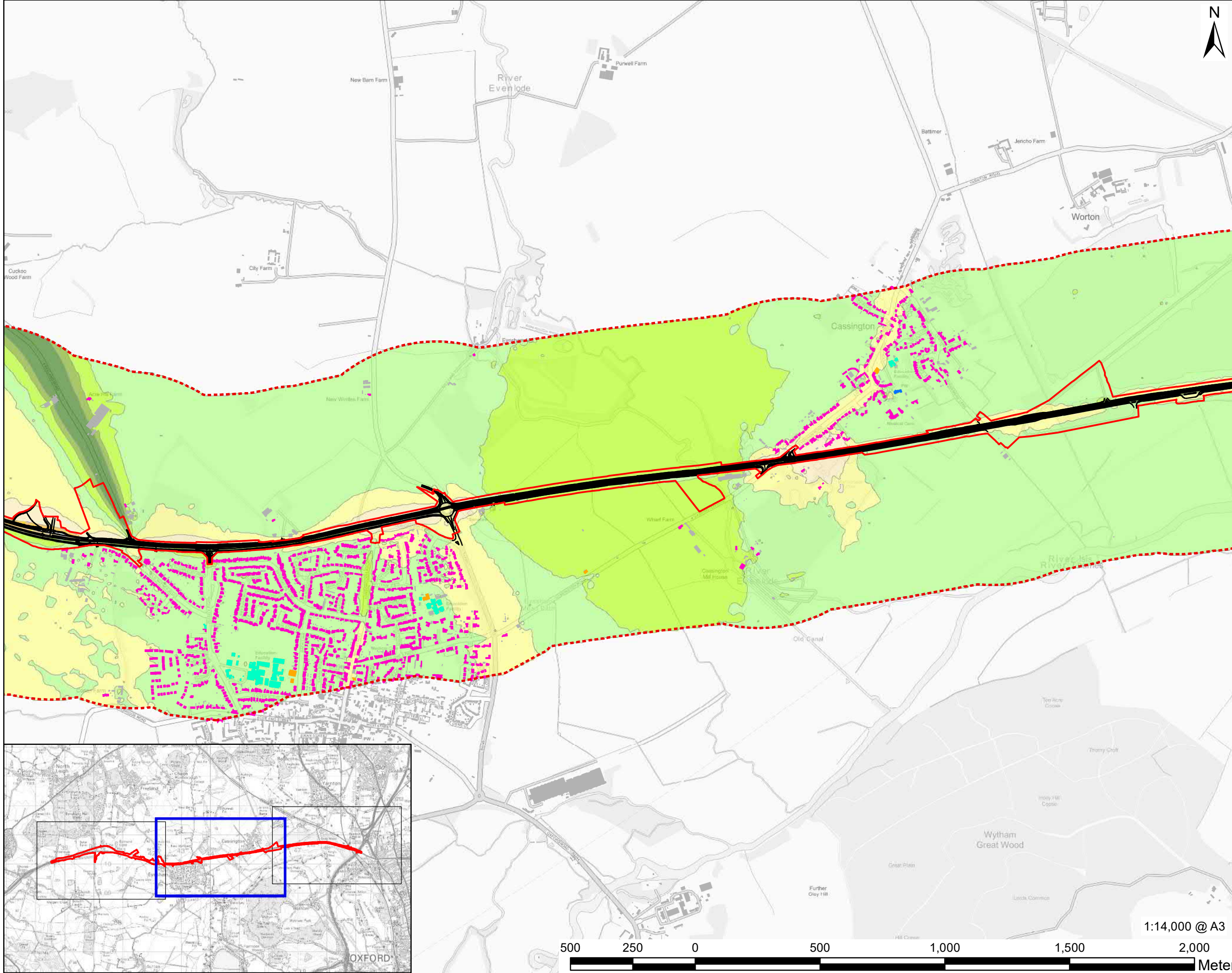
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Do-Something

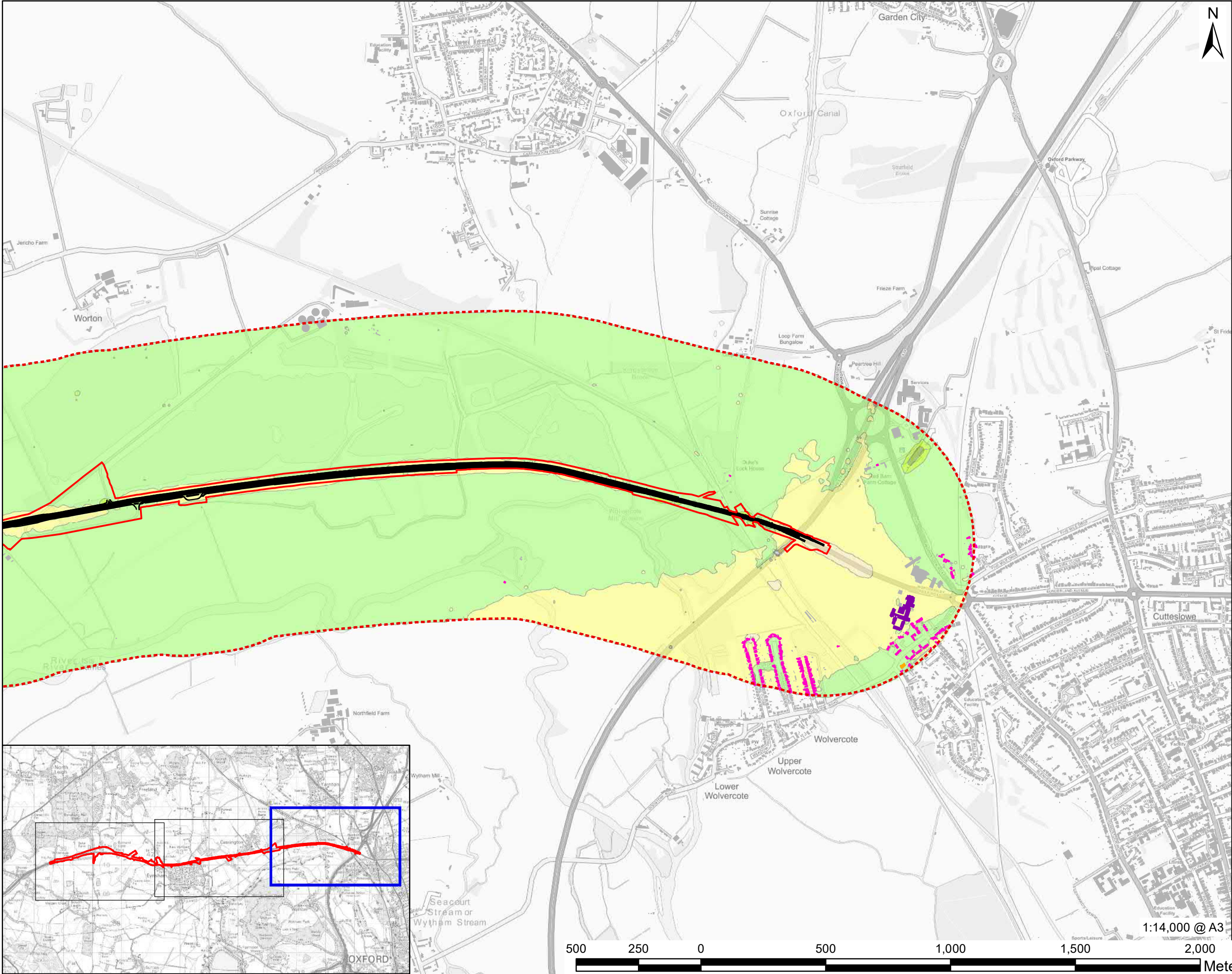
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LEGEND

- Site Boundary
- 600m Calculation Area
- Indicative Scheme Design
- Noise Bund
- Mitigation Option 1 - Noise Barrier
- Mitigation Option 2 - Quieter Surfacing
- Environmental Fence
- Residential Receptor
- Other Receptor**
 - Community Facility
 - Education Facility
- Change in $L_{A10\ 18h}$ dB at 4m (Free Field)**
 - <=-5
 - 4.9 to -3
 - 2.9 to -1
 - 0.9 to 0
 - 0 to 0.9
 - 1 to 2.9
 - 3 to 4.9
 - >=5





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LEGEND

- Site Boundary
- 600m Calculation Area
- Indicative Scheme Design
- Residential Receptor
- Other Receptor**
 - Community Facility
 - Hotel
- Change in $L_{A10\ 18h}$ dB at 4m (Free Field)**
 - <=-5
 - 4.9 to -3
 - 2.9 to -1
 - 0.9 to 0
 - 0. to 0.9
 - 1 to 2.9
 - 3 to 4.9
 - >=5

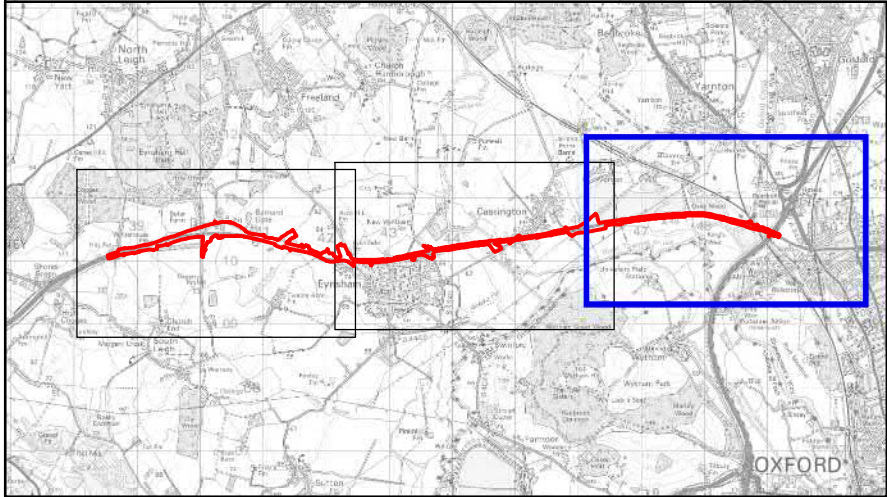
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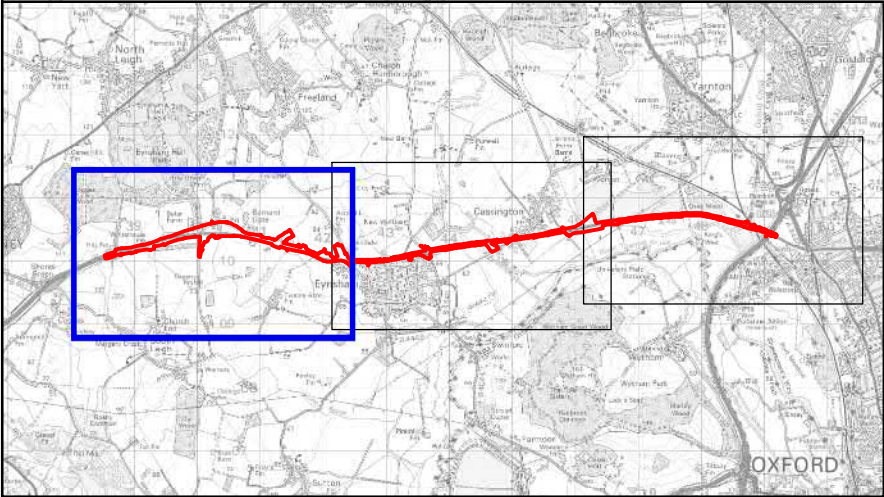
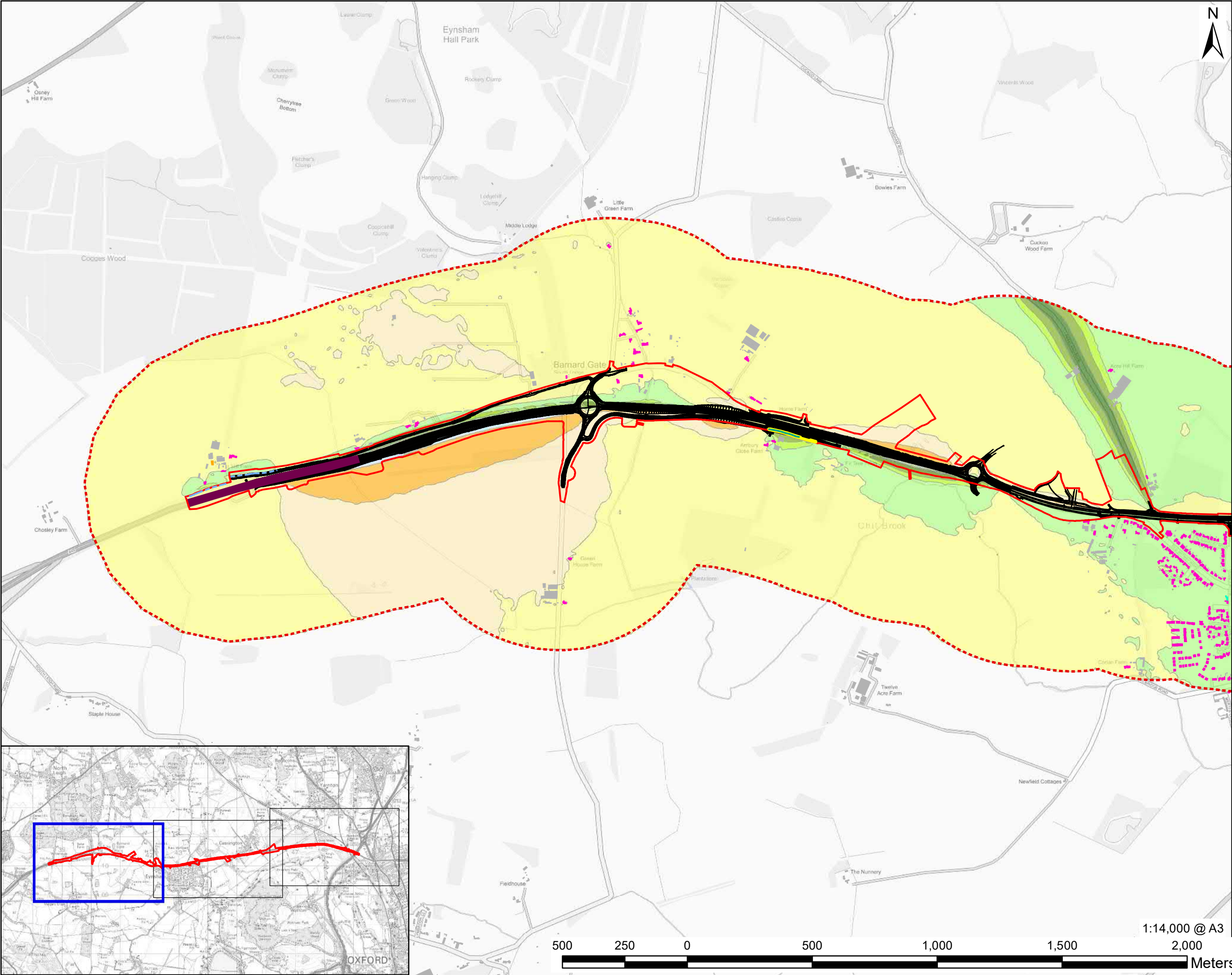
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Short Term Change in Traffic Noise Levels 2024 Do-Minimum to 2024 Do-Something

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- LEGEND**
- Site Boundary
 - 600m Calculation Area
 - Indicative Scheme Design
 - Noise Bund
 - Mitigation Option 1 - Noise Barrier
 - Mitigation Option 2 - Quieter Surfacing
 - Environmental Fence
 - Residential Receptor
 - Other Receptor**
 - Community Facility
 - Education Facility
 - Change in $L_{A10, 18h}$ dB at 4m (Free Field)**
 - ≤ -10
 - 9.9 to -5
 - 4.9 to -3
 - 2.9 to 0
 - 0.1 to 2.9
 - 3 to 4.9
 - 5 to 9.9
 - ≥ 10

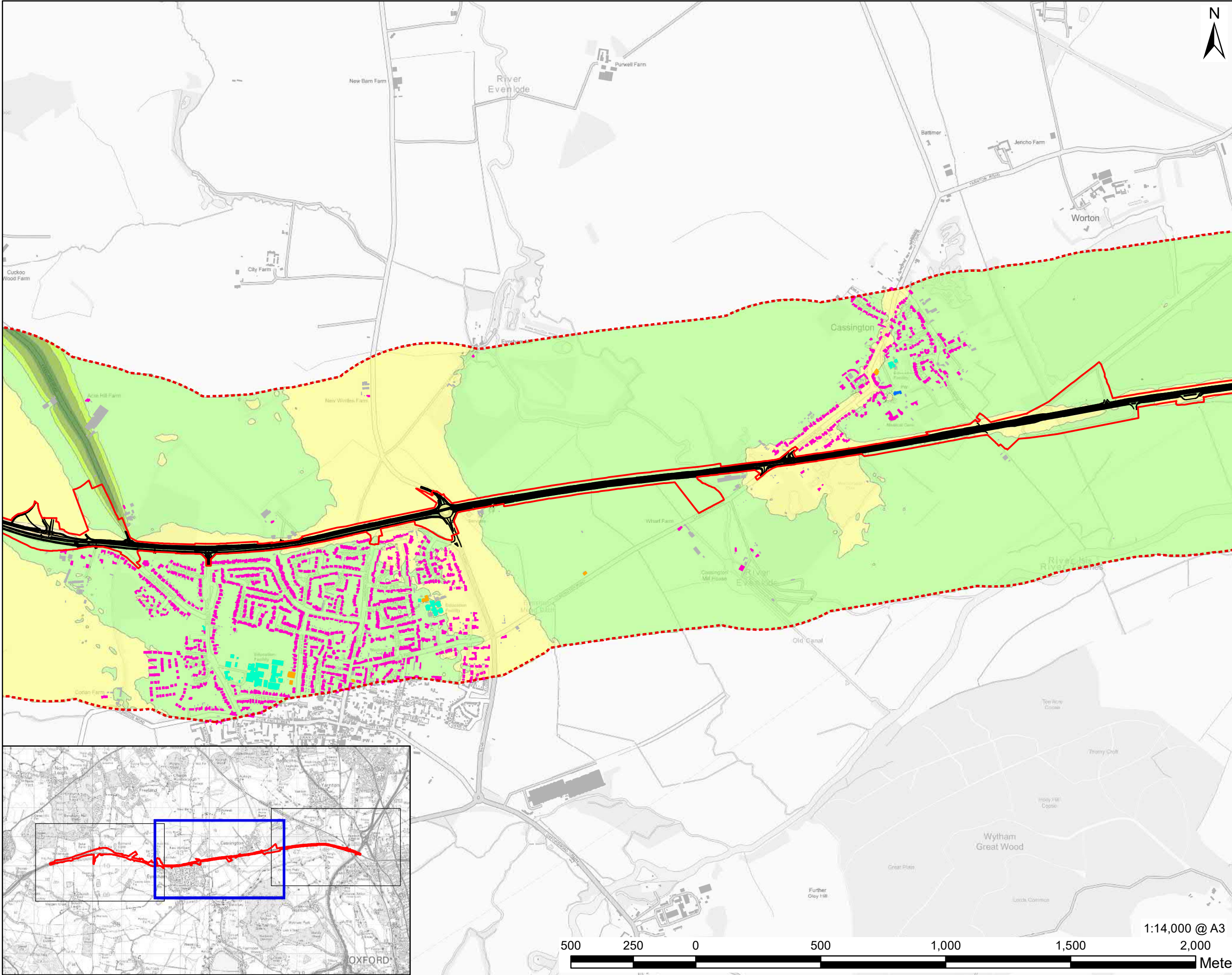
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- LEGEND**
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 - 600m Calculation Area
 - Indicative Scheme Design
 - Residential Receptor
 - Other Receptor**
 - Community Facility
 - Education Facility
 - Place of Worship
 - Change in $L_{A10, 18h}$ dB at 4m (Free Field)**
 - <=-10
 - 9.9 to -5
 - 4.9 to -3
 - 2.9 to 0
 - 0.1 to 2.9
 - 3 to 4.9
 - 5 to 9.9
 - >=10

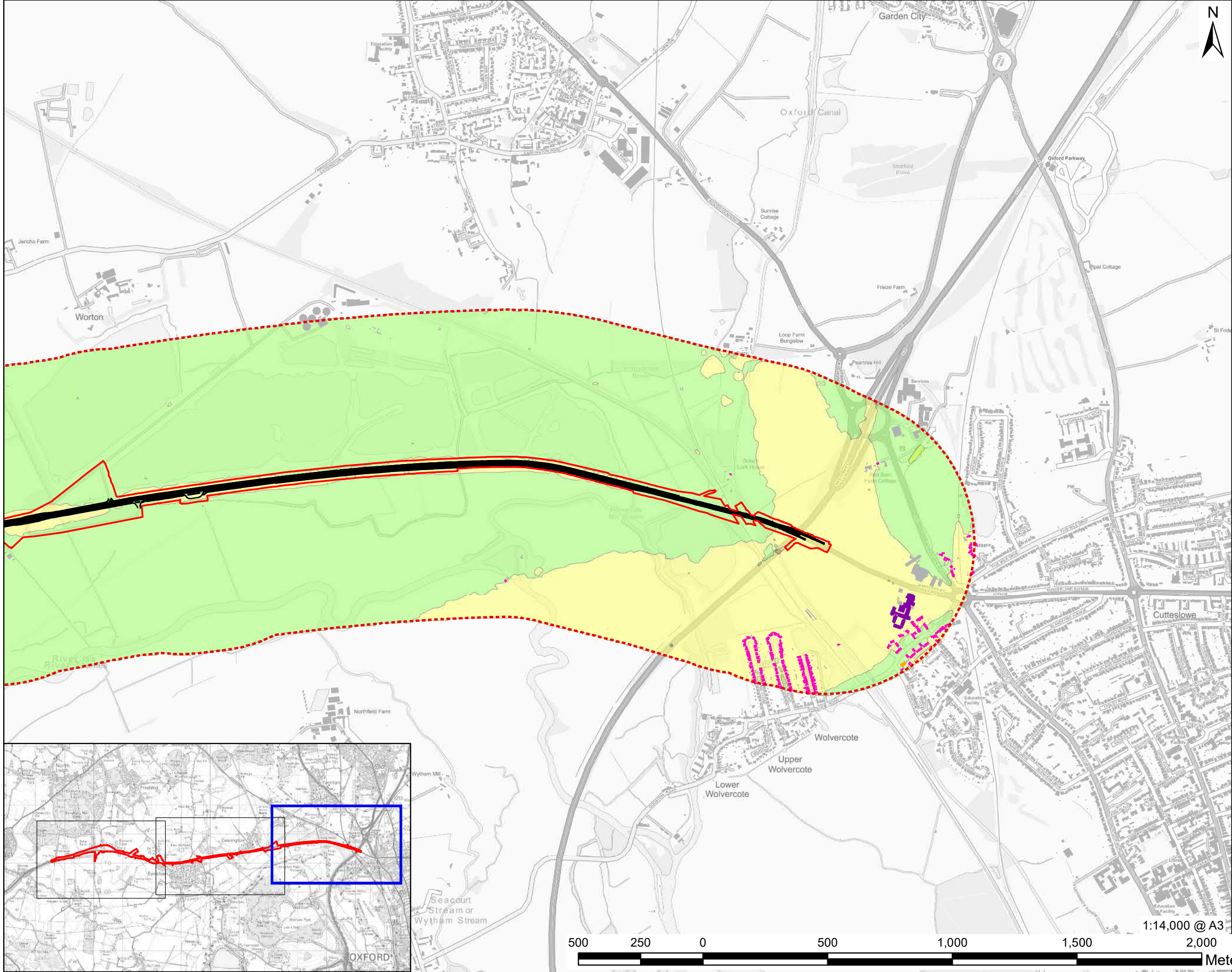
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LEGEND

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- Indicative Scheme Design
- Residential Receptor
- Other Receptor**
 - Community Facility
 - Hotel
- Change in $L_{A10, 18h}$ dB at 4m (Free Field)**
 - <=-10
 - 9.9 to -5
 - 4.9 to -3
 - 2.9 to 0
 - 0.1 to 2.9
 - 3 to 4.9
 - 5 to 9.9
 - >=10

NOTES
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ISSUE PURPOSE
ENVIRONMENTAL STATEMENT

PROJECT NUMBER
60615257

SHEET TITLE
Long Term Change in Traffic Noise Levels 2024 Do-Minimum to 2031 Do-Something

SHEET NUMBER
Figure 12-6 Sheet 3 of 3

