A46 Newark Bypass

TR010065/APP/6.1

6.1 Environmental Statement
Chapter 8 Biodiversity

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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A46 Newark Bypass

Development Consent Order 202[x]

ENVIRONMENTAL STATEMENT

CHAPTER 8 BIODIVERSITY

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Contents

8 Biodiversity 1
8.1 Introduction 1
8.2 Competent expert evidence 2
8.3 Legislative and policy framework 2
8.4 Consultation 13
8.5 Assessment methodology 17
8.6 Assessment assumptions and limitations 22
8.7 Study area 34
8.8 Baseline conditions 37
8.9 Potential impacts 75
8.10 Design, mitigation, compensation and enhancement measures 85
8.11 Assessment of likely significant effects 101
8.12 Monitoring 128
8.13 Conclusions 130
8.14 References 131

8 Biodiversity

8.1 Introduction

8.1.1 This Chapter presents the information required by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) to be provided in the Environmental Statement (ES) to enable the identification and assessment of likely significant effects on biodiversity.

8.1.2 The Scheme has the potential to cause both adverse and beneficial direct and indirect effects. This Chapter:

- Presents the existing baseline for biodiversity established from desk studies, dedicated surveys and consultation.
- Presents an assessment of the importance of biodiversity resources (sites, habitats and species) that have the potential to be affected by the Scheme.
- Identifies the potential impacts on biodiversity and ecology, based on the information gathered and analysis and assessments undertaken to date.
- Identifies any assumptions and limitations encountered in compiling and assessing the environmental information.
- Takes account of the measures incorporated into the design to avoid and reduce likely significant adverse effects on important features.
- Sets out any additional mitigation measures required to avoid, reduce or offset the possible adverse ecology and nature conservation effects.
- Identifies opportunities for Biodiversity Net Gain (BNG) and enhancement of biodiversity resources.

8.1.3 This assessment considers both construction and operational phase effects and has been prepared in accordance with the Design Manual for Roads and Bridges (DMRB) LA 108 Biodiversity[1] and LD 118 Biodiversity Design,[2] supported by the 'Guidelines for Ecological Impact Assessment in the UK and Ireland'[3] from the Chartered Institute of Ecology and Environmental Management (CIEEM).

8.1.4 This Chapter has been undertaken in compliance with the Planning Inspectorate's EIA Scoping Opinion **(TR010065/APP/6.10)**. Appendix

[1] National Highways (2020) DMRB LA 108 – Biodiversity, Revision 1 [online]. Available at: LA 108 - Biodiversity (standardsforhighways.co.uk) (Last accessed December 2023).

[2] National Highways (2020) DMRB LD 118 Biodiversity design, Revision 0 [online]. Available at: LD 118 - Biodiversity design (standardsforhighways.co.uk) (Last accessed December 2023).

[3] CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine Version 1.2 [online]. Available at: ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.2-April-22-Compressed.pdf (cieem.net) (Last accessed December 2023).

4.3 (Scoping Opinion Schedule of Comments and Responses) of the ES Appendices **(TR010065/APP/6.3)** contains further information on how each of the matters raised in the EIA Scoping Opinion have been addressed.

8.1.5 Chapter 2 (The Scheme) of this ES contains a detailed description of the Scheme, embedded and essential mitigation (including the principles of the mitigation hierarchy). The drawings referenced in this Chapter can be found in the ES Figures **(TR010065/APP/6.2)**, and the technical appendices referred to in this Chapter are presented in the ES Appendices **(TR010065/APP/6.3)**.

8.1.6 This Chapter should be read in parallel with Chapter 5 (Air Quality), Chapter 11 (Noise and Vibration), Chapter 13 (Road Drainage and the Water Environment) and Chapter 15 (Combined and Cumulative Effects) of this ES.

8.1.7 A Habitats Regulations Assessment (HRA) **(TR010065/APP/6.6)** has been compiled in parallel to the production of this ES in accordance with the Conservation of Habitats and Species Regulations 2017 (as amended)[4], in relation to European designated sites and follows standards set out in DMRB LA 115 - Habitats Regulations assessment and the Planning Inspectorate for Nationally Significant Schemes (PINS) Advice Note 10.[5] The HRA is provided as a standalone application document.

8.2 Competent expert evidence

8.2.1 The competent expert has an MRes Science and the Environment, is a Chartered Environmentalist and full member of the Chartered Institute of Ecology and Environmental Management. The competent expert has 15 years of professional experience in consultancy and specialises in ecological impact assessment and mitigation design and enhancement, including preparation of ES Biodiversity Chapters.

8.3 Legislative and policy framework

8.3.1 The principal legislation and planning context for the assessment of the environmental effects of the Scheme on biodiversity is presented below. The relevant legislation and policies listed below have been taken account of in the assessment.

[4] The Conservation of Habitats and Species Regulations 2017 (SI 2017/1012) [online]. Available at: https://www.legislation.gov.uk/uksi/2017/1012/2022-10-01 (Last accessed December 2023).

[5] The Planning Inspectorate (2022) Advice Note Ten: Habitats Regulations Assessment relevant to nationally significant infrastructure projects Version 9 [online]. Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-ten/ (Last accessed December 2023).

Legislation

Conservation of Habitats and Species Regulations 2017 (as amended); 'the Habitats Regulations'

8.3.2 The Habitats Regulations provide for the designation and protection of the "national site network", which comprise Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). These were previously known as 'European Sites' and are referred to as designated sites of international importance in this ES Chapter. The Habitat Regulations also provide the framework of protection for specific species of flora (listed in Schedule 2) and fauna (listed in Schedule 4) (known as European Protected Species (EPS)) and their associated habitats.

8.3.3 Designated sites of international importance, species and habitats which are a primary reason or qualifying feature for the selection of sites, that have potential to be affected by the Scheme, have been considered in this ES Chapter and in the Habitats Regulations Assessment **(TR010065/APP/6.6)**.

Wildlife and Countryside Act 1981 (as amended); 'the 1981 Act'

8.3.4 Provides protection to a range of native species of flora and fauna, controls the release of non-native species and provides for the notification, confirmation, protection and management of Sites of Special Scientific Interest (SSSI).

8.3.5 Designated sites, protected flora and fauna and invasive species covered by the 1981 Act that have potential to be affected by the Scheme, have been considered in this assessment.

The Natural Environment and Rural Communities Act 2006, as amended; 'the NERC Act'

8.3.6 The NERC Act (as amended by the Environment Act 2021) places a duty on public authorities in England to conserve and enhance biodiversity. This requires public bodies and statutory undertakers to have regard to the purposes of conserving biodiversity in a manner that is consistent with the exercise of their normal functions (Section 40). The NERC Act also places a duty on the Secretary of State for Environment to publish and maintain a list of species and habitats which are regarded as being of 'principal importance' for the purpose of conserving or enhancing biodiversity in England (Section 41).

8.3.7 The mitigation hierarchy has been implemented during the Scheme design to conserve and enhance Habitats of Principal Importance (HPI) and Species of Principal Importance (SPI), identified through the desk study and field surveys in this assessment.

The Environment Act 2021

8.3.8 The Environment Act 2021 sets out legislation to provide a post-Brexit environmental framework for the UK. As a summary, the Act includes new legislation such as: binding targets on air and water quality, biodiversity, and resource efficiency and waste reduction. However, the majority of the Environment Act 2021 is not yet in force and until any changes are made, extant legislation and policies remain in force. The Environment Act will amend the Planning Act 2008 (the "2008 Act") so as to provide for biodiversity gain objectives to be set out in a statement of government policy for Nationally Significant Infrastructure Projects (NSIPs), although it is unlikely that this will be in place prior to the determination of the Development Consent Order (DCO) application for this Scheme. It is currently expected that the requirement for Biodiversity Net Gain (BNG) will be mandated in winter 2025 for NSIPs for those DCO applications which have yet to commence examination.

Environmental Targets (Biodiversity) (England) Regulations 2022

8.3.9 Environmental Targets (Biodiversity) (England) Regulations set long-term targets in respect of biodiversity and sets a target relating to the abundance of species. These targets include:

- To reduce the risk of species' extinction by 2042 when compared to the risk of species' extinction in 2022
- In excess of 500,000 hectares of a range of wildlife-rich habitats are to be restored or created by 31st December 2042
- The overall relative species abundance index on 31 December 2030 indicates that the decline in the abundance of species has been halted
- To reverse the decline of species abundance. This will be indicated by the overall relative species abundance index by 31st December 2042 being higher than the overall relative species abundance index for 31 December 2022 and at least 10% higher than the overall relative species abundance index for 31st December 2030

8.3.10 The types of wildlife-rich habitat listed under Schedule 1 and species for the targets relating to the abundance of species listed under Schedule 2 have been considered during the assessment in this Chapter.

The Environmental Targets (Woodland and Trees Outside Woodland) (England) Regulations 2023

8.3.11 The Environmental Targets (Woodland and Trees Outside Woodland) (England) Regulations set a long-term target under section 1(1) of the Environment Act 2021 (c. 30) that 16.5% of all land in England is covered in woodland and trees outside woodland by 31 December

2050.[6] The Forestry Commission will calculate whether this target has been met, which will be reported by 10 November 2051.

8.3.12 The mitigation hierarchy has been implemented during the Scheme design to conserve and enhance woodland and trees outside woodland. The Natural England Biodiversity Metric 3.1 (hereafter referred to as the BNG metric) has been used to ensure an appropriate multiplier has informed the area of compensation planting required to achieve a conservation benefit for this habitat and therefore contribute to achieving the target set in these Regulations. The multiplier assigned to each habitat type has been informed by the condition and distinctiveness of that habitat recorded during baseline surveys and is detailed in Appendix 8.14: Biodiversity Net Gain Technical Report of the ES Appendices **(TR010065/APP/6.3)**. The multipliers applied are summarised in the compensation section of this ES Chapter (see section 8.10.33 onwards for Compensation requirements for designated sites and section 8.10.39 onwards for Compensation requirements for habitats).

The Hedgerows Regulations 1997

8.3.13 Under the Hedgerows Regulations it is an offence to remove a hedgerow (as defined within the Regulations) without applying to the local planning authority (LPA) for permission. If the hedgerow qualifies as 'Important' under the Regulations the LPA must decide whether the reasons for removal justify the loss of an 'Important Hedgerow', with a presumption for retention.

8.3.14 Field surveys have assessed whether any hedgerows potentially affected by the Scheme qualify as "important" under the ecological criteria.

The Protection of Badgers Act 1992

8.3.15 The Protection of Badgers Act provides specific legislation to protect badgers *Meles meles* within the UK from wilful injuring, killing, taking (or attempting to do so), digging for a badger or intentionally or recklessly damaging or destroying a sett unless a licence is obtained from a statutory authority.

8.3.16 Data collated from the desk study and field surveys has informed appropriate mitigation, proposed in this Chapter, to protect badgers from impacts resulting from the Scheme. A licence from Natural England would be applied for where required, to avoid committing a wildlife offence.

[6] The Environmental Targets (Woodland and Trees Outside Woodland) (England) Regulations 2023 (SI 2023/90) [online]. Available at: https://www.legislation.gov.uk/uksi/2023/90/made (Last accessed December 2023).

Wild Mammals (Protection) Act 1996

8.3.17 The Wild Mammals (Protection) Act provides protection for wild mammals against certain acts of deliberate harm "*with intent to inflict unnecessary suffering*".

8.3.18 This assessment has considered the requirements of this Act and includes mitigation measures to ensure any risk of unnecessary suffering of wild animals is avoided, where reasonably practicable.

Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

8.3.19 Water Environment (Water Framework Directive) (England and Wales) Regulations (WFD) require objectives to be identified and set, to protect, prevent deterioration and improve the status of all waterbodies. Waterbodies include: rivers, streams, lakes, reservoirs, estuaries, coastal waters, canals and groundwaters. The standard objective is to achieve 'good status', or 'good potential' by 2027 (if the water body is artificial or is heavily modified).

8.3.20 The field survey data detailed in this ES Chapter has informed Appendix 13.1 (WFD Compliance Assessment) of the ES Appendices **(TR010065/APP/6.3)**.

The Eels (England and Wales) Regulations 2009

8.3.21 The Eels (England and Wales) Regulations, commit the competent authority to take actions to halt and reverse the decline in eel stocks. The Environment Agency has been granted powers to achieve this, through which they have introduced several measures. For example, the recovery measures "*aim to achieve 40 percent escapement of adult eels relative to escapement levels under pristine conditions."* i.e. to reduce eel mortality, conservation measures should allow for 40 percent of adult eels to escape to sea (spawner escapement) relative to the escapement levels in the absence of anthropogenic impacts.

8.3.22 This assessment considers the requirements of these Regulations as European eel have been recorded within watercourses in the study area (desk study data). This includes the provision of mitigation in compliance with the Eels Regulations (detailed in Section 8.10).

Salmon and Freshwater Fisheries Act 1975 (as amended)

8.3.23 The Salmon and Freshwater Fisheries Act protects spawning fish (includes any spawning fish, fish about to spawn, fish that have recently spawned or fish that have not yet recovered from spawning), immature fish and the food resource of freshwater fish from disturbance. The Act regulates the movement, killing and obstruction of fish and also focuses on the obstruction of waterways and the impact on migratory fish species. The Act also makes it an offence to pollute a watercourse with the result of poisoning or causing injury to fish, spawning habitat, spawn or food sources.

8.3.24 This assessment has considered the risk of mortality, migration barriers, pollution and the degradation of habitats potentially resulting from the Scheme in relation to the Salmon and Freshwater Fisheries Act.

The Invasive Alien Species (Enforcement and Permitting) Order 2019

8.3.25 Schedule 2 of The Invasive Alien Species (Enforcement and Permitting) Order lists animals and plants where it is an offence to:

- release or allow their escape into the wild
- plant or otherwise cause to grow in the wild
- sell, offer or expose for sale, or have in their possession or transport for the purposes of sale/import
- publish or cause to be published any advertisement likely to be understood as conveying the buying or selling, or intent to buy or sell
- keep or breed

8.3.26 Licenses to rehabilitate and release grey squirrels and muntjac deer have been revoked since this Order came into effect. The impact of the Scheme and associated mitigation detailed in this assessment has taken into consideration the presence of species listed in Schedule 2 of this Order, identified through the desk study and field surveys.

National Policy

National Policy Statement for National Networks 2014[7]

8.3.27 The National Policy Statement for National Networks (NPSNN) sets out the policy which the Scheme should comply with. It is also the basis for informing a judgement on the impacts of a Scheme, for example whether the Scheme is consistent with the requirements of the NPSNN. Compliance of the Scheme with the NPSNN is detailed within the NPSNN Accordance Table **(TR010065/APP/7.2)**.

8.3.28 A draft NPSNN was published for consultation in March 2023. The consultation period ended in June 2023. The draft NPSNN may be subject to change following the consultation and once published in its designated form. Although this is currently in draft it may still be an important consideration for the Secretary of State when determining whether to consent the DCO for this Scheme. Accordingly, the Draft NPSNN Accordance Tables **(TR010065/APP/7.3)** summarise compliance of the Scheme with the draft NPSNN.

8.3.29 The policies of relevance to biodiversity within the NPSNN and detail on how they have been addressed in the assessment are provided below.

[7] Department for Transport (2014) National Networks National Policy Statement [online] available at: National Policy Statement for National Networks (publishing.service.gov.uk).

8.3.30 The NPSNN sets out the matters that the Secretary of State for Transport should give due regard to when determining DCO applications that will affect biodiversity and ecological conservation. The NPSNN ensures the ES:

- Clearly identifies whether the Scheme would have a significant effect on the integrity of a SAC, SPA or Ramsar site, which are captured within the Habitats Regulations Assessment **(TR010065/APP/6.6)** (requirements of paragraphs 4.22 and 4.25).
- Clearly identifies and assesses the likely significant effects of the Scheme on sites of international, national and local ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity (requirements of paragraphs 5.22, 5.26 and 5.32 to 5.35). This is considered within this ES Chapter.
- Paragraphs 5.23, 5.25, 5.32 and 5.36 provide guidance on the principles that should be applied in relation to avoid significant harm to biodiversity (sites, species and habitats), providing appropriate mitigation as an integral part of the Scheme, and taking advantage of conservation and enhancement opportunities. This is considered within this ES Chapter.
- Paragraph 5.32 states *"The Secretary of State should not grant development consent for any development that would result in the loss or deterioration of irreplaceable habitats including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the national need for and benefits of the development, in that location, clearly outweigh the loss"*. This is considered within this ES Chapter. Justification of unavoidable loss of irreplaceable habitats is provided in Chapter 3 Assessment of Alternatives of this ES.
- Paragraph 5.25 states *"The applicant may also wish to make use of biodiversity offsetting in devising compensation proposals to counteract any impacts on biodiversity which cannot be avoided or mitigated"*. This is considered within this ES Chapter.

National Planning Policy Framework 2023[8]

8.3.31 The National Planning Policy Framework (NPPF) sets out the Government's planning policy framework for the whole of England, including the Government's expectation for content and quality of planning applications and local plan policy. The overall strategic aims of the NPSNN and NPPF are consistent. The NPPF may be an important and relevant matter but does not form the basis for a decision on a NSIP.

8.3.32 Section 15 covers Habitats and Biodiversity and provides a list of principles that Local Planning Authorities should apply when determining planning applications. These include:

[8] Department for Levelling Up, Housing & Communities (December 2023). National Planning Policy Framework [online] available at: National Planning Policy Framework (publishing.service.gov.uk) (last accessed March 2024).

- If significant harm to biodiversity cannot be avoided, adequately mitigated or as a last resort compensated for then planning permission should be refused
- Developments likely to have an adverse effect on a Site of Special Scientific Interest (SSSI) should not normally be permitted
- Development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland, and ancient or veteran trees) should normally be refused; and
- Developments whose primary objective is to conserve or enhance biodiversity should be supported. Opportunities to improve biodiversity in and around developments should be integrated as part of their design, especially where this can secure net gains for biodiversity

8.3.33 Paragraph 180 sets out how the Government expects planning decisions to contribute to and enhance the natural environment through a number of measures including protecting landscapes, recognition of wider benefits from natural capital, minimising impacts on and achieving net gains for biodiversity.

8.3.34 Paragraph 186 provides a number of principles that should be applied by LPAs when determining planning applications. These include refusing permission where significant harm cannot be avoided, mitigated or compensated for.

8.3.35 The NPPF states in paragraph 187 that, for the purpose of considering development proposals that may affect them, the following should be given the same protection afforded to the national site network under the Conservation of Habitats and Species Regulations 2017 (as amended) (see above):

- Potential SPAs (pSPA) and possible or candidate Special Areas of Conservation (pSAC and cSAC)
- Listed or proposed Ramsar sites
- Sites identified, or required, as compensatory measures for adverse effects on habitats sites, pSPA, pSAC, cSAC and listed or proposed Ramsar sites

8.3.36 This assessment has taken account of the requirements of the NPPF by determining the biodiversity resource importance through desk study and field surveys, by implementing the mitigation hierarchy as a fundamental part of the Scheme design, and through identifying potential biodiversity gains.

25 Year Environment Plan[9]

8.3.37 This plan is the Government's vision for biodiversity improvements in England and identifies the need to explore 'net gain' within the planning system.

8.3.38 The first revision of the 25 year plan 'Environmental Improvement Plan' was published in February 2023.[10]

Biodiversity 2020: A strategy for England's wildlife and ecosystem services

8.3.39 Biodiversity 2020 is the most recent biodiversity strategy for England, with a stated mission to halt overall biodiversity loss, support healthy ecosystems and establish coherent ecological networks. Objectives include:

- Establishing coherent and resilient ecological networks, described as "*a network of high-quality sites, protected by buffer zones, and connected by wildlife corridors and smaller, but still wildlife-rich, 'stepping-stone' sites*"
- Taking targeted action for the recovery of priority species whose conservation is not delivered through wider habitat-based and ecosystem measures
- Bringing more SSSIs into favourable condition
- Reducing environmental pressures by working with sectors such as agriculture, forestry, planning and development

UK Post-2010 Biodiversity Framework

8.3.40 Underpinned by the biodiversity and environment strategies of the four countries of the UK, the Biodiversity Framework sets out their common purpose and shared priorities. Objectives include, but are not limited to:

- Halt the loss of biodiversity and continue to reverse previous losses through targeted actions for species and habitats
- Restore and enhance biodiversity in urban, rural and marine environments through better planning, design and practice
- Develop an effective management framework that ensures biodiversity is considered in wider decision-making

Local policy

8.3.41 Local Biodiversity Action Plans (LBAPs) outline the plans for conserving fauna, flora and habitats within a defined area. The

[9] 'A Green Future: Our 25 Year Plan to Improve the Environment' https://www.gov.uk/government/publications/25-year-environment-plan (last accessed December 2023).

[10] HM Government (2023) Environment Improvement Plan 2023; First revision of the 25 Year Environment Plan.[online] available at: Environmental Improvement Plan (publishing.service.gov.uk) (www.gov.uk) (last accessed December 2023).

following local plan policies are relevant to the assessment of the Scheme in terms of biodiversity.

8.3.42 The Nottinghamshire Biodiversity Action Plan (BAP)[11] outlines the approach to biodiversity in Nottinghamshire and sets the habitats and species of conservation concern in the county. Key targets listed within this LBAP of relevance to this assessment include the following:

- Through planning control or other land use consultation processes, allow no further loss of areas of ditches, eutrophic and mesotrophic standing water, lowland wet grassland, parkland and wood pasture, and rivers and streams habitat and seek opportunities to enhance existing areas and create new areas through approved development.
- Enhance, where necessary, bat roosting sites and important feeding habitats with the aim of increasing bat population levels within the county.
- Create and appropriately manage complementary habitats such as wet grassland, woodland and scrub alongside watercourses to provide potential resting and foraging areas for otters *Lutra lutra*.
- Limit accidental killing of otters by providing underpasses on new and existing roads where appropriate.
- Avoid damage to actual or potential water vole *Arvicola amphibius* habitat caused by culverting, channelisation, sheet piling and flood defence work wherever possible, and explore opportunities for restoring watercourses to a more natural structure.
- Following further investigation on the effects of mink predation, and if deemed to be appropriate, encourage control of mink where this will increase water vole abundance or range.

8.3.43 Nottingham County Council Green Estates Development Strategy & Plan 2013-2023[12] vision statement:

- '*To manage and promote the Green Estate for the benefit of the people of Nottinghamshire, aiming to improve the quality of the environment through sustainable management practices which enhance biodiversity and protect our cultural heritage for future generations'*

8.3.44 The document contains the following policy which is relevant to biodiversity:

8.3.45 Policy GE3: To provide a Green Estate rich in biodiversity and cultural heritage.

[11] Nottinghamshire Biodiversity Action Group (2008) Local Biodiversity Action Plan [online]. Available at: [redacted] (Last accessed December 2023).

[12] Green Estates Development Strategy & Plan 2013-2023 Appendix 1 [online]. Available at: https://www.nottinghamshire.gov.uk/media/125962/green-estates-strategy-2013-2023.pdf (Last accessed December 2023).

- *"The Green Estate team is dedicated to improving the biodiversity, archaeological and cultural heritage of Nottinghamshire through conservation management.*
- *We will actively manage the Green Estate in accordance with the national and local Biodiversity Action Plans.*
- *We will continue our work to eradicate invasive non-native species across the Green Estate.*
- *We will continue to work closely with partners and landowners on landscape scale projects and develop important wildlife corridors linking the Green Estate to the surrounding countryside."*

National Highways policy

8.3.46 Biodiversity is entrenched within the Government's Road Investment Strategy and National Highways' Strategic Business Plan. In particular, the Road Investment Strategy[13] states that by 2020, the company must deliver no net loss of biodiversity and that by 2040 it must deliver a net gain in biodiversity. The potential for the Scheme to deliver biodiversity net gains has been considered as part of the design-development and assessment processes.

8.3.47 National Highways Biodiversity Action Plan *Our Plan to Protect and Increase Biodiversity (2015)*[14] sets out how National Highways will work with service providers to halt overall biodiversity loss, and to maintain and enhance habitats and ecological networks. The document identifies National Highways' approach to meeting the challenge of the national decline in biodiversity. National Highways has identified five specific outcomes and related actions that will provide the most support for biodiversity across the network:

- Outcome 1: National Highways and its suppliers are equipped to produce good biodiversity performance.
- Outcome 2: The Strategic Road Network (SRN) is managed to support biodiversity.
- Outcome 3: National Highways has delivered biodiversity enhancements whilst implementing a capital programme of network improvement.
- Outcome 4: National Highways has addressed the legacy of biodiversity problems on their network via a targeted programme of investment.
- Outcome 5: National Highways is fully transparent about its biodiversity performance.

[13] Department for Transport (2020) Road Investment Strategy 2: 2020–2025 [online]. Available at: Road Investment Strategy 2: 2020-2025 (publishing.service.gov.uk) (Last accessed December 2023).

[14] Highways England (2015) Our plan to protect and increase biodiversity [online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/441300/N150146_-_Highways_England_Biodiversity_Plan3lo.pdf (Last accessed December 2023).

8.4 Consultation

8.4.1 The Planning Senior Adviser for Natural England was contacted on 15 March 2022 by email regarding the Biodiversity Net Gain (BNG) metric and protected species survey effort. Further consultation with Natural England has been undertaken by email and via virtual meetings. A provisional Discretionary Advice Service (DAS) was set up with Natural England in May 2022. The initial virtual meeting on 31 May 2022 provided an introduction to the Scheme, an overview of ecology survey findings undertaken to date, justification of survey effort and methodology, details of limitations, survey-specific queries, expressed the Applicant's aspiration for a biodiversity net gain and raised the potential for protected species licensing.

8.4.2 Natural England were emailed on 07 June 2022 seeking agreement to proposed survey efforts, including a 250 metre survey area around the main alignment for Great Crested Newt (GCN) *Triturus cristatus*, replacement of some dusk emergence/dawn re-entry surveys for bats and access limitations due to safety concerns. A response was received on 23 September 2022 from Natural England broadly accepting the justification for survey areas proposed for GCN and bats but requested further information. This information included confirmation that industry best practice was being adhered to and provision of written copies of advice from police and council liaison office relating to safety which restricted survey efforts.

8.4.3 This further detail was provided to Natural England in an email sent on 20 October 2022. This response email also included information about the addition of the Kelham and Averham Floodplain Compensation Area (FCA) to the Order Limits. On 7 February 2023 Natural England confirmed the approach to GCN surveys acceptable (500 metre survey area in Kelham and Averham FCA and a 250 metre survey area around the main alignment) and acknowledged evidence that appropriate effort is being made to conduct surveys when safe to do so. Natural England also broadly accepted the bat survey methodology but sought further clarification on a number of points. On 30 March 2023, further justification for the substitution of bat dusk emergence/dawn re-entry surveys for aerial inspections of trees was sent to Natural England to seek approval of this methodology. On 04 May 2023 Natural England confirmed that they were "*pleased to see that this survey methodology is not being used in isolation and that other survey techniques have been used to make your assessments of the potential impacts to bats and their habitat. We acknowledge that use of night vision aids is still in its early days and appreciate that you have considered our advice but have deemed it not applicable in this instance. Natural England have no further comments currently in relation to the proposed survey methodology.*"

8.4.4 A subsequent DAS was signed with Natural England to cover the period November 2022 to December 2023. Under this DAS, monthly virtual meetings have been undertaken with the Planning Senior Adviser at Natural England since November 2022. Whilst the details of the topics which Natural England have been engaged on are detailed below, limited feedback has been received to date on the information submitted. In a meeting with the Planning Senior Adviser at Natural England on 22 February 2023 it was confirmed that the Natural England protected species team had very limited resource (across the country) and that they could not confirm timescales for responses to Scheme feedback requests.

8.4.5 An online presentation was held with Natural England on 20 December 2022 detailing the ecology survey approach. This was subsequently issued as an 'Ecological Surveys Justification Report' on 22 December 2022 via email. The report included detail on the ecological survey methodologies, any deviations away from standard and justification for these where relevant. The aim of issuing this information was to seek agreement from Natural England on the survey approach. All the relevant detail from the Ecological Surveys Justification Report has been included in the relevant biodiversity technical appendices Appendix 8.1 to 8.15 of the ES Appendices **(TR010065/APP/6.3)**.

8.4.6 An online presentation was held with Natural England on 22 March 2023 detailing the loss of HPIs and local wildlife sites (LWS) associated with the Scheme, seeking advice on whether a bespoke compensatory package would be acceptable and requesting input from Natural England. Newark & Sherwood District Council was invited but a representative could not attend and so the slide deck and summary email was shared with both stakeholders on 24 March 2023. Feedback via email was received from Natural England on 24 May 2023 on the proposed HPI compensation. It also confirmed that Natural England does not generally have involvement with local sites, so advised the Applicant to seek the advice of named people within Newark & Sherwood District Council and Nottinghamshire Wildlife Trust.

8.4.7 An online presentation was held with Natural England on the 3 May 2023 detailing general embedded and protected species-specific mitigation in response to each impact identified within this assessment. An update was also provided on the HRA **(TR010065/APP/6.6)** and BNG assessments. Further update presentations were provided with a key focus on areas for habitat compensation.

8.4.8 The online presentation on 02 June 2023 was held with Natural England, the Nottinghamshire County Council County Ecologist and Nottinghamshire Wildlife Trust to provide an overview of impacts to LWSs and HPIs, air quality impacts on ecological receptors (following receipt of air quality modelling), and options for mitigation and

bespoke compensation packages. All parties responded positively to enhancing retained habitat, the creation of equivalent habitat to those which would be lost from LWSs and loss of HPIs. Some areas of land within the Order Limits (around Friendly Farmer Roundabout, east of the existing A46 carriageway between Cattle Market Junction and Farndon Roundabout) are currently inaccessible for surveys on grounds of health and safety (detailed in Figure 8.5 (Land Access Constraints) of the ES Figures **(TR010065/APP/6.2)**). The Applicant is working with agents and landowners to resolve access restrictions. During this presentation the stakeholders agreed that an acceptable level of survey effort has been undertaken in this area where access issues cannot be resolved.

8.4.9 Further meetings were held with Natural England on 27 July 2023 and 04 October 2023. The July meeting focussed on an update with regards to Biodiversity Net Gain and proposed compensation with regards to loss of Local Wildlife Site habitats and Habitats of Principal Importance. The October meeting provided general project updates associated with biodiversity, such as Biodiversity Net Gain, assessment assumptions (including discussion regarding the absence of great crested newts from pond F018) and mitigation measures. More detailed discussions were held with regards to the bat mitigation licence and compensation boxes for bird and bat species.

8.4.10 The Community Relations Officer for Newark & Sherwood District Council attended a virtual meeting on 28 April 2022 as an introduction to the Scheme and to discuss engagement with Newark's traveller communities. Further virtual calls have been held to discuss safety issues limiting access to undertake surveys and devise alternative methodology to satisfy industry best practice survey effort.

8.4.11 The Ecology Officer at Newark & Sherwood District Council, attended a virtual meeting on 21 July 2022 where they were provided with an overview of the Scheme, including the current Scheme status, overview of Environment Impact Assessment (EIA) key milestones and level of engagement. Specifics included a summary of ecology surveys undertaken to date and planned surveys going forward.

8.4.12 An Environmental Technical Working Group (TWG) has been established to support continued and collaborative engagement with the Environment Agency, Natural England, Nottinghamshire County Council and Newark & Sherwood District Council, as well as other relevant environmental organisations. The first Environmental TWG took place on 21 September 2022 and meetings have been held quarterly thereafter. The first meeting provided an overview of the Scheme, the anticipated Scheme timeline, an update on the EIA progress to date, an overview of the environmental surveys undertaken to date and planned future surveys to inform the EIA, a summary of the environmental design principles, and an overview of the indicative Environmental Masterplan (Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)**). Discussions

have been held around any likely environmental issues associated with the Scheme, how these will be managed, and proposed environmental design solutions.

8.4.13 Although the Humber Estuary Ramsar and SAC is outside of the survey area, it has been included in this Chapter's assessment in response to the Environment Agency's comment to the Preliminary Environmental Information Report (PEIR) (full details and responses are contained within the Consultation Report **(TR010065/APP/5.1)** and Consultation Report Annexes **(TR010065/APP/5.2)**:

"*…The potential flood compensation area around Kelham and Averham needs to ensure there is no detrimental impact to the river habitat as it is an incredibly important area for fish and fish spawning, including protected species such as lamprey. The Humber SAC is downstream but functionally linked as the lamprey move up river to spawn. Any change to habitat or water quality would need an HRA. It sounds however that the compensation area is most likely in the floodplain rather than works to the river itself but it this is something that will need to considered due to the importance of the area...*"

8.4.14 An online presentation was held with the Environment Agency on the 5 May 2023 detailing general embedded and protected species-specific mitigation associated with the River Trent and its tributaries. The presentation also provided a summary of the HRA **(TR010065/APP/6.6)** and an update to the BNG assessment with focus on the river habitat calculations. The Environment Agency provided a steer on design of fish escape passages, timings of specific works based on local knowledge (location of spawning pools) and agreed to the proposed mitigation. The Environment Agency's recommendations for the fish escape passage design include a naturalised shape and measure a minimum of 0.5 metres wide and 0.3 metres deep in summer low flows, where possible.

8.4.15 A further meeting with the Environment Agency took place on 20 June 2023, with regards to temporary and permanent works required within close proximity to statutory main rivers. Relevant biodiversity discussions focussed on the potential impact of the works (particularly in association with Nether Lock and Nether Weir, the proposed wetland habitat within Farndon East FCA (and now also Farndon West FCA) and Windmill Viaduct) upon fish and the measures embedded in or to be adopted into the design to minimise and mitigate impacts upon fish.

8.4.16 Engagement with the Environment Agency will continue to ensure shared knowledge and lessons learned from previous developments inform the detailed design of the Farndon West wetland area and Farndon East lake.

8.5 Assessment methodology

8.5.1 The Ecological Impact Assessment (EcIA) has been undertaken with reference to the DMRB LA 108 Biodiversity,[1] LD 118 Biodiversity Design[2] and LA 115 Habitats Regulations assessment,[15] 'Transport Analysis Guidance' (Department for Transport (DfT))[16] which supplements the DMRB standard, and the CIEEM Guidelines for EcIA.[17] This requires an assessment of the receptor or resource's environmental value (or sensitivity) and the magnitude of the Scheme's impacts (change). DMRB LA 108 refers to the value/sensitivity as biodiversity resource importance and the magnitude of impact as level of impact. Hereafter, the terminology from LA 108 is used in this Chapter.

8.5.2 Valuing ecological features involves the use of professional judgement, based on available guidance and information, together with advice from experts who know the area in which the study area sits and/or the distribution and status of the features that are being considered.

8.5.3 The scope of the biodiversity assessment was presented in Chapter 9 Biodiversity of the EIA Scoping Report[18] submitted to the Planning Inspectorate in September 2022. A schedule of responses detailing how each of the EIA Scoping Opinion **(TR010065/APP/6.10)** comments (on which this ES Chapter is based) have been considered as part of this Chapter is contained within Appendix 4.1 of the ES Appendices **(TR010065/APP/6.3)**.

Determining biodiversity resource importance

8.5.4 The biodiversity resource importance have been assessed using the criteria outlined in Table 8-1. This has been adapted from DMRB LA 108, Table 3.9, taking into account CIEEM guidance;[17] it replaces outdated terminology (e.g. Priority Habitats) and irrelevant information has been removed (e.g. Areas of Special Scientific Interest (ASSIs) are applicable to Northern Ireland).

8.5.5 The biodiversity resource importance is determined by its level of protection (for example, sites designated for their international and/or national importance), its vulnerability or rarity, views of consultees,

[15] National Highways (2020) DMRB LA 115 – Habitats Regulations assessment [online]. Available at: e2fdab58-d293-4af7-b737-b55e08e045ae (standardsforhighways.co.uk) (Last accessed December 2023).

[16] Department for Transport (2022) TAG UNIT A3 Environmental Impact Appraisal [online]. Available at: TAG UNIT A3 Environmental Impact Appraisal (publishing.service.gov.uk) (Last accessed December 2023).

[17] Chartered Institute of Ecology and Environmental Management (CIEEM) (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland Version 1.2 [online]. Available at: ECIA-Guidelines-April 2022.pdf (cieem.net) (Last accessed December 2023).

[18] National Highways (2022) A46 Newark Bypass EIA Scoping Report [online] available at: TR010065-000002-A46N - Scoping Report.pdf (planninginspectorate.gov.uk) (last accessed December 2023).

specialist expertise and professional judgement, as appropriate for that receptor.

Table 8-1: Criteria for determining the biodiversity resource importance

Resource importance		Typical descriptors
International or European value	Sites	SPAs, pSPAs, SACs, cSACs, pSACs, Sites of Community Importance (SCIs) and Ramsar sites (wetlands of international importance), Biogenetic Reserves, World Heritage Sites and Biosphere Reserves. Areas which meet the published selection criteria for those sites listed above but which are not themselves designated as such.
	Habitats	N/A
	Species	Resident, or regularly occurring, populations of species which may be considered at an International or European level where: • The loss of these populations would adversely affect the conservation status or distribution of the species at this geographic scale. • The population forms a critical part of a wider population at this scale. • The species is at a critical phase of its life cycle at this scale.
UK or National value	Sites	Designated sites including: SSSIs; Marine Protected Areas (MPAs) including Marine Conservation Zones (MCZs); and National Nature Reserves (NNRs). Areas which meet the published selection criteria e.g. Joint Nature Conservation Committee (JNCC) (1998) for those sites listed above but which are not themselves designated as such.
	Habitats	Areas of key/priority habitats that were identified in the UK Biodiversity Action Plan (BAP), and are published in accordance with Section 41 of the Natural Environment and Rural Communities Act (2006) to be of principal importance for the conservation of biodiversity. Areas of Ancient Woodland e.g. woodland listed within the Ancient Woodland Inventory.
	Species	Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level where: • The loss of these populations would adversely affect the conservation status or distribution of the species at this scale. • The population forms a critical part of a wider population at this scale. • The species is at a critical phase of its life cycle at this scale.
Regional value	Sites	Non-statutory designated sites, including heritage coasts.
	Habitats	Areas of key/priority habitats identified in the Regional BAP (where available); areas of key/priority habitat identified as being of Regional value in the appropriate Natural Area Profile (or equivalent); and areas that have been identified by regional plans or strategies as areas for restoration or re-

Resource importance		Typical descriptors
		creation of priority habitats (for example, Nottinghamshire Minerals Local Plan).[19]
	Species	Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level and key/priority species listed within the National Highways BAP where: • The loss of these populations would adversely affect the conservation status or distribution of the species at this scale. • The population forms a critical part of a wider population. • The species is at a critical phase of its life cycle. • Species identified in regional plans or strategies.
County or unitary authority area value	Sites	Wildlife/nature conservation sites designated at a county (or equivalent) level, including: Sites of Nature Conservation Importance (SNCIs); County Wildlife Sites (CWSs); Local Wildlife Sites (LWSs); Local Nature Conservation Sites (LNCS); Sites of Importance for Nature Conservation (SINCs) and Local Nature Reserves (LNRs). Areas which meet the published selection criteria for those sites listed above but which are not themselves designated as such.
	Habitats	Areas of key/priority habitats identified in the LBAP; and areas of habitat identified in the appropriate Natural Area Profile (or equivalent).
	Species	Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level where: • The loss of these populations would adversely affect the conservation status or distribution of the species across the County or Unitary Authority Area. • The population forms a critical part of a wider population. • The species is at a critical phase of its life cycle. • Species identified in county or equivalent authority area plans or strategies.
Local value	Sites	Wildlife/nature conservation sites designated at a local level, including: SNCIs; LWS; LNCS; SINCs; Sites of Local Nature Conservation Importance (SLNCIs) and LNRs.
	Habitats	Areas of habitat considered to appreciably enrich the habitat resource within the local context, including features of importance for migration, dispersal, or genetic exchange. Trees that are protected by Tree Preservation Orders (TPOs).
	Species	Populations/communities of species considered to appreciably enrich the habitat resource within the local context (such as veteran trees), including features of value for migration, dispersal or genetic exchange.

Source Adapted National Highways (2020) DMRB LA 108 Biodiversity, Table 3.9 with reference to CIEEM (2022) Guidelines for Ecological Impact Assessment in the UK and Ireland

[19] Nottinghamshire County Council (2016) Minerals Local Plan Background Paper Biodiversity. [online]. Available at: https://www.nottinghamshire.gov.uk/media/111889/bp-biodiversity.pdf (Last accessed December 2023).

8.5.6 Where a nature conservation resource has value at more than one level, its overriding value is that of the highest level. Effects on conservation status have only been assessed in detail for features of sufficient value (local or above). Effects on features below local value would be characterised as of neutral significance.

8.5.7 There may be instances where ecological features below local value (and therefore not considered further in this Chapter), may be subject to legal protection. Omission from this Chapter does not exclude these features from requiring mitigation in order to comply with legislation. In such cases the appropriate mitigation, such as reasonable avoidance measures during construction, are documented in the First Iteration Environmental Management Plan (EMP) **(TR010065/APP/6.5)**.

Determining level of impact

8.5.8 This Chapter has clarified the level of impact criteria taken from DMRB LA 108 Biodiversity Table 3.11, to provide greater clarity on the assessment and provide meaningful examples of what each point refers to.

8.5.9 The characterisation of each ecological impact will consider:

- The integrity and conservation status of the resource affected
- The probability of the impact occurring
- The complexity of the impact (direct, indirect, cumulative)
- The extent of the impact (for example the percentage of the resource affected)
- The size of the impact (for example complete loss or the proportion of a protected species population affected)
- The reversibility of the impact (permanent or temporary)
- The duration of the impact
- The timing and frequency of the impact (considering seasonal/life cycle constraints)

8.5.10 For the purpose of this assessment, permanent impact is considered to be irreversible within a reasonable timeframe or no reasonable chance of action being taken to reverse the impact. A temporary impact is one from which natural recovery or regeneration is possible.

8.5.11 The level of impact (change) as a result of the Scheme will be determined using the criteria in Table 8-2 in accordance with DMRB LA 108 Table 3.11.[1]

Table 8-2: Level of impact and typical descriptions

Level of impact (change)		Typical descriptions
Major	Adverse	• Permanent/irreversible damage to a biodiversity resource. • The extent, magnitude, frequency, and/or timing of an impact negatively affects the integrity or key characteristics of the resource.
	Beneficial	• Permanent addition of, improvement to, or restoration of a biodiversity resource. • The extent, magnitude, frequency, and/or timing of an impact positively affects the integrity or key characteristics of the resource.
Moderate	Adverse	• Temporary/reversible damage to a biodiversity resource. • The extent, magnitude, frequency, and/or timing of an impact negatively affects the integrity or key characteristics of the resource.
	Beneficial	• Temporary addition of, improvement to, or restoration of a biodiversity resource. • The extent, magnitude, frequency, and/or timing of an impact positively affects the integrity or key characteristics of the resource.
Minor	Adverse	• Permanent/irreversible damage to a biodiversity resource. • The extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource.
	Beneficial	• Permanent addition of, improvement to, or restoration of a biodiversity resource. • The extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource.
Negligible	Adverse	• Temporary/reversible damage to a biodiversity resource. • The extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource.
	Beneficial	• Temporary addition of, improvement to, or restoration of a biodiversity resource. • The extent, magnitude, frequency, and/or timing of an impact does not affect the integrity of key characteristics of the resource.
No Change		• No observable impact, either positive or negative.

Source National Highways (2020) DMRB LA 108 Biodiversity, Table 3.11

Determining overall significance of effect

8.5.12 The overall level of effect is based on the 'biodiversity resource importance' (Table 8-1 and the 'level of impact' Table 8-2). These

values are used in the matrix (Table 8-3) in accordance with DMRB LA 108 Table 3.13,[1] illustrating how these aspects are combined to identify the overall effect. Where the matrix identifies two significance categories (for example Slight or Moderate), professional judgment is used to select the most appropriate category. Where there is uncertainty, the precautionary principle will be applied, and the higher category selected. Any effect which is Moderate, Large or Very Large is considered to be a significant effect.

Table 8-3: Significance matrix

		Level of impact				
		No Change	**Negligible**	**Minor**	**Moderate**	**Major**
Resource importance	**International or European importance**	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	UK or national importance	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Regional importance	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	County or equivalent authority importance	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Local importance	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

Source National Highways (2020) DMRB LA 108 Biodiversity, Table 3.13

8.6 Assessment assumptions and limitations

8.6.1 The assessment has been based on the Scheme description and construction strategy presented in Chapter 2 (The Scheme) of this ES and has taken into account the lateral limits of deviation illustrated on the Works Plans **(TR010065/APP/2.3)** and vertical limits of deviation secured under Article 10 of the draft DCO **(TR010065/APP/3.1)** to establish a realistic worst-case assessment scenario.

8.6.2 The protected species technical appendices that support this Chapter (Appendices 8.1 to 8.15 of the ES Appendices **(TR010065/APP/6.3)**) record and highlight associated assumptions and limitations in accordance with the survey type being reported.

8.6.3 This assessment refers to habitats by Phase 1 Habitat (as detailed in Appendix 8.1 (Extended Phase 1 Habitat Technical Report) of the ES Appendices **(TR010065/APP/6.3)**) and National Vegetation Classification (NVC) categories (as detailed in Appendix 8.2 (National

Vegetation Classification Technical Report) of the ES Appendices **(TR010065/APP/6.3)**). These habitat classifications have been converted into 'UK Habs' categories to inform the Biodiversity Metric, which means that some habitats are combined under the same habitat type in the Biodiversity Metric 3.1 (as detailed in Appendix 8.14 (Biodiversity Net Gain Technical Report) of the ES Appendices **(TR010065/APP/6.3)**). In accordance with the Natural England Biodiversity Metric 3.1, the BNG Technical Report follows a different assessment methodology and therefore figures for loss, enhancement and creation of habitat types are not directly comparable with this ES Biodiversity Chapter. Furthermore, this assessment provides the area extent of habitats in metres squared or metres for linear habitats such as hedgerow. These area values and percentages for habitat loss, creation and enhancement are approximates only, as they have been rounded up or down to the appropriate scale for the context they have been referenced. However, quality assurance reviews confirm that both assessments align with one another in terms of loss and compensation requirements reported. In the absence of a standard industry tool to quantify the compensation required for habitat loss, the Biodiversity Metric has been applied.

8.6.4 The Biodiversity Metric does not provide compensation ratios, instead it applies several factors to each baseline habitat to ensure a net gain in biodiversity units (see further details in Appendix 8.14 (Biodiversity Net Gain Technical Report) of the ES Appendices **(TR010065/APP/6.3)**). However, for the ease of the reader of this report, compensation ratios (either for creation of habitat or enhancement) have been calculated from other values within the Biodiversity Metric. These are to provide confirmation that proposed compensation for key receptors including habitats within LWS and HPI is proportionate and in line with the requirements of the Biodiversity Metric and that the Scheme will achieve a positive net gain for biodiversity. Whilst the compensation ratios provided are designed to illustrate compensation levels required by the Biodiversity Metric it should be noted that this is an approximation as the Biodiversity Metric actually operates in terms of biodiversity units rather than ratios. At certain points in the chapter it has been necessary to refer to biodiversity units as well as ratios. Please see Biodiversity Net Gain Technical Report of the ES Appendices **(TR010065/APP/6.3)** for full details**.** This Chapter considers the 'time to target condition' (used in the Biodiversity Metric) of compensation planting when assessing the likely significant effects.

8.6.5 CIEEM's 'Advice Note on the Lifespan of Ecological Reports and Surveys' (2019) states that "it is important that planning decisions are based on up-to-date ecological reports and survey data. However, it is difficult to set a specific timeframe over which reports or survey data should be considered valid, as this will vary in different circumstances." The Advice Note states that survey results and

reports that are 12-18 months old are likely to be valid in most cases with the following exceptions:

- Where a site may offer existing or new features which could be utilised by a mobile species within a short time frame
- Where a mobile species is present on site or in the wider area and can create new features of relevance to the assessment
- Where country-specific or species-specific guidance dictates otherwise

8.6.6 For data between 18 months and 3 years old, CIEEM makes the following recommendations:

- A professional ecologist will need to undertake a site visit and may also need to update desk study information (effectively updating the Preliminary Ecological Appraisal) and then review the validity of the report, based on the factors listed below.
- Some or all of the other ecological surveys may need to be updated.
- The professional ecologist will need to issue a clear statement, with appropriate justification, on:

    - The validity of the report
    - Which, if any, of the surveys need to be updated
    - The appropriate scope, timing and methods for the update survey(s)

8.6.7 As detailed within Section 2.6 of Chapter 2 (The Scheme) of this ES, pre-commencement works are proposed to begin from June 2025 with main construction works starting in August 2025, therefore over 18 months will have lapsed since initial survey data was collected in spring 2021. Survey results will need to be reviewed prior to construction to identify areas where protected species have previously been recorded 'likely absent' from suitable habitat that may be directly impacted and therefore may require re-surveying to ensure the species is still absent. This will avoid risk of committing a wildlife offence should a mobile species have moved into identified suitable habitat since the initial survey and provide ample time to produce a Method Statement to apply for the relevant licence to Natural England, avoiding delays to the construction programme. Further survey results and any associated mitigation required will be provided to the relevant environmental stakeholders for consultation.

8.6.8 Reference to survey feature ID locations in this section of the ES are detailed, including drawings, in the associated technical report of the ES Appendices **(TR010065/APP/6.3)**.

8.6.9 Due to the requirements of the Scheme programme to provide an initial assessment of habitat suitability for a range of protected species, the Extended Phase 1 Habitat Survey was completed within the main alignment survey area earlier in the botanical growing season, when some botanical species may not have been in flower.

Surveys undertaken earlier in the season predominantly targeted habitats of lower ecological value (as identified from aerial mapping) and it is not considered that key indicator species have been missed. Where any uncertainty remained of the botanical importance of specific land parcels (for example lowland meadow HPI), botanical surveys were later undertaken in the key survey period for that specific habitat type.

8.6.10 Areas identified as comprising HPI (as listed under S41 of the NERC) Act, on Natural England's priority habitat inventory were ground-truthed (survey visits verified desk study data) in the associated survey period for each habitat in 2023, where access was granted. In the absence of survey data prior to the application for development consent, the outcome for HPIs is based on the data collected to date and a reasonable worst-case scenario, assuming HPI presence, has been applied to areas inaccessible to survey, using professional judgement that the data will not materially change the assessment. This includes wood pasture HPI and deciduous mixed woodland HPI in Kelham and Averham FCA, detailed in Section 8.8 (Baseline conditions) of this ES Chapter and Appendix 8.1 (Extended Phase 1 Habitat Technical Report) of the ES Appendices **(TR010065/APP/6.3)**.

8.6.11 Due to the addition of the Kelham and Averham FCA into the Scheme at a later date, not all protected species surveys could be undertaken in 2022 due to survey window constraints. Extended Phase 1 Habitat Surveys as well as species and habitat specific surveys were planned for spring 2023 to establish the baseline condition for these areas, however access restrictions have prevented all ecological surveys from being completed across an area south of the A617 Main Road (detailed in Figure 8.5 (Land Access Constraints) of the ES Figures **(TR010065/APP/6.2)**). In the absence of survey data for this specific location prior to the application for development consent, the outcome for each receptor is based on the survey data collected to date and is based on professional judgement that the data will not change significantly going forwards (for example, presence of a HPI based on desk study data). For those receptors that could see changes in data collected (for example, vagrant species such as bats and badger) a reasonable worst-case scenario has been assumed (assumed presence of badger and bat roosts). The precautionary assumption that protected species are present, forms a baseline that assigns greater ecological importance in this specific area than what may be present, which pre-construction surveys will confirm, as required under the First Iteration EMP **(TR010065/APP/6.5)**.

8.6.12 Some areas of land within the Order Limits (around Friendly Farmer Roundabout, east of the existing A46 carriageway between Cattle Market Junction and Farndon Roundabout) are currently inaccessible for surveys on grounds of health and safety. The Applicant has worked with agents and landowners to resolve access restrictions,

where possible. Natural England have agreed that an acceptable level of survey effort has been undertaken in this area where access issues cannot be resolved (see Section 8.4 (Consultation) of this ES Chapter).

8.6.13 Seasonal flooding through the winter months restricted access to numerous areas. For the most part, surveys were rescheduled for later in the year when flood water was not a restriction for access. However, surveys with seasonal constraints either had the survey area or the methodology adapted and, in combination, data from comparable locations was used to extrapolate a robust assessment. For example, wintering bird transect routes were amended to provide safe passage, surveyed from a distance where possible and species/numbers recorded for adjacent land of similar habitat were considered representative of those in the areas where access was not possible.

8.6.14 Access was not granted in 2022 for internal inspections of any buildings located within the study area, for bat roosts. This was in part due to the high number of private residences and the ongoing risk and safety concerns around Covid-19. During further survey efforts in 2023, internal access was sought for all buildings and internal inspections were undertaken between April and September 2023 with reference to Bat Conservation Trust (BCT) Guidelines,[20] where access was provided and it was safe to do so. Several buildings had limited access preventing a full internal inspection of a void. Limitations included spaces too small for a surveyor to fit (F002), the presence of structures blocking access to survey areas beyond the immediate access point (F002), upper storey inaccessible (F004, F008, F010, F016), cluttered/obscured space (F005, F008, F013), partial access only due to lack of safe access to entire internal space (F003, F009, F012) and one of the loft spaces painted shut (F023). It was not possible to internally survey the following buildings/structures, due to access refusal and/or safety concerns: F028, F034, F037, F050, F053, F054, F057, F061, F062, F063 and F064. Further description of access constraints to each building are detailed in Appendix 8.3 (Bat Technical Report) of the ES Appendices **(TR010065/APP/6.3)**. For the remaining buildings/structures mentioned above, a full suite of bat dusk emergence/dawn re-entry surveys have been completed up to September 2023, with the exception of the final survey visit for F010, F013 and F034 (which could not be completed due to access constraints). The lack or partial internal access to these buildings is not considered a substantial limitation to the assessment within this report, as a reasonable worst-case scenario (assumed presence of bats), using professional judgement has been applied (reported in this ES Chapter).

[20] Collins, J. (ed.) (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines, 3rd Edition. Bat Conservation Trust: London.

8.6.15 Access has been denied for the final emergence survey on three buildings (F010, F013 and F034). Two are located on the same parcel of land between 50 metres and 100 metres from the Order Limits (F010 and F013). Despite the absence of these final surveys, sufficient survey data has been collected to inform the assessment reported in this ES Chapter.

8.6.16 Where only partial internal inspections could be undertaken due to access constraints (F002, F004, F009, F010, F013 and F023) or no internal access was available due to the presence of asbestos (F062, F063 and F064), this would have restricted the ability to undertake comprehensive hibernation surveys for these buildings. Concerns were also highlighted with regards to security of survey equipment, if it were to be deployed within F004 and F005 (i.e. vulnerable to tampering or theft). As such, hibernation surveys, which would only have resulted in a partial dataset, were not undertaken. Instead, appropriate assumptions (assumed presence of bats) have been made based upon a reasonable worst-case scenario, using professional judgement.

8.6.17 Internal access to building F062, F063 and F064 was not possible due to the presence of asbestos, which also prevented entry to undertake hibernation surveys. Given the inability to survey these buildings for hibernating bats, a reasonable worst-case scenario (assumed presence of bats), using professional judgement has been applied to inform the ES Biodiversity Chapter.

8.6.18 Access has been refused for emergence/re-entry and or substituted aerial inspection surveys on six trees: F034 and F065 (within the Order Limits), and F173, F174, F177 and F179 (between 50 metres and 100 metres from the Order Limits).

8.6.19 In the absence of specific survey data in these locations, a worst-case scenario has been applied, assuming bat presence based upon other bat data collected from the study area and professional judgement. Given consideration of the worst-case scenario within the assessment of impacts, it is considered that should access permissions have been granted to collect any of the absent survey data, it is unlikely to have materially affected this assessment.

8.6.20 Trees were only climbed where it was safe to do so. Examples of exclusions include, but are not limited to, trees over hazardous features such as water, railway lines or roads being excluded. Trees that were not structurally stable such as those with excessive deadwood or fungal diseases were also excluded from the tree climbing surveys. Ten trees that were deemed unsafe to climb (F012, F074, F159, F209, F210, F211, F261, F334, F340 and F347) were subject to dusk emergence and/or dawn re-entry surveys, with the exception of tree (F012), after being cut down by the landowner in the interim period between the PRA and the emergence/re-entry surveys. Due to access constraints, the addition of Kelham and Averham FCA and a delayed response from Natural England regarding the proposed

substitution of some dusk emergence and/or dawn re-entry surveys, aerial climb inspection surveys of trees were undertaken across two survey seasons (both 2022 and 2023). However, the combination of both the 2022 and 2023 survey data is considered to provide sufficient information to support a robust assessment. Trees that will be subjected to greater impacts (within the Order Limits) were prioritised to be surveyed earlier in the season and trees assessed as having greater suitability to support roosting bats have undergone at least one climb inspection, where safe to do so and access has allowed. Completion of the remaining emergence/re-entry and/or substituted aerial inspection surveys were undertaken with reference to the BCT guidelines. This guidance states that a set number of surveys are to be undertaken, dependent on the suitability rating for roosting bats, within the bat survey season. Two surveys are undertaken for moderate suitability trees and three surveys for high suitability trees or confirmed roost. In the partial absence of survey data, where insufficient survey data has been collected to meet the recommended guidelines, the assessment for bats is based on a reasonable worst-case scenario, using survey data collected to date for each feature and professional judgement. In the total absence of survey data from trees, a worst-case scenario has been applied, assuming bat presence based on other bat data collected from the study area and professional judgement. Given consideration of the worst-case/reasonable worst-case scenarios within the assessment of impacts, it is considered that the collection of any of the absent survey data is unlikely to have materially affected this assessment.

8.6.21 Bat activity transect surveys along BT03 were undertaken in August to September 2022 inclusive and April to July 2023 inclusive, due to access constraints regarding safety in the early 2022 season. The timing of these transect surveys were restricted to dawn only, with provision of a security chaperone to reduce the risk to surveyor safety. These surveys were undertaken, where access was granted, with reference to the BCT Guidelines which state that one transect visit per month for habitat of moderate suitability for bats is to be conducted within the bat survey season.

8.6.22 This safety constraint also delayed deployment of the bat static detector BT03_BS02 along the same transect, which were later completed between May to July 2023 inclusive. A total survey completion effort of approximately 71% was achieved in 2022, where bat static detectors were deployed on site for at least five consecutive nights per month, in line with the guidance laid out by the BCT. For each of the static detectors where five consecutive nights of data were not recorded, these surveys were repeated during the 2023 bat survey season (April to October) where five consecutive nights of data were recorded for each of these, with the exception of a single deployment (BT01_BS02 - October 2023) due to technical issues. A total of 96% of data was successfully collected in line with the BCT Guidelines) with missing bat static surveys being attributed to

technological issues (detector malfunction), limitations with land access, concerns to surveyor safety and theft of equipment.

8.6.23 Crossing point surveys would not have any added value to the data already collected from activity surveys (transects and static). Survey data indicates that low numbers of common pipistrelle *Pipistrellus pipistrellus* (one record of a single individual bat to date) commute across the A46 east of Friendly Farmer Roundabout. Despite this area being subjected to high levels of disturbance (well-lit, five lanes across both the eastbound and westbound carriageways, frequently used by articulated lorries), existing features provide a safe height for bat flight (of this species) over the carriageway north to south (woodland either side of Winthorpe Beck). The data collected is sufficiently robust to inform the assessment in this Chapter and has been considered in the mitigation design. There are no other locations along the route which would benefit from crossing point surveys, therefore, crossing point surveys are consider not to be appropriate for this Scheme. Natural England have not objected or raised concerns on acknowledging receipt of the justification for not undertaking these surveys.

8.6.24 Consent to undertake ecological surveys at the following four LWS could not be obtained: Newark Dismantled Railway LWS, Newark Trent Grassland LWS, Kelham Road Grassland LWS and Newark (Beet Factory) Dismantled Railway LWS. Three of these sites (Newark Dismantled Railway LWS, Newark Trent Grassland LWS, Kelham Road Grassland LWS) are designated for their botanical interest and they were reviewed for this assessment using desk study data, dated between eight and 21 years old (surveys by others carried out between 2002 and 2015). Given the age of the desk study data, changes in habitat condition and composition at these LWSs are likely to have occurred, though this cannot be confirmed without site access. However, as there would not be any direct impacts upon these LWSs as a result of the Scheme, a review of the desk study data is considered sufficient to inform the assessment presented within this Chapter and the age of the desk study data is not considered to be a limitation upon this assessment.

8.6.25 The Newark (Beet Factory) Dismantled Railway LWS has the potential to be impacted. This site was last reviewed nearly 25 years ago (in 1998) and access has not been permitted to re-survey since. Whilst access to the LWS was not possible, the LWS was observed from the opposite bank of the ditch parallel to the LWS and the composition of species was informed by desk study data. This combination of information was used to classify the habitats present within the LWS (largely classified as semi-natural broadleaved woodland). It is acknowledged that changes in maintenance, or lack of maintenance, are likely to have altered the floral composition for which the LWS were designated; however, a reasonable worse-case scenario has been adopted to inform this assessment (in the absence

of detailed survey data). Given the classification of the majority of the LWS as woodland, a precautionary approach has been taken and it and has been assumed for this Chapter that the LWS comprised lowland mixed deciduous woodland HPI. Whilst this may result in 'overvaluing' the LWS, this approach is considered to be in line with best practice[3].

8.6.26 At the other five LWS where access was granted (Kelham Road Redoubt Grassland, Newark Grassland, Valley Farm Grassland, Kelham Road Grassland II and Great North Road Grasslands), a spring/early summer survey visit for terrestrial invertebrates was not undertaken due to programming constraints. This is not considered to be a significant limitation to the assessment of the invertebrate interest due to the low number and limited diversity of species recorded for each LWS surveyed later in the survey season (survey effort concentrated between June to August in 2022 and 2023). Data collected in the later part of the survey season, desk study records and comparison of similar habitat compositions (for example suitability for egg-laying, nest creation, foraging) have been used to infer likely presence of terrestrial invertebrates and provide a robust assessment within this ES Chapter.

8.6.27 The summer of 2022 was atypically warm, resulting in low water levels of ponds (some of which were dry) which limited aquatic invertebrate sampling and Rapid pond surveys. A macroinvertebrate sample (Predictive System for Multimetrics (PSYM) and Rapid surveys) could not be collected for 50% of ponds due to insufficient water levels and access issues. Further details are provided in Appendix 8.8 (Aquatic Technical Report) of the ES Appendices **(TR010065/APP/6.3)**. Ditch macroinvertebrate samples were undertaken in a sub-optimal sampling period (December 2022). Faunal diversity may appear lower during winter months and therefore conservation value may be underestimated, though seasonal effects may have been somewhat offset by mild conditions at the time of survey. In the absence of survey data prior to the application for development consent, a realistic precautionary approach has been applied whereby the assessment for aquatic invertebrates is based on the survey data collected to date and using professional judgement that additional data (access to previously inaccessible land) would not change the assessment reported in this ES Chapter.

8.6.28 Where anecdotal evidence of otter holts and field signs cannot be disproven, sufficient uncertainty remains to the validity of the record. Therefore, a precautionary approach has been taken, whereby anecdotal evidence has been recorded alongside survey data. Further detail is provided in Section 4 of Appendix 8.10 (Confidential Otter Technical Report) of the ES Appendices **(TR010065/APP/6.3)**. This includes where surveyors could not rule out the presence of a natal/rearing holt due to limited access of an island adjacent to Staythorpe Weir (along OT06). In accordance with best practice, the

quarterly otter surveys were undertaken between October 2022 and August 2023 on eight of the nine otter transects (OT01 – OT08). Transect OT09 (part of Old Trent Dyke) was originally scoped out of the assessment as it comprises of unsuitable habitat for otters. It was then scoped back in following the identification of an otter spraint during a water vole survey in May 2022. Although four visits searching for otter field signs have been undertaken, due to access issues these are not equally spread over 12 months, in reference to best practice guidance. However, using professional judgement, the data collected is considered to be representative of how otter utilise Old Trent Dyke across different seasons (May 2022, September 2022, May 2023 and August 2023). Habitat along this transect does not comprise of, or provide connectivity to, undisturbed and dense vegetation suitable for otter resting sites, holts, or woodland to rear young. Professional judgement suggests that the single otter spraint recorded on OT09 was likely to have been left by a young otter exploring the landscape and the area is not used as a regular otter commuting or foraging route. Access to survey via boat was denied for a 6.3 kilometre section of the River Trent for part of the year. This lack of access resulted in three of the eight transects (OT06 – OT08) not being surveyed by boat in October/November 2022 and January 2023. The landowner, however, permitted partial access along the banks via foot, with an escort, which accounted for ~40% accessibility of the OT06 – OT08 stretch during these times. A total of eight islands were identified, four of which were inaccessible. Approximately a 560 metre length at the western end of OT02, between Newark Trent Weir and Tolney Lane, was not navigable by boat and was deemed unsafe to access by foot. A further three islands, along OT06-08, could not be accessed by dismounting the boat, nor could a robust search for field signs be achieved through binoculars from adjacent banks or the boat. These inaccessible locations included a small island north of the Staythorpe Weir and the Nottingham-Lincolnshire railway and Kelham Hall Shingle Bank LWS (both on the west bank of OT06) and a small island ~82 metres north of A617 Kelham Bridge (on the east bank of OT07). Best practice guidelines were adhered to for otter transects OT01-OT08, ensuring that each transect was surveyed four times, roughly spread equally through the year to collect data from each season. In the absence of survey data for OT02, OT06-OT08 prior to the application for development consent, the assessment for otter is based on the survey data collected to date and using professional judgement that the data will not materially change the assessment.

8.6.29 Any incidental data that is collected post development consent application will further support the mitigation for each protected species, detailed in this Chapter and the First Iteration EMP **(TR010065/APP/6.5)**. Incidental data refers to observations recorded on surveys where the intended purpose was not aimed at searching for evidence of that protected species, during pre-commencement works or during construction. This could also include anecdotal

evidence from sources other than the surveyors assigned to undertake the survey, for example stakeholders.

8.6.30 A third party undertook maintenance work in March 2023 on water vole transect WV09 (located between the railway and the large waterbody on British Sugar Ltd owned land), clearing vegetation from the channel and up to the top of the ditch embankment. This action resulted in the cancellation of a GCN eDNA survey in April 2023 on Pond F022 (which is fundamentally a widening at the northern end of WV09), as a false positive result could not be ruled out. This is because historic DNA, if present, would likely have been released into the water column following disturbance of the sediment during dredging. Furthermore, Pond F022 was no longer a distinct pool under the disused railway bridge, and instead was found to be a continuation of the ditch WV09. Presence / likely absence GCN surveys were ruled out of Pond F022/WV09 due to pollution and turbidity of the water (inhibiting torching), shallow water (preventing the use of bottle traps), absence of macrophytes (preventing egg searches), barbed wire fencing, steep banks and uneven depth of deep sediment within the channel meaning only a quarter of the previous footprint of the pond was accessible for netting (this method has low detectable for presence). In addition, the west bank comprised bare earth and the east bank was not accessible (ruling out refuge searches). Pond F018 will unlikely be accessible prior to construction, due to safety issues. In the absence of this data, GCN are assumed absent in these locations due to the absence of GCN across the rest of the Scheme, poor habitat connectivity and sub-optimal and poor condition of habitat adjacent / surrounding waterbodies (e.g. arable, urbanised areas of hard standing, including road networks acting as barriers). Furthermore, Pond F018 is located approximately 390 metres south of the closest section of the Order Limits, where an access road is located, and approximately 880 metres east of a proposed area of construction works. Both of these locations are separated from Pond F018 by unfavourable habitat for GCN, which includes a dense urban area and a rail line, further demonstrating the barriers to dispersal that would block any GCN (if present) from dispersing into the site of the works. This basis for the assessment with regards to F018 has been discussed with Natural England and was deemed acceptable (see Section 8.4 (Consultation) of this Chapter).

8.6.31 Up until the third party undertook these maintenance works in March 2023, the west bank of watercourse WV09 comprised of dense scrub which prevented access to the northern section to undertake water vole surveys. Although the clearance work facilitated access for potential water vole surveys in Spring 2023, it was found that both banks were void of vegetation, extended beyond three metres from the water’s edge on the west bank. Polluted water, scrub encroachment beyond the top of the east bank with limited herbaceous understorey and no access through culverts resulted in

further water vole surveys being scoped out since the site visit in Spring 2023, on the basis that the habitat is unsuitable to support water vole. However, it is acknowledged that whilst this watercourse is not suitable at present for water voles, there is potential for suitable undisturbed habitat to establish over subsequent years and water voles to inhabit the ditch as surrounding populations expand. However, it is expected that the third party will continue to manage this watercourse in the same way, undertaking maintenance clearance when the functioning of the drainage ditch deteriorates due to scrub encroachment. A habitat suitability survey will be undertaken pre-construction, as required under commitment B5 of Table 3-2 Register of Environmental Actions and Commitments (REAC) within the First Iteration EMP (**TR010065/APP/6.5**), to inform whether further surveys are required to establish the presence/likely absence of water vole. If water vole burrows are recorded within five metres of construction works, the works adjacent to this watercourse are anticipated to cause disturbance to water vole along a short length of the eastern bank only (<50 metres), nearest the existing A46 carriageway. Under this realistic worst-case scenario, mitigation would comprise the displacement of water vole by a licensed surveyor (or accredited personnel working under someone else's licence), including the destruction of burrows.

8.6.32 Since engineers visited in 2022, no further access to water vole transect WV35 (located in the Kelham area) has been granted to undertake an initial assessment of habitat suitability for water vole. Suitability of this ditch is considered to be poor based on photographs provided from 2022, as it appears to be dry and dominated by bramble. However, this transect, comprising a depression along the base of a ha-ha, is subject to seasonal flooding and the condition of the wall along the northern bank is unknown and so could provide opportunities for water vole to burrow between the stonework. Photographs suggest water vole transect WV35 is unsuitable for water voles as the ditch was dry and dominated by scrub at the time the photo was taken. This ditch will be subject to a check for water vole field signs by an Ecological Clerk of Work (ECoW) prior to vegetation clearance within the ditch, in addition to checks for other ecological constraints (e.g. nesting birds).

8.6.33 Five out of seven reptile presence/likely absence surveys were undertaken on RS01_F001 in 2022 (located north-east of Windmill Viaduct), prior to the incidental destruction of artificial refugia towards the end of the survey period for that year (September 2022). The final two reptile presence/likely absence surveys were completed in 2023 at survey location RS01_F001. The Applicant agreed an approach with the landowner for the surveys to continue around farming activities, to avoid risk of injuring reptiles taking refuge under tiles.

8.6.34 Whilst anecdotal evidence can be useful, there is a low level of confidence in the robustness of such data, as the methodology used,

age of the data, competence of identification and objectiveness of the recorder cannot be verified. Therefore, the baseline data and assessment presented in this Chapter are informed by recent site surveys undertaken in 2022 and 2023 by experienced surveyors who hold CIEEM membership. Where anecdotal evidence cannot be confirmed or disproven by field surveys, a precautionary approach has been applied to the assessment presuming presence, for example, the presence of otter natal holt on inaccessible islands. For further details see Section 8.8 (Baseline conditions) within this Chapter.

8.6.35 The air quality modelled data which has informed the assessment in this Chapter, assumes a 10 metre elevation above ground level for the main carriageway, the A1 flyover and 15 roads but that all ecological receptors are at ground level (zero metres). This does not take into account the difference in emission exposure to a low lying habitat such as grassland, compared with potentially lower levels emissions at the height of a semi-mature tree canopy for instance. The results also do not take into account that:

- tree belts with a vegetated understorey have the potential to buffer the effects of low lying habitats (such as grassland) between the Affected Road Network (ARN) and adjacent habitats
- result in an edge-effect whereby trees in a woodland boundary are more strongly affected by nearby pollutant sources than trees within woodland[21]

8.6.36 Furthermore, air quality calculations do not take into consideration whether sampling points are located within cuttings or behind an embankment.

8.7 Study area

8.7.1 The following study areas were used to gather information on biodiversity resources with the potential to be affected by the Scheme, known as the zone of influence (ZoI). Consideration has been given to the sensitivity of receptors to environmental change and the likely potential impacts.

8.7.2 The following study areas have been used to assess biodiversity resources:

- 2 kilometres from the Order Limits or functionally linked land for sites within the National Site Network (SACs, SPAs, cSACs, pSACs, pSPAs) and Ramsar sites in line with the DMRB LA 115.

[21] Caporn, S. et al (2016). Assessing the effects of small increments of atmospheric nitrogen deposition (above the critical load) on semi-natural habitats of conservation importance. Natural England Commissioned Reports, Number 210 [online]. Available at: naturalengland.org.uk/publication/5354697970941952 (Last accessed December 2023).

- 30 kilometres from the Order Limits for SACs designated for bat populations in line with the DMRB LA 115.
- 2 kilometres from the Order Limits for nationally designated nature conservation sites, including SSSIs, National Nature Reserves (NNRs), National Parks, Marine Protected Areas (MPAs) and Marine Conservation Zones (MCZs) in line with best practice[3] and professional judgement.
- Designated nature conservation sites with hydrological links to the Scheme including:
    - Sites which intersect, are adjacent to, are hydrologically connected to, or are located upstream or downstream of the Scheme
    - Sites with hydrological or hydrogeological features within the National Site Network and Ramsar sites containing a groundwater terrestrial ecosystem
- For surface water quality and hydrological connectivity, a study area of 1 kilometre from the Order Limits is considered appropriate for identifying both statutory and non-statutory designated conservation sites in line with the DMRB LA 113 Road drainage and the water environment.[22]
- Following the simple assessment to establish potential hydrological or hydrogeological linkage to biodiversity resources supporting a groundwater terrestrial ecosystem, a study area of 1 kilometre from the Scheme is also considered appropriate in line with the DMRB LA 113.
- 2 kilometres from the Order Limits for locally designated nature conservations sites, including LNRs and LWSs.
- 2 kilometres from the Order Limits for protected and notable species desk study records.
- 1 kilometre from the Order Limits for ancient woodland and veteran or ancient trees in line with the best practice guidance[23] and professional judgement.
- 250 metres from the Order Limits for the extended Phase 1 Habitat Survey and HPI. Data gathered during the extended Phase 1 Habitat Survey informs the requirements for protected species surveys, including habitat suitability index (HSI) assessments of waterbodies for GCN (applicable for the main alignment only), badger, birds (barn owl *Tyto alba*, breeding and wintering species), otter, reptile, water

[22] National Highways (2020) DMRB LA 113 – Road drainage and the water environment [online]. Available at: d6388f5f-2694-4986-ac46-b17b62c21727 (standardsforhighways.co.uk) (Last accessed December 2023).

[23] Natural England and Forestry Commission (2022). Ancient woodland, ancient trees and veteran trees: advice for making planning decisions [online]. Available at: Ancient woodland, ancient trees and veteran trees: advice for making planning decisions - GOV.UK (www.gov.uk) (Last accessed December 2023).

vole in line with DMRB LD 118, best practice guidance[24] and professional judgement.

- 500 metres from the Kelham and Averham FCA Order Limits only for HSI assessments of waterbodies for GCN in line with the best practice guidance.[25]
- 100 metres from the Order Limits for assessment of structures, buildings and trees for bats in line with the best practice guidance.[20]
- Ponds within the Order Limits are subject to PSYM which includes aquatic plants and invertebrates, and those up to 250 metres from the Order Limits are subject to rapid pond surveys for aquatic invertebrates, using professional judgment.
- LWS with the potential to support notable invertebrate assemblages within 250 metres from the Order Limits for assessment of terrestrial invertebrates in line with the best practice guidance.[24]
- 2 kilometres upstream and downstream along the River Trent from the Order Limits for otter in line with DMRB advice notice[26] and professional judgement.
- 1.5 kilometres from the Order Limits for barn owl in line with the best practice guidance.[27]
- 200 metres from the Scheme ARN for sites within the National Site Network, Ramsar sites, SSSIs, LNRs, LWSs, ancient woodland and ancient and veteran trees with the potential to be impacted by increases in nitrogen deposition in line with the DMRB LA 105 Air Quality.[28]
- 200 metres from the Scheme ARN for protected species indirectly impacted by degradation of habitats within designated sites, resulting from increases in nitrogen deposition in line with the DMRB LA 105 Air Quality.

8.7.3 The ARN used in this Chapter is consistent with the ARN used in the Air quality (Chapter 5) and Climate (Chapter 14) Chapters of this ES. Ecological receptors beyond 200 metres of the ARN have been scoped out of assessment in this Chapter.

8.7.4 Broadly speaking, Figure 8.1 (General survey area for most ecological receptors) of the ES Figures **(TR010065/APP/6.2)** shows the rough survey area for ecological surveys. This does not include the otter transects along main watercourses, which extend 2 kilometres upstream and downstream of the Order Limits, or the desk based

[24] Natural England and Department for Environment, Food & Rural Affairs (2014) Protected species and development: advice for local planning authorities [online]. Available at: https://www.gov.uk/guidance/protected-species-how-to-review-planning-applications (Last accessed December 2023).

[25] English Nature (2001). Great Crested Newt Mitigation Guidelines. English Nature, Peterborough

[26] National Highways (1999) DMRB Nature conservation advice in relation to otters. Volume 10 Section 1 Part 9 HA 81/99.

[27] Shawyer C (2012). Barn Owl *Tyto alba* Survey Methodology and Techniques for use in Ecological Assessment. Wildlife Conservation Partnership.

[28] National Highways (2019) DMRB LA 105- Air Quality Revision 0 [online]. Available at 10191621-07df-44a3-892e-c1d5c7a28d90 (standardsforhighways.co.uk) (Last accessed December 2023).

assessment for air quality (200 metres from the ARN). The ecological receptors sensitive to nitrogen and within 200 metres of the ARN are detailed in the baseline below (Section 8.8 (Baseline conditions) of this Chapter) and in Figure 8.2 (Nitrogen Sensitive Ecological Receptors) of the ES Figures **(TR010065/APP/6.2)**. Each ecological receptor has its own ZoI and therefore survey area, as detailed above. These survey areas are specified in figures within each associated technical report (see Appendices 8.1 to 8.15 of the ES Appendices **(TR010065/APP/6.3)**).

8.7.5 The above study areas have been determined based on a proportionate and reasonable approach to the likely impacts to result from the Scheme.

8.8 Baseline conditions

8.8.1 This section summarises the existing ecological features identified during the desk study, consultations and field surveys. Full details of the desk studies, survey methodology and field survey results are provided within Appendices 8.1 to 8.15 of the ES Appendices **(TR010065/APP/6.3)**.

8.8.2 Information regarding statutory and non-statutory sites was obtained from the UK Government's MAGIC Interactive Map (geographic information about the natural environment),[29] with further information obtained from Natural England[30] and the JNCC[31] website.

8.8.3 Information on the LWS, protected and notable habitats and species within the Scheme study area have been obtained from data supplied by Nottinghamshire Biological and Geological Record Centre (NBGRC) in February 2022 and further updated information supplied in June 2022. NBGRC data was supplemented with roadkill records from Cardiff University's Otter Project[32] and National Highways. Bird species data has been obtained from a data request from British Trust for Ornithology (BTO) Data Report in February 2022. Further information relating to habitats and species have been obtained from ecological surveys that have been undertaken since January 2021 until present.

8.8.4 Details of the Condition Assessments for rivers (River Trent) and ditches (Old Trent Dyke) (informed by Modular River Physical (MoRPh) surveys) and river habitat walkover surveys are available in

[29] Defra (2018) MAGIC Interactive Map [online]. Available at: http://magic.defra.gov.uk/ (Last accessed December 2023).

[30] Natural England (2018) Natural England website [online]. Available at: https://www.gov.uk/government/organisations/natural-england (Last accessed December 2023).

[31] NCC (2018) JNCC website [online]. Available at: http://jncc.defra.gov.uk/ (Last accessed December 2023).

[32] Cardiff University (undated) Map of otter casualties [online]. Available at: [redacted] (Last accessed December 2023).

Appendix 8.13 (River Physical Habitat Technical Report) of the ES Appendices **(TR010065/APP/6.3)**. There have been numerous design iterations resulting in changes to the Order Limits and therefore the study area has evolved over the project timeline. Features recorded during surveys that are now located outside of the current study area, are no longer within the ZoI. These features have been omitted from technical reports and associated drawings. Original feature references have been retained, so do not appear sequentially in results tables in the technical report appendices.

8.8.5 This Chapter considers the effect of ammonia (NH_3) contribution to nitrogen deposition from operational road traffic on sensitive ecological receptors. The methodology of this assessment is detailed within Section 5.5.63 of Chapter 5 (Air Quality) of this ES. The background nitrogen deposition rate at each designated site and range of critical load for each sensitive habitat has been obtained from Air Pollution Information System (APIS).[33]

Designated sites

Sites of international importance

8.8.6 There are no designated sites of international importance (National Site Network or Ramsar sites) within 2 kilometres of the Scheme or within 200 metres of the ARN. There are no sites within the National Site Network where bats are a qualifying feature within 30 kilometres of the Scheme.

8.8.7 Humber Estuary Ramsar, SAC and SPA are hydrologically connected to the Scheme, downstream of the River Trent (Table 8-4). The Humber Estuary Ramsar and SAC are located approximately 53 kilometres directly from the Order Limits and 75 kilometres via the River Trent. The Humber Estuary SPA is located approximately 63 kilometres directly from the Order Limits and 75 kilometres via the River Trent. Given the distance of the SPA from the Order Limits and the nature of the qualifying feature for this designation (various bird species and the non-breeding waterfowl assemblage), the Scheme will not impact this designated site and so it has been scoped out of further assessment. The SAC is also of international importance for Annex I habitats present. These receptors will not be affected by the Scheme due to the distance from source of potential impacts and so habitats within the SAC are scoped out of further assessment. River lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* (qualifying features of the Humber Estuary Ramsar and SAC)[34] migrate up rivers to spawn and therefore the River Trent may serve

[33] Air Pollution Information System (APIS) (2023) [online]. Available at: [redacted] (Last accessed December 2023).

[34] Joint Nature Conservation Committee (JNCC)(n.d). Humber Estuary [online]. Available at: https://sac.jncc.gov.uk/site/UK0030170 (Last accessed December 2023).

as a migratory route or habitat for lamprey species. The Humber Estuary Ramsar and SAC are included in the baseline for this reason. No significant areas of gravel substrate suitable for lamprey spawning have been identified within the Order Limits or within 2 kilometres downstream within the River Trent.

8.8.8 The southern branch of the River Trent between Nether Lock Viaduct and Windmill Viaduct is not considered to be the main lamprey migration route, as Nether Lock Weir acts as a permanent barrier and the lock is considered semi-permeable (fish can advance upstream when boats use the lock to move upstream). Though the lock is used less often at night, it is still a viable pathway for lamprey migration. The northern branch of the River Trent is subject to less sky glow than the southern branch that flows through the urban area of Newark-on-Trent, which could deter passage of lamprey (and European eel *Anguilla anguilla*). The rip-rap structure at the base of Staythorpe Weir, where the northern and southern branches of the River Trent diverge, allow fish to scale the weir providing continuity of the lamprey migration route to the upper reaches.

Table 8-4: Sites of international importance included in the assessment

Site Name	Distance from the Scheme	Features
Humber Estuary SAC	Located approximately 53km north-east from the Order Limits (directly) and 75km via the River Trent.	Primary reason for SAC site selection is the presence of Annex I habitats: estuaries, mudflats and sandflats not covered by seawater at low tide. Qualifying features include Annex I habitats: sandbanks which are slightly covered by sea water all the time, coastal lagoons, *Salicornia* and other annuals colonizing mud and sand, Atlantic salt meadows *Glauco-Puccinellietalia maritimae*, embryonic shifting dunes, shifting dunes along the shoreline with *Ammophila arenaria*, fixed coastal dunes with herbaceous vegetation, and dunes with *Hippopha rhamnoides.* Species that are qualifying features include: river lamprey*,* sea lamprey and grey seal *Halochoerus grypus*.
Humber Estuary Ramsar		The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons. Fish species (river lamprey and sea lamprey) are a qualifying feature and the River Trent could be used by breeding and migrating lamprey.

Sites of national importance

8.8.9 There are no sites of national importance located within 2 kilometres of the Scheme, none have hydrological links to the Scheme and none are within 200 metres of the ARN.

Sites of county importance

8.8.10 Two statutory designations of county importance (LNR designated in the county context, with limited potential for substitution) located within 2 kilometres of the Scheme are presented in Table 8-5 below. Although Farndon Ponds LNR is adjacent to the River Trent, it is located upstream of the Scheme and therefore there is no surface water pathway for the Scheme to impact this LNR. Devon Park Pastures LNR has a surface water connection. However, as the LNR is located greater than 450 metres from the Scheme and upstream, it is considered that there is no credible pathway for a change in water quality to impact this LNR. Further details are provided in Table 13-7 in Chapter 13 (Road Drainage and the Water Environment) of this ES. Devon Park Pastures LNR is located within 200 metres of the ARN. Although the baseline total deposition rate (2022) is in exceedance of the APIS critical load, the change in nitrogen deposition is not greater than 0.4kg N/ha/yr. In accordance with DMRB LA 105 Air quality, if the nitrogen deposition is below this threshold, the receptor does not need to be assessed further as the Scheme is unlikely to result in a significant effect on air quality. Further details are provided in Chapter 5 (Air Quality) of this ES. Therefore, both LNRs are not considered further within the assessment.

Table 8-5: Statutory sites of county importance within the study area but excluded from the assessment

Site Name	Distance from the Scheme	Features
Devon Park Pastures LNR	450m east of the Order Limits Within ~50m of the ARN	This site comprises a range of habitats including neutral grassland, marginal river vegetation and an area of deciduous woodland. It was designated by Newark & Sherwood District Council for a range of common but species-rich habitats and the opportunities they provide for people to interact and connect with nature.
Farndon Ponds LNR	512m west (upstream) of the Order Limits	This site comprises common but species-rich habitats and provides opportunities for people to interact and connect with nature.

8.8.11 Forty-three non-statutory designated sites of county importance are located within 2 kilometres of the Scheme and/or within 200 metres of the ARN (which are considered to support habitats sensitive to nitrogen deposition). Of these 43 LWSs, only 24 LWSs within 200 metres of the ARN are considered to support habitats sensitive to nitrogen deposition and have been taken forward in this assessment for air quality. Figure 8.2 (Nitrogen Sensitive Ecological Receptors) of

the ES Figures **(TR010065/APP/6.2)** shows LWS located within 200 metres of the ARN. A total of seven LWS are located within the Order Limits, with a further five LWS immediately adjacent to the boundary.

8.8.12 These sites have all been included in this Chapter of the ES and are listed in Table 8-6 below. Within this table, the distance from Scheme column uses the terminology 'Scheme footprint' and 'Order Limits'. Scheme footprint refers to the footprint of the permanent works, including the main A46 carriageway alignment and associated embankment, resulting in direct, permanent loss. In the context of Table 8-6, Order Limits refers to all remaining land not under the proposed main alignment or associated embankments and could be subject to: no direct impacts (retained habitat); temporary, direct loss (enabling works e.g. vegetation clearance to facilitate construction); or direct, permanent loss (e.g. construction of access tracks). These LWS are designated for rich assemblages of notable flora and/or fauna communities which is considered to be of at least county level importance for their flora and/or fauna.[35] Desk study data for four LWS were used where access for surveys could not be obtained: Newark Dismantled Railway LWS, Newark Trent Grassland LWS, Kelham Road Grassland LWS and Newark (Beet Factory) Dismantled Railway LWS. Newark (Beet Factory) Dismantled Railway LWS was observable from the opposite west bank of the ditch parallel to the LWS. The east bank of the ditch (within the LWS) comprised of scrub encroachment (dominated by hawthorn) with limited herbaceous understorey. Further botanical surveys classified this habitat as lowland mixed deciduous woodland HPI. This does not align with the designation citation from Newark & Sherwood District Council which describes the sides dominated by scrub with the old track bed and verges supporting scrubby grassland containing species such as hare's-foot clover *Trifolium arvense*, common stork's-bill *Erodium cicutarium* and harebell *Campanula rotundifolia*. The habitat which Trent Banks/Wharves, Newark LWS is designated for is not present within the Order Limits. Locations of all LWS sites can be seen in Appendix F of Appendix 8.1 (Extended Phase 1 Habitat Technical Report) of the ES Appendices **(TR010065/APP/6.3)**.

Table 8-6: Non-statutory sites of county importance (LWS) included in the assessment

Site name	Distance from the Scheme/ARN	Features
Dairy Farm Railway Strip, Newark	Within the Scheme footprint and within the ARN	Broadleaved, mixed and yew *Tacus baccata* woodland. Designated for its botanical interest: a notable damp community of woodland, scrub and wetland species.

[35] Nottinghamshire Local Sites Panel (2018) Guidelines for the selection of Local Wildlife Sites in Nottinghamshire Part 2A – Local Wildlife Sites selection criteria: species [online] Available at: PART 2 – BIOLOGICAL SINC SELECTION CRITERIA (nottinghamcity.gov.uk)pdf (Last accessed December 2023).

Site name	Distance from the Scheme/ARN	Features
Great North Road Grasslands	Within the Scheme footprint and within the ARN	Designated for its botanical interest: a series of diverse meadows with damp hollows.
Old Trent Dyke	Within the Scheme footprint (and within the ARN, though not sensitive to nitrogen)	Designated for its botanical interest and water beetle and bug interest: a species-rich aquatic community in a secondary channel of the River Trent.
Newark (Beet Factory) Dismantled Railway	Within the Order Limits and within ~10m of the ARN	Designated for its botanical interest: a dismantled railway line with a characteristic flora.
Newark Dismantled Railway	Within the Order Limits and within ~40m of the ARN	Disused stretch of railway embankment now partially wooded and scrubbed over with a canopy. Open areas of neutral grassland. Designated for its botanical interest: a dismantled railway line with a characteristic flora.
River Trent, Staythorpe	Within the Order Limits	Designated for its botanical interest: a good representative stretch of the River Trent with broad aquatic margins.
Trent Banks/Wharves, Newark	Within the Order Limits (and within the ARN, though not sensitive to nitrogen)	Fen, marsh and swamp. Designated for its botanical interest: a mosaic of emergent, ruderal and tall herb communities along the bank of the River Trent.
Kelham Road Redoubt Grassland	Immediately adjacent to the Order Limits and within ~5m of the ARN	Neutral grassland. Designated for its botanical interest: a hay meadow with a diverse grassland community.
Valley Farm Grassland	Immediately adjacent to the Order Limits and within ~15m of the ARN	This site is designated for its botanical interest: damp grassland with notable species.
Kelham Road Grassland II	Immediately adjacent to the Order Limits and within ~10m of the ARN	Designated for its botanical interest: a notable horse grazed species-rich neutral grassland.
Newark Grassland	Immediately adjacent to the Order Limits and within ~10m of the ARN	Neutral grassland. Designated for its botanical interest: species-rich unimproved grassland on river gravel.
Newark Trent Grassland	Immediately adjacent to the Order Limits and within ~185m of the ARN	Neutral grassland. Designated for its botanical interest: a grazed pasture with several depressions supporting notable inundation communities.
River Devon (North of Cotham)	203m east of the Order Limits and (and within ~5m of the ARN, though not sensitive to nitrogen)	Designated for its botanical interest: a historically interesting water course with valuable riparian features and a locally diverse aquatic flora.
Long Lane Grassland, Farndon	210m west of the Order Limits	Designated for its botanical interest: a good association of common grassland species.
Devon Nurseries Grassland	310m east of the Order Limits	Neutral grassland.

Site name	Distance from the Scheme/ARN	Features
South Muskham Gravel Pits	390m west of the Order Limits	Designated for its botanical interest: an excellent complex of pools, scrub and ruderal habitats among old gravel workings, of particular ornithological value.
Devon Grasslands, Newark	460m east of the Order Limits	Designated for its botanical interest: a sequence of notable wet riverside pastures.
Kelham Hall Shingle Bank	500m south-east of the Order Limits	This site has developing scrub and ruderal communities.
Trentside Meadows Grassland	530m west of the Order Limits	Designated for its botanical interest: a characteristic neutral floodplain meadow.
Devon Park, Newark	560m east of the Order Limits and within ~60m of the ARN	Designated for its botanical interest: a sequence of neutral grassland, marsh, woodland and scrub along the banks of the River Devon.
Kelham Road Grassland	660m west of the Order Limits and within ~10m of the ARN	Neutral grassland. Designated for its botanical interest: a herb-rich grassland.
River Trent – Kelham	690m north-east of the Order Limits (and within ~5m of the ARN, though not sensitive to nitrogen)	A section of the River Trent of interest for water beetles.
Queen's Sconce, Newark	750m east of the Order Limits and within ~105m of the ARN	Designated for its botanical interest: notable unimproved acidic and neutral grassland communities on a civil war earthwork.
The Fleet, Winthorpe	820m north-west of the Order Limits	Designated for its botanical interest: a notable mosaic of aquatic, marginal and marshy grassland habitats.
Fardon Gravel Pit and Marina	950m west of the Order Limits	Designated for its botanical interest: mature gravel pits of botanical interest.
Kelham Road Redoubt	1km north-west of the Order Limits and within ~60m of the ARN	Civil war redoubt supporting a notable flora
Farndon Willow Holt	1.1km west from the Order Limits	An excellent wet woodland plant community.
Hawton Civil War Fort	1.2km south-east from the Order Limits	Neutral grassland. A notable pasture community on an archaeological site.
Wyke Lane Grassland and Ponds	1.2km south-west from the Order Limits	Meadows with dry and wet areas and old retting ponds of botanical interest.
Kelham Pool	1.25km north-east from the Order Limits	A seasonal pool of interest for water beetles and water bugs.
Kelham Trent and Island	1.4km north-east of the Order Limits	A valuable community of scrub, ruderals and notable gravel colonists on an island on the River Trent.
Kelham Hills	1.6km north-west of the Order Limits	Broadleaved, mixed and yew woodland. Designated for mature, deciduous woodland, largely of zoological interest.
The Fleet, South Muskham	1.6km north-west from the Order Limits and within the ARN	Fen, marsh and swamp. A linear strip of open water and swamp with notable aquatic and emergent plant communities.

Site name	Distance from the Scheme/ARN	Features
Beacon Hill Gypsum Workings	1.7km south-east from the Order Limits and within ~35m of the ARN	A mosaic of neutral grassland and scrub on old gypsum workings.
Balderton Dismantled Railway South	Within the ARN	A dismantled railway with substantial areas of neutral grassland and scrub.
Lowfield Grassland, Balderton	Within ~5m of the ARN	A small species-rich neutral grassland, remnant of a once notable grassland.
Newark Golf Course	Within ~5m of the ARN	A good mixed habitat association of acidic grassland, heath and deciduous woodland.
Spring Wood	Within ~5m of the ARN	A characteristic Mercia Mudstone woodland with a diverse ground flora
Flintham Park	Within ~10m of the ARN	Broadleaved, mixed and yew woodland. A mature estate incorporating a variety of habitats of botanical and zoological interest.
South Scaffold Lane, Collingham	Within ~25m of the ARN	A green lane with a characteristic grassland flora and species-rich hedgerow.
Coneygre Wood	Within ~25m of the ARN	Broadleaved, mixed and yew woodland. Important bat foraging area.
Hill Holt	Within ~40m of the ARN	Broadleaved, mixed and yew woodland.
Langford Moor Area	Within ~185m of the ARN	Valuable plant and animal communities along rides and in drainage ditches throughout this coniferous forestry plantation.

Habitats

8.8.13 Habitats within the Scheme study area were identified, classified and mapped in accordance with the Handbook for Phase 1 Habitat Survey.[36] The habitats identified are summarised in Table 8-7 and detailed within Appendix 8.1 (Extended Phase 1 Habitat Technical Report) of the ES Appendices **(TR010065/APP/6.3)**. The Phase 1 Habitat system for classifying habitats has been converted into 'UK Habs' categories to be used in the Natural England Biodiversity Metric. Further details are provided within Appendix 8.14 (Biodiversity Net Gain Technical Report) of the ES Appendices **(TR010065/APP/6.3)**. The Scheme study area broadly comprised a mosaic of predominantly arable, broadleaved woodland, improved and semi-improved grassland, small patches of amenity grassland, interspersed with intact species-poor hedgerow and ponds in an urban landscape.

[36] Joint Nature Conservation Committee (JNCC) (2010) Handbook for Phase 1 Habitat Survey - a technique for environmental audit [online] Available at: [redacted] (Last accessed December 2023).

8.8.14 Six types of HPI were identified within 1 kilometre of the Scheme or adjacent to the ARN; coastal and floodplain grazing marsh, eutrophic standing water, lowland meadows, lowland mixed deciduous woodland, traditional orchard and wood pasture. The conservation importance of HPIs takes into account the rarity and quality of habitats at each geographical level. With the survey information collected to date, none of the HPIs are considered to meet the criteria for national importance and are therefore considered to be of county importance, as surveys have indicated good condition and the size or connectivity of the resource is sufficient to have potential implications at that geographical scale. As stated in Section 8.6 (Assessment assumptions and limitations) of this Chapter, access for surveys was not granted for areas of wood pasture HPI and deciduous mixed woodland HPI in Kelham, south of the A617 carriageway. In the absence of survey data for inaccessible land, a reasonable worst-case approach, assuming HPI presence, has been taken using professional judgement that the data will not materially change the assessment, whereby areas of Priority Habitats, as shown on MAGIC interactive map, have been converted to HPIs.

8.8.15 No ancient woodlands or ancient trees have been identified within 1 kilometre of the Order Limits. The Woodland Trust's Ancient Tree Inventory website has been reviewed to locate records of ancient and veteran trees within 200 metres of the ARN. One ancient woodland, also designated Spring Wood, Kelham LWS, is located within 200 metres of the ARN. A veteran pedunculate oak is located approximately 170 metres north of the ARN at Coddington, east of Newark-on-Trent, (OS national grid reference SK 82580 54455). Surveys from 2022 and 2023 identified a total of four veteran trees within the Order Limits, which are also located within 200 metres of the ARN (Table 8-7). A further four veteran trees were recorded within 200 metres of the ARN (Table 8-7). Veteran trees are an irreplaceable habitat and of national importance. Ancient woodland, veteran trees and other nitrogen sensitive ecological receptors located within 200 metres of the ARN are shown in Figure 8.2 (Nitrogen Sensitive Ecological Receptors) of the ES Figures **(TR010065/APP/6.2)**.

8.8.16 Local importance has been determined for some habitats due to these forming an important habitat resource in the local context, owing to the quality and size of these habitats, and the function of these habitats as a breeding/dispersal resource for protected species such as bats, birds and reptiles. The protection of a number of scattered trees with TPOs also attributed to the determination of this habitat being of local importance. Given the survey data to date, semi-natural broad-leaved woodland has been determined to be of local importance.

8.8.17 Habitats considered to be of importance below local level (site) such as arable, amenity grassland, tall ruderal and coniferous and mixed plantation woodland, are included in the baseline below (Table 8-7)

for completeness only to describe the overall landscape. They are scoped out of the assessment and areas of loss are not reported individually but are included in total loss of all habitats reported within a LWS. Broadleaved plantation woodland and scrub (importance of a local level) have been considered as part of the assessment of habitats where these habitats do not comprise part of a designated site. An independent assessment has been undertaken on these habitat types that are present within designated sites.

8.8.18 The remaining habitats in the vicinity of the Scheme which did not meet the criteria for HPI are considered to be of local importance as they appreciably enrich the overall habitat resource within the local context.

8.8.19 Standing water and running water of local level importance (including rivers/streams, ditches/dykes, ponds) have also been scoped out of the assessment as standalone habitat. This ES Chapter only assesses impacts after embedded mitigation (detailed in Chapter 2 (The Scheme) of this ES), which will eliminate impacts on these aquatic habitats. Instead, these habitat types have been considered as part of the assessment of designated sites and/or habitats supporting protected species within this ES Chapter. Furthermore, assessment on aquatic environments are detailed in Appendix 13.1 (WFD Compliance Assessment) of the ES Appendices **(TR010065/APP/6.3)** and habitat loss, creation and or enhancement are captured in the BNG metric to support a net gain in habitat units.

Table 8-7: Habitat descriptions

Broad habitat type	Importance	Location and description of habitat present
Coastal and floodplain grazing marsh	County	Within the Order Limits, adjacent to the A46 carriageway, south of the railway line and east of Old Trent Dyke (central OS national grid reference SK 78339 53812). Periodically inundated pasture with ditches which maintain the water levels, containing standing fresh water.
Eutrophic standing water	County	Adjacent to the Order Limits, within British Sugar land (central OS national grid reference SK 79696 54878). This large water body is likely to have been subjected to nutrient enrichment as a result of nearby industrial processes.
Lowland meadows	County	Within the Order Limits, adjacent to the A616 Great North Road west of Cattle Market Junction (central OS national grid reference SK 79289 54757). Identified at an earlier stage of the Scheme development as 'confirming to lowland meadow[37] priority habitat

[37] Joint Nature Conservation Committee (JNCC). (2008). UK Biodiversity Action Plan Priority Habitat Descriptions: Lowland Meadows. Available: Eutrophic standing waters (UK BAP Priority Habitat description) (jncc.gov.uk).

Broad habitat type	Importance	Location and description of habitat present
		criteria'.[38] The grassland is livestock grazed, with plant species found to include common bent, sweet vernal-grass *Anthoxanthum odoratum*, smooth meadow-grass *Poa pratensis*, ribwort plantain *Plantago lanceolata*, common daisy *Bellis perennis*, common sorrel *Rumex acetosa*, lady's bedstraw *Galium verum*, salad burnet *Sanguisorba minor*, meadow foxtail *Alopecurus pratensis*, crested dog's-tail *Cynosurus geniculatus*, marsh foxtail *Alopecurus geniculatus*, and yellow rattle *Rhinanthus minor*. An additional area of lowland meadow was identified by the Applicant. Located adjacent to the Order Limits, to the north of the A617 (central OS national grid reference SK 79147 54763). Species identified include common knapweed *Centaurea nigra*, common bird's-foot-trefoil *Lotus corniculatus*, meadow vetchling *Lathyrus pratensis*, lady's bedstraw, rough hawkbit *Leontodon hispidus* and great burnet *Sanguisorba officinalis*. Unimproved grassland was also recorded adjacent to the wetland mosaic habitat directly north-east of the A46.
Lowland mixed deciduous woodland	County	One woodland is located immediately adjacent to the A46, north-west of the A17/A46 roundabout, within the Order Limits (central OS national grid reference SK 81477 56012). The canopy was comprised of horse chestnut *Aesculus hippocastanum*, ash *Fraxinus excelsior*, wild cherry *Prunus avium*, sessile oak *Quercus petraea* and pedunculate oak. Ground flora included cleavers *Galium aparine* and common nettle *Urtica dioica*. A second woodland is located immediately adjacent to the A46 and south of a large body of water on British Sugar land within the Order Limits (central OS national grid reference SK 79711 54739). This woodland comprises species including pedunculate oak, dogwood *Cornus sanguinea*, hawthorn, hazel *Corylus avellana*, privet *Ligustrum vulgare* and elder *Sambucus nigra*. Ground flora present included wood avens *Geum urbanum* and bramble *Rubus fruticosus* agg. A third woodland is located east of the large body of water on British Sugar land and west of the Nottingham Lincoln railway line, partially within the Order Limits (central OS national grid reference SK 79536 54816). This woodland canopy consisted of sycamore *Acer pseudoplatanus*, silver birch *Betula pendula*, ash and elder. The ground layer contained constant garlic mustard *Alliaria petiolata*, cleavers, red campion *Silene dioica* and common nettle with no frequent associates. A fourth area of deciduous woodland BAP priority habitat (central OS national grid reference SK 77028 55240) is shown on the MAGIC website as overlapping

[38] Atkins, Technical Note: A46 Newark Northern Bypass, Preliminary Walkover Survey (2019).

Broad habitat type	Importance	Location and description of habitat present
		wood pasture and parkland (another BAP Priority Habitats). These habitats cannot overlap, and no habitat information is available for either Priority Habitat. Access was denied for further surveys planned to be undertaken during 2023 to document the species composition and to map a distinct boundary between HPIs. Therefore, a reasonable worst-case scenario has been assumed, using MAGIC Interactive Map in combination with open source aerial photography to define each of the HPI boundaries.
Traditional orchard	County	85m east of the Scheme (central OS national grid reference SK 78237 52338). Several mature apple *Malus domes*tica and pear *Pyrus communis* trees adjacent to a residential property (produce is not grown commercially).
Wood pasture	County	Identified at two sites within the Scheme study area, at Winthorpe House within the Order Limits (central OS national grid reference SK 81595 56469) and Langford Hall adjacent to the Order Limits (central OS national grid reference SK 82476 57126). Both sites comprise of scattered mature coniferous pine *Pinus* spp., as well as deciduous ash, oak *Quercus* spp. and beech *Fagus sylvatica*. The trees are currently actively managed as pollards. The pasture is comprised of species-poor semi-improved grassland and is sward dominant. A third area is identified on the MAGIC website, located in an area associated with Kelham Hall/St Wilfrid's Church within the Order Limits (central OS national grid reference SK 77004 55240). MAGIC shows two overlapping BAP Priority Habitats (Wood pasture and parkland and Deciduous mixed woodland). No habitat information is available for either Priority Habitat. Access was denied for further surveys planned to be undertaken during 2023 to document the species composition and to map HPIs. Therefore a reasonable worst-case scenario has been assumed, using MAGIC Interactive Map in combination with aerial photography to define the wood pasture HPI boundary.

Broad habitat type	Importance	Location and description of habitat present
Veteran trees	National	A total of four veteran trees were identified within the Order Limits and within 200m of the ARN: Pedunculate oak (T038 at E:481499 N:356135 and T139 at E:479688, N:354755), common ash (T136 at E:479613 N:354749), sweet chestnut *Castanea sativa* (T651 at E:482454 N:357117). Three of these veteran trees are in conflict with the Scheme footprint: T038, T136 and T139 (further details are provided in Appendix 7.4 Arboricultural Impact Assessment of the ES Appendices **(TR010065/APP/6.3)**). Four additional veteran trees are located within 200m ARN: small leaved lime *Tilia cordata* (E: 479510, N: 359194), yew (E:471585, N:356440), pedunculate oak (E:482582, N: 354457), sycamore (T669 at E:482487 N:357310). The veteran trees are considered to be of national importance as they constitute irreplaceable habitat and are uncommon across the Scheme study area.
Amenity grassland	Site	Small pockets of amenity grassland are present throughout the Scheme study area, predominantly outside the Order Limits and located at Cattle Market Junction to the northern extent of the Scheme. Scoped out of the assessment.
Arable	Site	Large arable fields are present throughout the Scheme study area and the Order Limits, predominantly north of the existing A46 carriageway. Scoped out of the assessment.
Broadleaved plantation woodland	Local	There is ubiquitous broad-leaved plantation woodland mainly located adjacent to the A46, within the Order Limits. It is likely that this planting has been implemented as screening. The woodland is largely comprised of native species, including ash, pedunculate oak, and sycamore, with hawthorn and blackthorn *Prunus spinosa* present within the sub-canopy layer in some areas.
Coniferous plantation woodland	Site	Coniferous plantation woodland was identified at the centre of the Phase 1 habitat survey area within the Order Limits, on the south of the A46 between the Newark cricket pitch and an area of broadleaved plantation woodland. The habitat was dominated by Leyland cypress *Cupressocyparis* x *leylandii*. Scoped out of the assessment.
Improved grassland	Local	Large areas of improved grassland were present in the Kelham area towards the north-west of the Scheme, within and adjacent to the Order Limits, as well as in the north-east, and smaller patches of improved grassland were present throughout the survey area. Dominant species were typically grasses including perennial rye-grass *Lolium perenne*, cock's-foot *Dactylis glomerata* and Yorkshire fog. In addition, common nettle, creeping thistle *Cirsium arvense*, broad-leaved dock *Rumex obtusifolius*, ribwort plantain, white clover *Trifolium repens* and common daisy were found less frequently.

Broad habitat type	Importance	Location and description of habitat present
Hedgerows	Local	There is a total of 9.92 kilometres of hedgerows within the Order Limits. All hedgerows surveyed were identified as being species-poor and comprised predominantly of hawthorn and blackthorn, with occasional dog-rose *Rosa canina* agg. and elder. 90% are intact hedgerows and hedge with trees, with several hedgerows comprising young and semi-mature trees, including ash and oak. No hedgerows are considered 'important' under the biodiversity criteria of the Hedgerows Regulations, 1997.
Marshy grassland	Local	Marshy grassland was identified surrounding a small waterbody (Pond F002) in the north of the survey area, between the A46 and railway north-east of Crankley Point level crossing, within the Order Limits. This area was surveyed in summer 2019, with species identified including purple loosestrife *Lythrum salicaria*, yellow loosestrife *Lysimachia vulgaris*, and meadowsweet *Filipendula ulmaria*. More recent surveys during January 2022 also found common reed *Phragmites australis* and common bulrush *Typha latifolia*.
Mixed plantation woodland	Site	Four areas of mixed plantation woodland were identified in the north-east of the survey area, south of Winthorpe and within the area north-west of the A46. An area of mixed plantation woodland was recorded directly westerly adjacent to the A46 close to Winthorpe House. The woodland was comprised of pine species *Pinus* sp., ash, beech and oak species *Quercus* sp. Two further areas of mixed plantation woodland were identified within the survey area. Firstly, a linear patch of woodland is located between the A617 and Kelham Hall, with sweet chestnut, European larch *Larix decidua,* beech, yew, wild cherry, sessile oak and ash. Ground flora was sparse with wood avens and red campion rare. A second area of mixed plantation woodland is located nearby, west of the A617 and south of Broadgate Lane, close to a waterbody. Scoped out of the assessment as a standalone habitat. This habitat is considered in combination with other plantation woodland types as part of the assessment of habitats within designated sites.
Notable trees	Local	Ten notable trees are located within, or immediately adjacent to, the Order Limits. Nine of these notable trees are located in Kelham more than 15 metres outside the Order Limits and one is on the boundary of the Order Limits north of Friendly Farmer Roundabout.

Broad habitat type	Importance	Location and description of habitat present
Parkland/ scattered trees	Local	There are numerous scattered broad-leaved trees within the survey area. Species present included ash, oak, sycamore, beech, silver birch, horse chestnut, sweet chestnut, willow *Salix* spp. And poplar *Populus* spp. Some of the trees are currently actively managed by pollarding. Several mature pine trees and Leyland cypress trees were recorded within the survey area. Namely at Newark Rugby Club, Newark Cricket Club and within wood pasture at Winthorpe House and Langford Hall. Scoped out of the assessment as a standalone habitat to prevent 'double-counting'. Parkland is assessed under 'wood pasture and parkland HPI', trees of veteran status have been assessed independently in this ES Chapter and in Appendix 7.4 (Arboricultural Impact Assessment) of the ES Appendices **(TR010065/APP/6.3)**. This habitat type has also been considered as part of the assessment of habitats supporting protected species.
Running water (rivers/streams)	Local	The Scheme crosses the River Trent twice along the existing A46 carriageway: Windmill Viaduct and Nether Lock Viaduct. Several smaller watercourses are culverted under the existing A46 carriageway, these include Old Trent Dyke, The Fleet, Winthorpe Beck and an unnamed watercourse which passes under the railway line adjacent to Severn Trent Water Ltd. sewage works. Scoped out of the assessment as a standalone habitat. This habitat is considered as part of the assessment of designated sites and habitats supporting protected species as well as within Appendix 13.1 (WFD Compliance Assessment) of the ES Appendices **(TR010065/APP/6.3)**.
Scrub	Local	Scrub habitat is present throughout the survey area, both in scattered and dense forms. Though typically comprising small, isolated pockets, some areas of scrub parallel to the A46 carriageway adjoining plantation woodland offer opportunities for dispersal of protected species by providing a continuous length of vegetation. The dominant species within this habitat was bramble.
Semi-improved neutral grassland	Local	Several areas of semi-improved neutral grassland were identified during surveys, with the greatest concentration of this habitat in the central part of the survey area close to the A46 and Great North Road roundabout. Species identified within this habitat included red fescue *Festuca rubra*, common bent *Agrostis stolonifera*, cock's-foot, Yorkshire fog, common sorrel, red clover *Trifolium pratense*, ribwort plantain and creeping thistle

Broad habitat type	Importance	Location and description of habitat present
Semi-natural broad-leaved woodland	Local	There are numerous pockets of semi-natural broad-leaved woodland within the survey area. The canopy was generally comprised of semi-mature to mature oak and ash. Sycamore and beech were also present within the canopy layer in some woodlands. Holly *Ilex aquifolium* and hazel were present within the sub-canopy layers in some parcels, though very local in abundance. Due to the sub-optimal time of the survey, it was not possible to accurately survey the ground flora layer in all woodland (see Section 8.6 (Assessment assumptions and limitations)).
Species-poor semi-improved grassland	Local	Most common in the south and central regions of the survey area and present close to the A17/A46 roundabout in the north-east of the area. The habitat was characterised by the dominance of grass species including red fescue, Yorkshire fog, common bent, and cock's-foot. Other species recorded during surveys included creeping buttercup *Ranunculus repens*, broad-leaved dock, and creeping thistle.
Standing water (ditches/dykes)	Local	There were a number of ditches and dykes within the survey area adjacent to scattered broad-leaved trees, species-poor semi-improved grassland and arable. The Old Trent Dyke is located approximately 600 metres north of the River Trent and passes under the existing A46. Ditch habitats have been identified under Nottinghamshire's HAP. Scoped out of the assessment as a standalone habitat. This habitat is considered as part of the assessment of designated sites and habitats supporting protected species as well as within Appendix 13.1 (WFD Compliance Assessment) of the ES Appendices **(TR010065/APP/6.3)**.
Standing water (ponds)	Local	There were 29 ponds identified within the survey area. Common bulrush was often present within pond habitats, with other species including soft rush, meadowsweet and yellow water-lily *Nuphar lutea* locally abundant. Scoped out of the assessment as a standalone habitat. This habitat is considered as part of the assessment of habitats supporting protected species as well as within Appendix 13.1 (WFD Compliance Assessment) of the ES Appendices **(TR010065/APP/6.3)**.
Tall ruderal	Site	Tall ruderal habitat existed within several land parcels and was comprised of mainly willowherb species *Epilobium* spp., creeping thistle, common nettle and broad-leaved dock. Scoped out of the assessment.

8.8.20 The MAGIC.gov website identifies a number of areas of 'Priority Habitat Inventory (PHI) – Deciduous Woodland (England)' within, and immediately adjacent to, the Order Limits. The deciduous woodland is detailed within the 'User guide for Natural England's Priority Habitat Inventory v3.0 (November 2022). The document describes the PHI mapping process as it maps "…*most of the terrestrial semi-natural*

habitat types that were identified as being the most threatened and requiring conservation action under the UK Biodiversity Action Plan (UK BAP)… All BAP Priority Habitats occurring in England are identified as habitats of principal importance for the conservation of biodiversity under section 41 of The Natural Environment and Rural Communities (NERC) Act".

8.8.21 Further areas of woodland identified via aerial imagery, were subject to ground-truthing surveys in 2023 where access allowed, to assess whether they meet the requirements to be classified as a HPI. This included both sides of the A46 east of the Great North Road roundabout, and surrounding the large waterbody on British Sugar owned land. Woodlands are further discussed in Appendix 8.2 (National Vegetation Classification Technical Report) of the ES Appendices **(TR010065/APP/6.3)**.

8.8.22 In summary, the following woodland types were record within the Order Limits:

- Broadleaved semi-natural woodland (non-HPI)
- Coniferous plantation woodland (non-HPI)
- Lowland mixed deciduous woodland HPI
- Mixed plantation woodland (non-HPI)
- Semi-natural broad-leaved woodland (non-HPI)

8.8.23 In the absence of survey data, the outcome for HPIs and non-HPI are based on the survey data collected to date and using professional judgement that the data will not materially change the assessment. This precautionary approach has been applied to areas such as Kelham, where lowland mixed deciduous woodland HPI and wood pasture and parkland HPI are detailed on MAGIC interactive maps but access has not been granted to undertake ground truthing field surveys. Therefore, presence of these two HPIs are considered to align with the area mapped on MAGIC for the purpose of the assessment in this Chapter.

Protected species

Badgers

8.8.24 Badger walkover surveys were conducted alongside the extended Phase 1 Habitat Surveys along the main alignment and within the Kelham and Averham FCA between January – August 2022. Incidental observations of badger field signs were recorded during other species-specific ecological surveys in 2022 and 2023.

8.8.25 Two inactive outlier badger setts (F001 and F002) were identified within the survey area, all with single entrances and with no evidence of current badger use. F001 is within the Order Limits and F002 is located 50 metres north-west of the Order Limits. Two enlarged

mammal burrows (F018 and F033 both located within the Order Limits) were also identified. However, no evidence of use by badger was noted.

8.8.26 Evidence of badgers using the survey area for foraging was documented in the form of snuffle pits, located within five separate areas. Latrines were identified in three distinct locations within the survey area, comprising of fresh, semi-fresh and old dung. One fresh latrine (F028) was recorded 95 metres east of large mammal burrow F020, just outside of the Order Limits and a single latrine (F031) was identified at the location of large mammal burrow F018. An additional area of latrines (including four latrines, two with old dung within them) was identified approximately 80 metres north-west of the Kelham and Averham FCA (F017). These latrines were located 200 metres north of an enlarged mammal burrow (F033) located within the same woodland. The location of badger field signs is contained within Appendix 8.15 (Confidential Badger Technical Report) of the ES Appendices **(TR010065/APP/6.3)**.

8.8.27 A total of 35 records of badger roadkill have been recorded within 2 kilometres of the Order Limits since 1992, 23 of which were recorded in the last 10 years (since June 2013). Of these, 10 records are located within the Order Limits, three of these are incidental records recorded during site visits between 2020 and 2023. Of these 10 records, one was recorded on the A1133 north-west of Winthorpe Junction, two along the A1 carriageway between the northbound slip road to Cattle Market Junction and the A46 carriageway overbridge, and seven along the A46 carriageway between Farndon and Winthorpe. Details of the location of badger roadkill records are shown on Figure 8.3 (Badger roadkill data within 2km of the Order Limits) of the ES Figures **(TR010065/APP/6.2)**.

8.8.28 The presence of badger setts cannot be ruled out within those land parcels where access was not granted (detailed in Figure 8.5 (Land Access Constraints) of the ES Figures (TR010065/APP/6.2)). However, this inaccessible land comprises of several urbanised areas located outside of the Order Limits, predominantly unsuitable for setts due to high levels of anthropogenic disturbance and risk of persecution. A reasonable worst-case scenario has been taken for land adjacent to the Order Limits, east of the A617 carriageway. It is assumed that a badger sett could be present within the deciduous woodland linked to a dry ditch comprising of dense scrub, along the northern perimeter of arable fields. To date, no active badger setts have been recorded. Any changes to badger sett activity, including receipt of incidental recordings prior to or during construction, will inform appropriate mitigation detailed in Section 8.10 (Design, mitigation, compensation and enhancement measures). This includes an initial 21 days of monitoring prior to works likely to commit a wildlife offence, to ascertain the use of setts by badger.

8.8.29 Further information is contained within Appendix 8.15 (Confidential Badger Technical Report) of the ES Appendices **(TR010065/APP/6.3)**.

8.8.30 Badgers are protected under the Badger Act 1992. It is a common species, widespread in the UK. With some foraging activity across the Scheme, but no active setts identified, the population present is considered to be of local importance.

Bats

8.8.31 All trees, buildings and structures accessible within a 100 metre buffer of the Order Limits were subjected to the following surveys in 2022 and 2023, with reference to best practice guidance as set out within the Bat Conservation Trust (BCT) Good Practice Guidelines:[39]

- External inspection for potential roost features (PRFs) from ground level
- Bat aerial inspections of trees to reclassify PRFs and determine the presence/absence of bats at the time of the survey
- Dusk emergence and dawn re-entry surveys to assess the presence of roosts in buildings and trees
- Walked transects, to assess the activity levels and identify important commuting routes and foraging grounds of bats along defined routes within the survey area
- Static bat recorded assessment, to assess activity levels and species present at designated points along walked transect routes
- Hibernation surveys, to assess the potential for buildings and trees for hibernating bats and locate any hibernation roosts

8.8.32 Suitable habitat for bats has been identified within the Order Limits from desk study records and the Phase 1 surveys. Hedgerows, woodland, scrub and various waterbodies were assessed as having Moderate suitability to support commuting and foraging bats.

8.8.33 The Preliminary Roost Assessments (PRA) identified 229 trees with varying suitability to support roosting bats (low, moderate, high, confirmed roost) within the survey area; 84 of which were within the Order Limits, with the remaining 145 trees located within 100 metres of the Order Limits. Trees with a roosting suitability of 'Moderate' or above were scoped in for aerial tree climb inspections, if the trees were identified as being safe to climb. Of these 229 identified from PRA surveys, 89 of them were identified as needing further surveys via the use of aerial tree climbing inspection surveys. Seventy-nine of these trees were subject to aerial tree climb inspection surveys. A further 10 trees were unsafe to climb and access was not permitted for aerial inspection of a single tree (F173). These surveys were carried out by licensed and certified climbers between January 2022

[39] Bat Conservation Trust: Bat surveys for Professional Ecologists, Good practice Guidelines 3rd edition (2016).

and August 2023 to further assess suitability and look for evidence of roosting bats.

8.8.34 Four trees were identified from ground level as having suitability to support bats during the hibernation period (trees F034, F050, F071, F074), three of which were subject to hibernation surveys by aerial inspections in 2023, however tree F071 could not be fully inspected due to the extent and shape of the cavity. Tree F074 was unsafe to climb due to the extent of rot and presence of barn owl. These inspection surveys confirmed hibernation suitability in two trees (F034 and F050) but no evidence of bats was recorded. Outside of the hibernation period, emergence and re-entry surveys and alternative aerial tree climb inspections were undertaken on these four trees in 2022 and 2023 and no evidence of a roost has been recorded to date. Only one survey out of a total of three surveys was completed for tree F034 before access was revoked.

8.8.35 To date, four confirmed bat roosts in four trees (tree F123, tree F210, tree F213 and tree F225) have been identified across the survey area. Tree F123 was identified as a confirmed noctule *Nyctalus noctula* roost during an aerial inspection survey, located within 30 metres of the Order Limits. The results of the final emergence, re-entry and substituted aerial inspection surveys of the confirmed bat roost in tree F123 recorded no further evidence of roosting bats. Tree F210, located approximately 70 metres from the Kelham and Averham FCA Order Limits, was identified as a *Myotis* sp. maternity roost (likely Daubenton's bat) during emergence and re-entry surveys. Tree F213, located 105 metres from the Kelham and Averham FCA Order Limits, was identified as a confirmed roost during the PRA and aerial inspection surveys, supporting an unknown bat species. The bat was facing away from the cavity opening and retreated further into the cavity, preventing the surveyor from identifying the species. The first survey of tree F225 identified a roost comprising a single soprano pipistrelle. This bat was observed to investigate/swarm around the tree prior to re-entering a trunk cavity located approximately 1.5m above the ground. Two further surveys of tree F225 did not identify any further instances of roosting bats. As such, the roost within F225 is considered to be a day roost. Tree F225 is approximately 30 metres from the Kelham and Averham FCA Order Limits.

8.8.36 Of the 39 structures and buildings within the survey area (five bridges and 34 buildings), 26 buildings were identified as having suitability to support roosting bats. The PRA surveys highlighted hibernation suitability in 11 buildings and structures across the survey area. Internal inspections were undertaken on seven out of 11 buildings identified as having bat hibernation suitability during the PRA. However, only partial inspections were undertaken on the remaining six buildings (F002, F004, F005, F010, F013 and F023) and no inspections were undertaken on a further four buildings (F061, F062, F063 and F064) (limitations are detailed in Section 8.6 (Assessment

assumptions and limitations) of this ES Chapter). Building F009 has potential for a bat hibernation roost, though no evidence was found during internal inspections. Three of the four buildings that were not subject to internal inspections have voids within each pitched roof with potential for hibernation roosts (F062, F063 and F064). Dusk emergence and dawn re-entry surveys of buildings and structures confirmed five bat roosts in buildings within the survey area. These comprise a soprano pipistrelle *P. pygmaeus* daytime roost in building F004 (within the Scheme alignment), a common pipistrelle daytime roost in building F010 (located *c*.100 metres from the Order Limits), a brown long-eared bat *Plecotus auritus* daytime roost in building F013 (located *c*.150 metres east of the Order Limits), a common pipistrelle daytime roost in F054 (located 15 metres from the Order Limits) and a *Pipistrellus* sp daytime roost in building F057 (located *c*.81 metres from the Order Limits). Bat droppings were identified on an external windowsill of building F002 (located *c*.15 metres from the Order Limits) during the PRA surveys in 2019 (during a previous stage of works[40]). No evidence of roosting bats has been identified during 2022 and 2023 surveys of F002.

8.8.37 Bat activity transect and static surveys recorded at least eight bat species using the survey area for commuting and foraging purposes. These are barbastelle *Barbastellus barbastellus*, brown long-eared bat, common pipistrelle, Leisler's bat *Nyctalus leisleri*, noctule, serotine *Eptesicus serotinus,* soprano pipistrelle and unidentified *Myotis* sp. – along with unidentified *Nyctalus* sp., *Pipistrellus* sp. and bat species. Transect BT02 exhibited the highest levels of activity, predominantly from common species (common pipistrelle, noctule and soprano pipistrelle).

8.8.38 A single barbastelle call was recorded across all transect surveys, within transect BT01. Additionally, barbastelle records were recorded on eight of the 12 static bat detectors, with the highest number of records being recorded from static detector BT01_BS01 (nine records in total, eight of which were recorded in August).

8.8.39 Full results of the PRA and results of the follow up surveys including bat dusk emergence/dawn re-entry surveys, bat activity (transect and static) surveys and climbed inspection surveys are detailed in Appendix 8.3 (Bat Technical Report) of the ES Appendices **(TR010065/APP/6.3)**.

8.8.40 The composition of the bat assemblage using the study area consists predominantly of widespread and common species. The abundance of the common species recorded in the survey area is considered to be relatively typical for the region and landscape present.

[40] Atkins. (2019). HE551478-ATK-EBD-XX_A46-RP-LE-000008. A46 Newark Northern Bypass Preliminary Walkover Survey Technical Note.

8.8.41 Low numbers of scarce[35] species (such as Leisler's) and very low numbers of the rare barbastelle bat were also recorded. There is a Species Action Plan (SAP) for bats within the Nottinghamshire LBAP. Barbastelle and soprano pipistrelle are also SPI. Due to the presence of a scarce and rare species in low numbers, the bat assemblage present is considered to be of regional importance. In the absence of a complete package of survey data (due to failure of equipment or no access granted), the outcome for bats is based on the data collected to date and a reasonable worst-case scenario has been applied using professional judgement (assemblage has been assumed to include scarce and rare species, in similar numbers to those recorded elsewhere across the scheme, where data was absent). With the data collected to date and application of the reasonable worst-case scenario, the missing data will not materially change the outcome of this assessment.

Birds – barn owl

8.8.42 The NBGRC data search returned 17 records of barn owl, with the closest located approximately 500 metres from the Order Limits and dated 2016. The BTO Data Report highlighted that barn owl are known to breed within at least one tetrad (a 2-kilometre by 2-kilometre square) spanned by the Scheme. Confirmed breeding was recorded in the period 2007–2011 with presence recorded at the 10-kilometre square scale in the past five years. Barn owl are also known to be present in the 10-kilometre squares spanned by the Scheme both historically (2007–2011) and in the past five years.

8.8.43 The extended Phase 1 Habitat Survey was used to gain an insight as to where suitable barn owl habitat is present. Stage 1 and Stage 2 survey efforts focused on the largest areas of habitat loss and where potential Traffic Accident Blackspots (TABs) may arise. The areas of the survey area which were not surveyed, remain negligible in terms of risk to barn owls during the operational phase due to the widening of the existing road.

8.8.44 Barn owl Stage 1 and Stage 2 surveys were carried out concurrently in 2022 within the Order Limits and up to 250 metres. A barn owl Stage 3 nest verification survey is required to carry out an internal investigation of the cavities, boxes and buildings identified as potential nest site (PNS), to determine if they are occupied breeding sites. Barn owl Stage 3 surveys must be undertaken at least one year prior to the closure of any confirmed nest sites, pre-construction (as required under commitment B7 of Table 3-2 REAC within the First Iteration EMP (**TR010065/APP/6.5**)). Any survey data that is collected during barn owl Stage 3 surveys will be submitted as confirmatory information. It is recommended that these nest verification surveys are undertaken in winter to reduce the likelihood of disturbing barn owl chicks in a nest.

8.8.45 A total of 16 PNS, active roost site (ARS) and potential roost site (PRS) were identified within the survey area, three of which (PNS's) were identified incidentally during other species-specific ecology surveys and seven of the PNS were barn owl or tawny owl boxes.

8.8.46 No live, or dead barn owls were observed during the combined Stage 1 and Stage 2 barn owl field surveys. Barn owls (non-nesting) were incidentally observed 10 times during bat and botanical surveys. In addition, an anecdotal sighting by a landowner has also been recorded.

8.8.47 Three TAB's were identified. The new stretch of road by Brownhills Junction and Friendly Farmer Roundabout will intersect five hedgerows or tree lines. The two other TAB's were assessed based on desk study data where the widening, or improvements, of the road is in areas of suitable barn owl habitat with confirmed barn owl presence. One is located around Cattle Market Junction and the other is north of Farndon Roundabout.

8.8.48 Further information is available in Appendix 8.4 (Confidential Barn Owl Technical Report) of the ES Appendices **(TR010065/APP/6.3)**.

8.8.49 Barn owls are known to be present within the survey area and although the species is widely distributed, populations are in decline in the UK and are considered scarce in Nottinghamshire.[35] It is likely that there is at least one breeding pair within the study area and the barn owl population present is therefore considered to be of county importance. Barn owl Stage 3 surveys detailed above, are to be undertaken prior to construction by an ornithologist who holds a Natural England class 1 barn owl licence. The level of impact to barn owls is not considered likely to change. In the unlikely event that the biodiversity resource importance is increased to regional importance following the completion of barn owl Stage 3 surveys, the significance of effect assessed in this Chapter will not change in accordance with DMRB significance matrix (see Table 8-3).

Birds - breeding

8.8.50 Field surveys and subsequent mapping of species richness and abundance for breeding birds were undertaken across 11 transects, once a month during the 2022 breeding season (between April to September inclusive). Breeding bird surveys were carried out across six visits between April – August 2022, inclusive, with reference to the guidelines laid out by the Bird Survey and Assessment Steering Group (2022)[41] and 'look-see' method as described by Bibby et al. (1992; 2000).[42]

[41] Bird Survey & Assessment Steering Group. (2022). Bird Survey Guidelines for assessing ecological impacts, v.1.0.0. Available URL: [redacted] (Last Accessed 15 December 2023).

[42] Bibby, C.J., Burgess, N.D., Hill, D.A., Mustoe, S. and Lambton, S. (1992, 2000). Bird Census Techniques. *Academic Press, London, UK.*

8.8.51 The 11 transects provided representative samples of the typical habitats present across the Scheme. These include watercourses and waterbodies, woodland, trees and scrub, grassland, arable fields and boundary hedgerows, buildings and infrastructure.

8.8.52 The River Trent, the large lake north of the Order Limits (within British Sugar land) and small ponds through the Scheme provide valuable nesting, foraging and loafing habitats for waterfowl and watercourses act as an important commuting corridor and foraging resource for other species.

8.8.53 Woodland, trees, hedgerow and scrub provide valuable nesting, foraging and roosting habitat for a broad range of bird species. An active rookery (comprising over 10 nests) was identified within a strip of semi-natural broadleaved woodland located at National Grid Reference (NGR) SK 8151 5605 between the existing A46 corridor and Winthorpe village and a second active rookery was identified at Winthorpe Roundabout (SK 82299 56830). An active kestrel *Falco tinnunculus* nest site was recorded within a cavity on a mature ash tree located along transect C01 at NGR SK 81036 56118 and along the western boundary of a large arable field.

8.8.54 Birds recorded that are known to use buildings and infrastructure during the breeding bird surveys included house sparrow *Passer domesticus* (no confirmed nests, though one individual was observed carrying food), starling *Sturnus vulgaris* (no confirmed nests), swallow *Hirundo rustica* (four confirmed nest sites), swift *Apus apus* (no confirmed nests) and house martin *Delichon urbicum* (two confirmed nest sites).

8.8.55 Northern and southern parts of the survey area are dominated by large tracts of open (lowland) farmland, comprising a mosaic of improved grassland, semi-improved grassland, and arable fields. Most are bound by managed species-poor hedgerows, hedgerows with trees, or tree lines (shelter belts). An active lapwing *Vanellus vanellus* nest was recorded along transect A04 centrally within a large arable field (no other active nests were noted, with a peak count of two individuals observed across all survey visits).

8.8.56 A total of 63 species were recorded in the 2022 breeding season. Two non-native species were excluded from this assessment, these being Canada goose *Branta canadensis* and Egyptian goose *Alopochen aegyptiaca*. Of the 61 native species recorded, five of these species are important ecological features based on the following criteria:

- Species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) with breeding evidence in the study area:
    - Barn owl
    - Cetti's warbler *Cettia cetti*
- SPI that are present in the study area:

  - Herring gull Larus argentatus
  - LBAP species that are present in the study area:
  - Barn owl
  - Cetti's warbler
  - Cormorant *Phalacrocorax carbo*
  - Sand martin *Riparia riparia*

- Species evaluated as Critically Endangered, Endangered or Vulnerable on the International Union for Conservation of Nature (IUCN) Regional Red List assessment of extinction risk for Great Britain (IUCN2) that are notable in the study area:

  - Herring gull

- Red List or Amber List Birds of Conservation Concern (BoCC[5])[43] that are notable in the study area:

  - Black-headed gull *Chroicocephalus ridibundus*
  - Bullfinch *Pyrrhula pyrrhula*
  - Common shelduck *Tadorna tadorna*
  - Common tern *Sterna hirundo*
  - Greylay goose *Anser anser*
  - Grey wagtail *Motacilla cinerea*
  - Herring gull
  - House martin *Delichon urbicum*
  - House sparrow
  - Kestrel
  - Lapwing
  - Meadow pipit Anthus pratensis
  - Reed bunting *Emberiza schoeniclus*
  - Rook *Corvus frugilegus*
  - Starling *Sturnus vulgaris*
  - Stock dove *Columba oenas*
  - Sedge warbler *Acrocephalus schoenobaenus*
  - Song thrush *Turdus philomelos*
  - Sparrowhawk *Accipiter nisus*
  - Swift
  - Tawny owl *Strix aluco*
  - Willow warbler *Phylloscopus trochilus*
  - Woodpigeon *Columba palumbus*

8.8.57 Although a kingfisher *Alcedo atthis* was noted as an incidental observation along the River Trent during another survey, it was not recorded across any of the six survey visits for breeding birds and has

[43] Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Noble D. and Win, I. (2021). The status of our bird populations: The Fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. *Brit. Birds* 114, 723–747.

therefore not been considered of significance. No species recorded during the surveys in 2022 met the following criteria:

- Rare Breeding Bird Panel (RBBP) species with breeding evidence in the study area.
- Annex 1 of the EU Birds Directive present in the study area.

8.8.58 Further details on the breeding bird surveys, including transect locations, are available in Appendix 8.5 (Breeding Bird Technical Report) of the ES Appendices **(TR010065/APP/6.3)**.

8.8.59 The breeding bird assemblage present is considered to be of county importance due to the presence of a number of species notable for Nottinghamshire.

Birds - wintering

8.8.60 Wintering bird surveys were carried out across four visits in January to February 2022 and November to December 2022. Transect routes were devised to survey a representative sample of the habitats within a 1 kilometre buffer of the Order Limits and were surveyed once per survey visit, unless otherwise explained within the limitations.

8.8.61 Habitats surveyed within the transects included all watercourses, including running (riverine) and standing (wetlands), drains, wooded areas and fields. The River Trent corridor provides habitat and important commuting networks for birds during winter. Hedgerows, tree lines and unmanaged gardens within the vicinity of the Scheme provide winter foraging and roosting habitats and may facilitate bird movement across the landscape. The grassland and arable land in the vicinity of the Scheme provide winter foraging opportunities for birds.

8.8.62 A total of 71 species were recorded during winter bird surveys. Totals of 64 and 58 species were recorded during the January to February and November to December surveys, respectively. Of all species recorded, 51 were present in both January to February and November to December surveys.

8.8.63 Field surveys identified the presence of five notable species based on the following criteria:

- SPI that are present in the study area:
  - Grey partridge *Perdix perdix*
- Species evaluated as Critically Endangered, Endangered or Vulnerable on the International Union for Conservation of Nature (IUCN) Regional Red List assessment of extinction risk for Great Britain (IUCN2) that are notable and present in the survey area:
  - Grey partridge
  - Kestrel

- Oystercatcher *Haematopus ostralegus*

- Red List or Amber List Birds of Conservation Concern (BoCC5[43]) that are notable and present in the survey area:
  - Fieldfare *Turdus pilaris* (Red)
  - Grey partridge (Red)
  - Kestrel (Amber)
  - Oystercatcher (Amber)
  - Redwing *Turdus iliacus* (Amber)

8.8.64 The grassland and arable land in the vicinity of the Scheme provide winter foraging opportunities for birds including groups of over 200 lapwing observed to the east of transect BT03. In addition, a peak count of 250 fieldfare, a peak count of 350 redwing, rook and linnet *Carduelis cannabina* were all recorded foraging in grassland and arable habitats.

8.8.65 Further details are available in Appendix 8.6 (Wintering Bird Technical Report) of the ES Appendices **(TR010065/APP/6.3)**.

8.8.66 Wintering birds are considered to be of county importance based on the bird assemblage recorded during the surveys, which contains a number of notable species for Nottinghamshire.

Fish

8.8.67 The desk study identified five protected fish species within the study area (250 metres of the Order Limits): barbel *Barbus barbus*, brown trout *Salmo trutta*, bullhead *Cottus gobio*, spined loach *Cobitis taenia* and European eel. In addition, 24 non-native aquatic and riparian species were identified within the study area.

8.8.68 An additional 16 native fish species were noted in the study area, and the fish community was characterised by species typical of an eastern lowland river. The potential for presence of additional migratory species was noted, as there are records of brown/sea trout *Salmo trutta,* flounder *Platichthys flesus* and European eel *Anguilla anguilla* (all freshwater life stages) within 10 kilometres of the Order Limits. Additional migratory species that may use the study area as a migratory route are salmon *Salmo salar*, river lamprey, and sea lamprey.

8.8.69 The combined survey results from extended Phase 1 Habitat Survey, GCN, otter, water vole, aquatic invertebrate, river habitat walkover surveys and modular river physical habitat surveys (MoRPh), which informed the river condition assessment, have scoped out many watercourses and waterbodies from further assessment of the Scheme on fish species due to the lack of viable pathways for impact. For example, watercourses upstream of the works and land-locked waterbodies that are not hydrologically connected to the Scheme. During consultation, the Environment Agency confirmed the presence

of coarse fish spawning pools at the base of Nether Lock Weir. Site surveys did not record any other significant spawning areas downstream of any main alignment works. The urban reach upstream of Nether Lock weir is silty and therefore unsuitable for spawning.

8.8.70 River habitat walkover surveys were undertaken in August and September 2022 along the River Trent within the Order Limits and Old Trent Dyke. Remaining drainage ditches that are entirely artificial, are subjected to eutrophication, typically culverted and considered of low suitability for protected fish and are therefore not included in this assessment. The pond in Kelham and Averham FCA that will be lost to the Scheme will not be surveyed due to safety concerns and limited access around the perimeter and a reasonable worst-case scenario has been applied (i.e. the presence of fish).

8.8.71 The fish populations present are considered to be of regional importance on the basis of the desk study records, consultation with the Environment Agency and the river habitat walkover survey.

Great Crested Newt

8.8.72 A total of three GCN records, 19 records of smooth newt *Lissotriton vulgaris* and 35 unidentified newt records were returned by NBGRC. All three GCN records returned were located within proximity to the Kelham and Averham FCA (which is separated from the main alignment via the River Trent) and were dated from 2020.

8.8.73 Twenty-seven waterbodies were identified within the survey area. Twenty-three of these ponds were subject to HSI surveys, the remaining five waterbodies were not surveyed as they were dry at the time of survey or unsuitable for GCN. HSI results of ‘Below Average’ or higher were recorded for 21 of the 23 ponds. Of these 21 waterbodies, 20 waterbodies were subject to eDNA surveys (where access was agreed with the landowner). Thirteen of the 16 waterbodies with HSI scores of ‘Average’ or higher from the 2022 and 2023 surveys were subject to a round of traditional presence/likely absence surveys whilst eDNA samples were being analysed. Presence/likely absence surveys for GCN ceased on all ponds whose eDNA results were ‘negative’. No GCN were recorded during this time.

8.8.74 Laboratory analysis of the eDNA samples returned a ‘negative’ result (no GCN DNA present) for all ponds but one (F022), which returned an ‘inconclusive’ result in 2022. Pond F022 was discovered towards the end of the 2022 GCN survey season so the window had been missed to undertake presence/likely absence surveys (mid-March and mid-June). A HSI survey was undertaken again on Pond F022 in April 2023 following the clearance of vegetation from the channel (including dredging) and up to the top of the ditch embankment by a third party, which caused the pond to become a continuation of drainage ditch WV09 and was no longer a distinct pool under the disused railway bridge. The 2023 HSI score (‘Below Average’) reflected that habitat

had been rendered unsuitable for GCN. The eDNA survey was aborted in 2023 due to sediment disturbance and therefore risk of false positive results from historic DNA, if present. Pond F022 was ruled out of requiring presence/likely absence surveys due to pollution and turbidity of the water (inhibiting torching), shallow water (preventing the use of bottle traps), lack of macrophytes (preventing egg searches), barbed wire fencing, steep banks and uneven depth of deep sediment within the channel, meaning that only a quarter of the previous footprint of the pond was accessible for netting (this method has low detectable for presence). The west bank was also bare/exposed earth and the east bank was not accessible (ruling out refuge searches). On the basis of the above it is assumed that GCN are absent. If GCN are discovered pre-construction or during construction in proximity to waterbody F022, any impacts would be indirect and temporary and would be mitigated through embedded and essential mitigation already detailed in this Chapter.

8.8.75 Anecdotal evidence was obtained of a recorded newt presence within an ornamental pond stocked with fish (F024) located immediately adjacent to the Order Limits. The results of an eDNA survey in April 2023 indicated GCN were absent from pond F024.

8.8.76 As a result of design evolution, seven of the twenty-eight ponds within the survey area (five within the Kelham and Averham FCA and two along the main alignment of the Scheme), were identified late in the year (2022) when a full suite of presence/likely absence and eDNA surveys could not be completed. These seven ponds were subject to HSI surveys in February 2023, six of which returned a HSI score of 'Below Average' or above and were subject to further eDNA surveys in April 2023. The results of these eDNA surveys were 'negative' (no GCN DNA present).

8.8.77 The waterbodies surveyed for eDNA in 2023, were also subject to presence/likely absence surveys from April 2023, whilst waiting for the results of the eDNA from the laboratory. No GCN were recorded during these surveys.

8.8.78 The safety issues preventing surveys of ditch F018 in 2022 are ongoing in 2023 and are not anticipated to be resolved for eDNA surveys (or any other survey) to proceed prior to construction. An urban settlement to the north and the River Trent to the south are barriers to GCN movement and terrestrial habitat provides poor connectivity between ditch F018 and the Order Limits to the west and east. For this reason, the absence of this data is not considered to change the assessment detailed in this Chapter.

8.8.79 Further details are available in Appendix 8.7 (Great Crested Newt Technical Report) of the ES Appendices **(TR010065/APP/6.3)**.

8.8.80 GCN survey results indicate GCN are absent from the survey area. Desk study records indicate historic presence of a small metapopulation within proximity to the Kelham and Averham FCA.

The River Trent is a permanent barrier to GCN dispersal between the Kelham and Averham FCA and the main alignment. GCN are listed on the LBAP as a species of conservation concern in the county and any GCN population present meets the criteria for LWS selection in Nottinghamshire.[35] Based on desk study records, barriers to movement (for example the River Trent) and absence from field survey data, it is considered that GCN are absent from the study area but are potentially present in the wider landscape (over 900 metres north of Kelham), beyond the ZoI of the Scheme. Therefore, this species is not considered further in this assessment.

Invertebrates - aquatic

8.8.81 The desktop data search returned 13 records of invertebrate invasive and non-native species (INNS) within the River Trent, five of which are high impact species. Field surveys were carried out in both spring and autumn 2022 and spring 2023.

8.8.82 The PSYM surveys undertaken within the survey area of the main alignment in July 2022, identified one INNS, Northern River/Florida crangonyctid *Crangonyx pseudogracilis /floridanus* in pond P2 and one notable species designated as Nationally Scarce, *Noterus crassicornis* in pond P01. A further three ponds were identified for PSYM surveys (P3, P6, P7), but they could not be fully surveyed as water levels were too low to undertake macroinvertebrate sampling. The Trophic ranking score (TRS) scores do not suggest high nutrient levels, however ponds P6 and P7 both had a low number of species observed, suggesting a habitat pressure or pressure from low water levels.

8.8.83 The results of the rapid pond assessments indicate:

- P8 and P11 are likely ephemeral in nature, as despite being dry at the time of survey they were dominated by wetland plants
- In P9 the INNS waterweed *Elodea* sp. and demon shrimp *Dikerogammarus haemobaphes* were recorded
- Pond P10 had the highest scoring macroinvertebrate taxa groups and falls into the ‘Excellent quality’ category
- Ponds P9 and P14 scored highly and fall into the ‘Good quality’ category

8.8.84 Surveys indicate all riverine watercourses as being sedimented to heavily sedimented with a moderate to low conservation value and macroinvertebrate communities within the survey area are associated with moderate flow. Site R3 results indicated that the site showed high species diversity and little influence of pollution. Surveys within the Kelham and Averham FCA indicate an influence of pollution and nutrient enrichment associated with slow-flowing waterbodies, however site D8 had a Fairly High conservation value and D11 had a High conservation value.

8.8.85 One pond (P15 within the Order Limits) in the Kelham and Averham FCA was subject to a PSYM survey. A Rapid pond survey was undertaken on ponds P16 and P17 (pond location within 250m of the Order Limits) in June 2023. At P15 two water beetle and two Odonata families were recorded. No protected or notable species were recorded, however the INNS Northern River/Florida crangonyctid and Jenkin's spire shell *Potamopyrgus antipodarum* were identified.

8.8.86 The results of the rapid pond assessment of the two ponds located within the Kelham and Averham FCA indicate:

- P16 was of 'Moderate quality', with mostly low to medium sensitivity groups present
- P17 was considered 'Excellent quality' with all macroinvertebrate groups were recorded at this site

8.8.87 In the absence of survey data, the outcome for aquatic invertebrates is based on the data collected to date and a reasonable worst-case scenario has been applied using professional judgement (whereby is has been assumed that the aquatic invertebrate assemblage recorded at accessible survey points are also present at those survey points which were inaccessible). With the data collected to date and application of the reasonable worst-case scenario, the missing data will not materially change the outcome of this assessment.

8.8.88 Further details are available in Appendix 8.8 (Invertebrate (Aquatic) Technical Report) of the ES Appendices **(TR010065/APP/6.3)**.

8.8.89 Aquatic invertebrate assemblages present are considered to be of county importance. This is primarily due to the designation of the River Trent – Kelham LWS and Old Trent Dyke LWS for water beetle interest, with the latter site also of interest for aquatic true bugs (Hemiptera). The assignment of county importance is further supported by the identification of the Nationally Scarce water beetle *Noterus crassicornis* in a pond within the Order Limits, a species which appears to have a sparse distribution in the county.

Invertebrates - terrestrial

8.8.90 The Phase 1 Habitat Survey identified wetland habitat mosaic directly north of the A46 (central grid OS national reference SK 80487 56024) which offers optimal habitat for notable invertebrate assemblages. In addition, areas of unimproved and semi-improved neutral grassland may support terrestrial invertebrates which are SPI. Invertebrates exist in all habitats but certain habitat types are potentially of higher value and were therefore considered more closely in the survey. These included semi-natural vegetation, open mosaics and previously developed brownfield land focusing on LWS.

8.8.91 Nine LWSs were identified, through a desk study undertaken in 2022, as having potential suitability to support notable invertebrate assemblages. Terrestrial invertebrate surveys were undertaken at five

of the accessible LWS. Each site was surveyed on four occasions between June and August 2022. Two protected and/or notable terrestrial invertebrates (excluding SPI listed for research only) were recorded at three LWS (Kelham Road Redoubt Grassland LWS, Newark Grassland LWS and Great North Road Grasslands LWS). The latter is the only one of these three LWS within the Order Limits. These were the large garden bumblebee *Bombus ruderatus* and a solitary wasp *Lestiphorus bicinctus*. Whilst the large garden bumblebee is likely to be found in flower rich grasslands along waterways and legume-dominated 'Pollen and Nectar Margins' along agricultural fields, the solitary wasp is associated with scrub or bramble in sunny locations on light soils.

8.8.92 Of the four LWSs that did not have access to undertake surveys, two grasslands are located outside of the Order Limits. In the absence of data for the grassland LWS, a reasonable worst-case scenario has been applied whereby the terrestrial invertebrate assemblage recorded at LWSs comprising grassland, are also present at grassland LWSs that have not been surveyed. A further two LWS are partially within the Order Limits (Newark Dismantled Railway LWS and Newark (Beet Factory) Dismantled Railway LWS) and comprise of woodland and scrub. In the absence of data, a reasonable worst-case scenario has been applied whereby the solitary wasp (associated with habitat on these two LWS) and common terrestrial invertebrate assemblages recorded across the survey area, are assumed present.

8.8.93 Further details are available in Appendix 8.9 (Invertebrate (Terrestrial) Technical Report) of the ES Appendices **(TR010065/APP/6.3)**.

8.8.94 Due to the presence of two notable species that are scarce in Nottinghamshire and are at the northern extent of their current ranges[44] (beyond the range recorded for the solitary wasp[45]), the invertebrate assemblage present within each LWS is of county level of importance.

Otter

8.8.95 The presence of otter in the River Trent catchment is well-documented and a total of seven records were returned from a biological records search within 2 kilometres of the Scheme in 2022. An initial habitat assessment of watercourses within 2 kilometres of the Scheme was undertaken in 2022, scoping in one watercourse, the River Trent from which were deemed suitable for otter and, therefore, recommended for field sign surveys. Owing to the length of the River Trent and multiple crossings by the Scheme, this watercourse was

[44] M. Edwards (2012). Bees, Wasps & Ants Rcording Society (BWARS) website [online]. Available at: [redacted] (Last accessed December 2023).

[45] S. J. Falk (2001). Bees, Wasps & Ants Rcording Society (BWARS) website [online]. Available at: [redacted] (Last accessed December 2023).

split into eight transects (OT01 – OT08). One additional transect (OT09) was surveyed on the northern section of the Old Trent Dyke. This watercourse was initially scoped out the assessment owing to limited suitability for otter. However, the identification of a spraint on a separate survey on this watercourse in May 2022 initiated a review of the watercourses being surveyed for their presence/likely absence of otter which resulted in this watercourse being scoped back in to the assessment.

8.8.96 Eight of the nine otter transects (OT01 – OT08) were subject to four separate surveys in October/November 2022, January 2023, April 2023 and July 2023 respectively. The final transect (OT09) was only subject to two visits, the first in May 2022 where a single spraint was identified, and the second in August 2023, in which no field signs were recorded. The presence of otter use was confirmed on six of the transects (OT03, OT04, OT06, OT07, OT08, OT09). Otter resting sites with field signs indicating use by otter was identified along transects OT02 OT06, OT07 and OT08; with resting sites being identified with records of spraints and footprints. Potential resting sites were identified on all transects except for transect OT09. However, the majority of these resting sites did not have any field signs indicating the sites were being used by otter. Suitable habitats for otter resting sites were identified across the Scheme, although none have been confirmed as supporting active resting sites as of August 2023 when surveys were completed. There is evidence of slides and potential resting sites recorded along the transects.

8.8.97 The greatest activity was recorded within transects OT07 and OT08, north-west of the A46 and the town of Newark. These areas are subject to less disturbance from humans and boat traffic, and suitable terrestrial habitat and cover is more abundant.

8.8.98 In addition to the survey results, there was anecdotal evidence, from the Nottingham Piscatorial Society (NPS) fisheries manager, of a natal/rearing holt on an island where two branches of the River Trent converge (OT06), 600 metres from the Order Limits (west of the Farndon West borrow pit) and 1.2 kilometres from the Order Limits (south of Kelham and Averham FCA). However, the overall general location of this island would not be considered suitable to support a natal holt due to its location at the confluence of two watercourses which would otherwise form main highways for otter dispersal. A search of the accessible areas of this island recorded otter footprints only. Small areas of the island were inaccessible due to dense willow carr and high-water levels, so the presence/likely absence of a natal/rearing holt could not be confirmed. This island was only safely accessible by boat and due to restrictions to access the waterway at certain times of the year (outside the fishing period), it was not feasible to set a trail camera on the island as it could not be collected once deployed. Furthermore, the riverbanks were too far away from the islands to trigger a trail camera. A precautionary approach of

presence is considered within this Chapter at all inaccessible locations.

8.8.99 Anecdotal otter sightings were reported by fisheries staff, anglers and marina users along the northern branch of the River Trent (OT06, OT07 and OT08), on the southern branch of the River Trent around Newark Marina Limited and on a residential pontoon in Farndon on the southern bank (OT03). Surveys recorded spraints ~630 metres upstream of Windmill Viaduct and ~130 metres downstream of Staythorpe Weir (OT04), ~340 metres downstream of Kelham Trent and Island LWS (OT07), on opposite banks under the Nottingham Lincoln railway bridge and ~260 metres upstream of Great North Road bridge (OT08), along Old Trent Dyke during a water vole survey (OT09 undertaken in May 2023) and at Nether Lock Viaduct (OT01 and OT02),adjacent and within the Order Limitsby fisheries staff and anglers.

8.8.100 Further details are available in Appendix 8.10 (Confidential Otter Technical Report) of the ES Appendices **(TR010065/APP/6.3)**.

8.8.101 Biological records from desk study and survey data indicate otters are present along the River Trent, and the wider landscape of Nottinghamshire, although the population has declined over the decades. Otter is a SPI and there is an otter SAP within the Nottinghamshire LBAP. Therefore, the otter population present is considered to be of county importance.

Reptiles

8.8.102 Following the identification of habitats suitable for common reptiles during the extended Phase 1 Habitat Surveys, reptile habitat suitability assessments and reptile presence/likely absence surveys were undertaken over the course of seven visits between August to September 2022 along the main alignment of the Scheme.

8.8.103 There were three individual records of grass snake *Natrix helvetica* located at reptile assessment sites RS03 and RS06, with a maximum peak count of one grass snake being recorded on three occasions. One additional record of reptiles (a juvenile grass snake) was recorded as an incidental sighting during other ecological surveys being conducted for the Scheme.

8.8.104 Surveys of suitable reptile habitat within the Kelham and Averham FCA (RS08_F001 and RS08_F002) and further surveys within RS01_F001 were completed between March to May 2023. Reptiles are considered absent from location RS01_F001 and RS08, and therefore no further surveys are required.

8.8.105 Due to the presence of reptiles at RS03 and RS06, further surveys are required, under commitment B14 of Table 3-2 REAC within the First Iteration EMP (**TR010065/APP/6.5**), to establish the population size. At least 20 visits in suitable weather per season are required to

gain an idea of relative population (Froglife, 1999). The remaining 13 of these 20 visits in these areas will be conducted pre-construction.

8.8.106 Further details are available in Appendix 8.11 (Reptile Technical Report) of the ES Appendices **(TR010065/APP/6.3)**.

8.8.107 Population size class surveys will be undertaken prior to construction, to confirm the proposed mitigation is appropriate and inform the location of habitat enhancements at detailed design. Due to the low numbers of reptiles that were recorded during the presence/absence surveys, it is unlikely that the biodiversity resource importance will change. In the absence of survey data, the outcome for reptiles is based on the data collected to date and a worst-case scenario, assuming reptile presence, using professional judgement. As such, the absent data is not considered to alter the assessment.

8.8.108 A maximum of one grass snake has been recorded per survey in long swards of grassland strips adjacent to a ditch or pond, between existing carriageways and adjacent fields to date. These reptile suitable habitats are located within relatively isolated areas. The number of grass snake found does not meet the Nottinghamshire criterion for LWS designation (three grass snake adults noted on a single visit indicates a significant population size for Nottinghamshire).[35] However, in the absence of population size class survey data, a precautionary approach has been taken and the reptile population present is considered to be of up to county importance. The level of impact to reptiles is not considered likely to change.

Water voles

8.8.109 A total of 43 linear features were identified during the desk study with the potential to support water voles. The extended Phase 1 Habitat Survey scoped out numerous dry ditches. Transects were assigned to suitable watercourses and split into lengths of approximately 100 metres. Water vole habitat suitability assessment surveys scoped out further unsuitable habitat. For instance, culverted, isolated short sections of drainage ditches or shallow eutrophic ditches in wooded areas with ivy dominated banks. A total of 58 subsections were identified as being suitable to support water vole, predominantly at the mid to southern end of the Scheme towards Farndon and the mid to upper extent of Old Trent Dyke. Initially, eight watercourses were identified as comprising habitat suitable for water voles. Following the removal of dense scrub from the top of water vole transect WV09 embankments by a third party, a review of habitat suitability for water voles was undertaken in April 2023. The review resulted in this watercourse being scoped out of further surveys as it was considered to comprise unsuitable habitat for water voles.

8.8.110 The presence of water vole was confirmed on one waterbody within the survey area, known as Old Trent Dyke (WV14). On this waterbody three droppings were recorded in a single location in September 2022 along subsection WV14_S14. This survey subsection is outside of the

Order Limits, however Old Trent Dyke flows through the Order Limits, under the existing A46 carriageway. To date this has been the only record of definitive evidence of water vole recorded from the surveys. However, it should be noted that 19 records of feeding stations were also recorded on the Old Trent Dyke, one of which was recorded during the same survey visit in September 2022.

8.8.111 Evidence of small mammal presence was identified on nine waterbodies (WV02, WV05, WV06, WV09, WV14, WV32, WV33, WV34 and WV36). A total of 348 records of small mammal field signs were identified during the presence/likely absence surveys undertaken between May to November 2022 and April to August 2023. Evidence of feeding remains and footprints identified during the surveys resembled those of water voles. However, in the absence of latrines and droppings indicative of water voles, field signs of small mammals recorded in isolation cannot be definitive identification of water vole presence, as per best practice guidance.[46]

8.8.112 Ditches around Kelham and Averham FCA were surveyed for water vole field signs in May and August 2023, except for one waterbody (WV35_S01 – WV35_S09) where access has been refused since 2022. In the absence of survey data for this waterbody, the outcome for water vole is based on the data collected to date and a reasonable worst-case scenario, using professional judgement, has been applied. Based upon only one definitive record of water vole (droppings) recorded across the entire study area, the reasonable worst-case for WV35_S01 – WV35_S09 assumes water vole are present in this location in a low population. The absent data from WV35_S01 – WV35_S09 is not considered likely to materially alter the assessment reported in this ES Chapter. If access is granted post DCO submission, surveys will be undertaken as part of pre-construction checks (as required under commitment B5 of Table 3-2 REAC within the First Iteration EMP (**TR010065/APP/6.5**)).

8.8.113 Further details are available in Appendix 8.12 (Water Vole Technical Report) of the ES Appendices **(TR010065/APP/6.3)**.

8.8.114 Suitable habitat for water vole are connected with lengths of sub-optimal or unsuitable habitat and definitive signs of water vole presence have only been recorded on one waterbody in a single location (WV14_S14) during the surveys in September 2022. As water vole have been identified as being present on one waterbody which flows through the Order Limits (Old Trent Dyke), it is likely that there is a small population that is breeding within the survey area. Water vole has declined across the UK and scarce records (potentially reflects under representation) across Nottinghamshire show pockets of healthy local populations. Although in recent decades water vole have also declined in Nottinghamshire in both

[46] Dean, M (2021). Water Vole Field Signs and Habitat Assessment: A Practical Guide to Water Vole Surveys. Pelagic Publishing.

range and numbers, the county's population is thought to be important in the East Midlands.[35] The species is a SPI and there is a water vole SAP within the Nottinghamshire LBAP. Therefore, water vole are considered to be of county level importance. The biodiversity resource importance will not change following completion of pre-construction surveys in Kelham and Averham FCA along water vole transect WV35 (no access granted at the time this Chapter was produced). The level of impact to water voles, and therefore the mitigation, is not likely to change and therefore, the significance of effect assessed in this report will not change, in accordance with DMRB significance matrix (see Table 8-3).

Receptors scoped out of baseline surveys

White-clawed crayfish

8.8.115 Thirteen records of the invasive non-native signal crayfish, *Pacifastacus leniusculus,* were returned by the desk study. As the signal crayfish is known to outcompete and spread disease to the native white-clawed crayfish *Austropotamobius pallipes*, it is unlikely that white-clawed crayfish are present within the rivers in the survey area. In addition, Nottinghamshire County Council have identified that signal crayfish are present within the River Trent close to the survey area, while native white-clawed crayfish are absent from within the catchment.[47]

8.8.116 White-clawed crayfish are absent from biological data search records and no suitable habitat was identified within the extent of the extended Phase 1 Habitat Survey. It is therefore unlikely that white-clawed crayfish are present and this species is not considered further in this assessment.

European hedgehog

8.8.117 Although the European hedgehog *Erinaceus europaeus* is listed as species of principal importance (SPI), the species is not considered during the selection of Nottinghamshire LWS.[35] This is because although hedgehogs have experienced significant declines, they are widespread in the county and protection of sites is not considered to have any meaningful impacts on their conservation status. The lack of data for hedgehogs outside urban areas make LWS designation difficult and is being kept under review. This species is 'Vulnerable' on Red List and a hedgehog Species Action Plan is in production by Nottinghamshire BAP.

8.8.118 The desktop data study returned 157 records of hedgehog within 2 kilometres of the Order Limits, 22 of which were found dead. A total

[47] Nottinghamshire County Council (2011). Crayfish in Nottinghamshire: Help us to protect our native white-clawed crayfish [online]. Available at: http://nottsbag.org.uk/wp-content/uploads/2020/05/NottsCrayfishLeafletFINAL_10.03.11.pdf. (Last accessed December 2023).

of six were found to be within the boundary of the Order Limits. There have been no records of hedgehogs (sightings or field signs) during surveys to date. Although the species is common and widespread, but in serious decline nationally, a precautionary approach has been taken whereby the hedgehog population is considered to be of local importance only.

Brown hare

8.8.119 Although the brown hare *Lepus europaeus* is listed as a SPI, the species is not considered within the selection of Nottinghamshire LWS. This is because although brown hare have experienced significant declines, they are common and widespread in the county and protection of sites is not considered to have any meaningful impacts on their conservation status. LWS designation would be difficult due to the mobility of brown hare and is being kept under review.

8.8.120 The desktop data study returned 34 records of brown hare within 2 kilometres of the Order Limits, two of which were found dead. None of these records are found to be within the Order Limits. A total of 11 incidental sightings of live brown hare were recorded during protected species surveys, two of which were within the Order Limits. A precautionary approach has been taken whereby the brown hare population is considered to be of local importance only.

Invasive non-native species

American mink

8.8.121 Field signs of American mink *Neovison vison* were recorded within the Order Limits adjacent to Kelham Road Bridge over the northern branch of the River Trent. Mink scat was recorded in multiple areas, including immediately adjacent to the Order Limits, along the River Trent and within the Order Limits at Nether Lock Viaduct and opposite the proposed borrow pits north-east of Windmill Viaduct. This species has no biodiversity resource importance and will only be discussed in this Chapter with regards to indirect impacts to local water vole populations, on which they predate.

Indian balsam

8.8.122 A total of 14 distinct locations of Indian balsam *Impatiens glandulifera* have been recorded within the Scheme footprint. It was particularly abundant along the bank of the northern branch of the River Trent close to where it is crossed by the railway line (central OS national grid reference SK 79755 56314) and to the south around Windmill Viaduct and the lower reaches of Old Trent Dyke. This species has no biodiversity resource importance.

Other botanical species

8.8.123 Orange balsam *Impatiens capensis* and least duckweed *Lemna minuta* were recorded within Old Trent Dyke and whilst not listed under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended), these species can be invasive / dominant within the habitats they occupy.

Invertebrate species

8.8.124 Aquatic surveys identified a number of INNS in the main channel of the River Trent. High impact species included Asian clam *Corbicula fluminea*, bloody red mysid *Hemimysis anomala*, demon shrimp *Dikerogammarus haemobaphes*, zebra mussel *Dreissena polymorpha,* signal crayfish and Chinese mitten crab *Eriocheir sinensis*. In addition, seven other invasive and non-native invertebrates were recorded.

8.8.125 Northern River/Florida crangonyctid *Crangonyx pseudogracilis /floridanus* was recorded in two ponds.[48]

8.8.126 Invertebrates INNS have no biodiversity resource importance.

8.9 Potential impacts

8.9.1 The following potential impacts from the Scheme have been identified for both the construction and operational stages. For the purpose of this impact assessment, ecological features of Local importance or higher are carried forward into the assessment.

Construction

Designated sites

8.9.2 There is potential for impacts to river and sea lamprey, fish species which are a qualifying feature of the Humber Estuary Ramsar and SAC. The Scheme is located approximately 53 kilometres from the Humber Estuary SAC which is designated for Annex I habitats. Due to the substantial distance between the SAC and the Scheme, it will have no direct or indirect adverse impacts (habitat loss, water and air pollution) on the primary reasons for selection of the SAC. However, river lamprey and sea lamprey may migrate up the River Trent to spawn, which is hydrologically connected to the SAC downstream. Construction of a new outfall on the west bank of the River Trent upstream of Nether Lock Viaduct has potential to temporarily adversely impact the localised water quality by increasing silt

[48] WFD-UKTAG listed INNS, categorised as High/Medium/Low/Unknown Impact (WFD-UKTAG, 2021).

suspension in the water column. Embedded mitigation (including the use of silt curtains) will reduce this impact, although it cannot eradicate the risk completely (embedded mitigation measures are detailed in Chapter 2 The Scheme of this ES). As long as silt curtains are maintained, residual sediment deposition is unlikely to smother habitats that support spawning river or sea lamprey population associated with the SAC, due to high dilution of low quantities of residual particles entering the River Trent and the distance from suitable spawning substrate. Light spill resulting from unavoidable night works (bridge beam installation) and noise and vibration from sheet piling works, have potential to create a barrier to lamprey migration at both Nether Lock Viaduct and Windmill Viaduct during the works (approximately two weeks at each location, excluding weekends, to undertake bridge beam installation).

8.9.3 The Scheme has the potential to cause damage and the direct loss of habitats within four LWSs. Seven designated sites are located within the Order Limits. However, the effects of plant emissions on local air quality are considered of negligible significance relative to the surrounding road traffic contributions on the local road network, given the nature of the site plant. Further to this, guidance from the Institute of Air Quality Management (IAQM) notes that effects from on-site plant exhausts would likely not be significant. Construction plant emissions have therefore been scoped out as the impacts would be minimal and not significant. For further details please refer to Chapter 5 (Air Quality) of this ES.

8.9.4 A total of approximately 840 square metres of habitats within Dairy Farm Railway Strip, Newark LWS is anticipated to be permanently lost, which accounts for 4.9% of the LWS's total area. Total loss includes habitats of low ecological value, such as arable. Of the approximately 840 square metres of habitats within Dairy Farm Railway Strip, Newark LWS which is anticipated to be permanently lost, a total of approximately 680 square metres of broadleaved plantation woodland (the habitat which the LWS has been designated) will be permanently lost to facilitate the temporary satellite compound and bridge clearance for construction of the Nottingham Lincoln Railway Line (NLRL) west crossing (north), which would account for 4% of the LWS's total area.

8.9.5 A total of approximately 22,260 square metres of Great North Road Grasslands LWS would be lost to carriageway widening and the construction of attenuation basins, which would account for 74% of the LWSs total area. This includes the permanent loss of habitats which are not the reason for the LWSs designation, such as amenity grassland, standing water, hardstanding. Permanent loss includes approximately 60 square metres of one pond, approximately 110 square metres of marginal and inundation vegetation, approximately 670 square metres of broadleaved plantation woodland and approximately 16,800 square metres of unimproved and semi-

improved neutral grassland and modified improved grassland (of which approximately 110 square metres is lowland meadow). Approximately 56% of the LWS will be permanently lost (approximately 17,050 square metres) and 17% (approximately 5,220 square metres) will be temporarily lost long-term (during construction). This includes habitats which are not the reason for the LWSs designation (such as grassland and standing water).

8.9.6 A total of approximately 300 square metres of Newark (Beet Factory) Dismantled Railway LWS would be lost, which would account for 2.5% of the LWS's total area. Taking a reasonable worse-case scenario (in the absence of survey data), this habitat comprises of lowland mixed deciduous woodland HPI. Only 7 square metres is anticipated to be permanently lost to structures associated with the NLRL east crossing (south). The remaining 290 square metres of woodland would be permanently lost to provide clearance of these structures and replanted with low-layer habitat of species-rich grassland to maintain clearance during operation. Further details are provided in Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)**.

8.9.7 A total of approximately 40 metres of Old Trent Dyke LWS will be culverted where the western carriageway embankment widens (including to facilitate maintenance track and drainage design) and would account for a permanent loss of 1% of the LWS's total length.

8.9.8 Embedded mitigation will reduce the risk of pollution incidents, such as contaminated land runoff or spills/leaks of oils and fuels and increased airborne pollutants (embedded mitigation measures are detailed in Chapter 2 (The Scheme) of this ES. The residual effect resulting from a pollution event will not adversely affect any designated site's integrity through degradation of habitats, and subsequently will not impact protected species which they may support.

Habitats

8.9.9 There is the potential for habitat, including HPI, to be permanently and temporarily lost and damaged as a result of the Scheme.

8.9.10 The Scheme will result in a total loss of approximately 11,290 square metres of lowland mixed deciduous woodland HPI between three distinct woodlands, including those within designated sites. This total loss will account for approximately 63% of this HPI. Permanent loss within the three woodlands comprise of approximately 5,740 square metres under the footprint of the A1 flyover (approximately 94% of the contiguous area), approximately 4,930 square metres south of the lake on British Sugar land (approximately 59% of the contiguous area) and approximately 370 square metres of the woodland on the south-west corner of the British Sugar land (approximately 11% of the contiguous area). Approximately 240 square metres of lowland mixed deciduous woodland HPI will be subject to temporary long-term loss

(during the construction period), which accounts for 4% of the contiguous area.

8.9.11 A total of approximately 1030 square metres of lowland meadow HPI will be lost, equating to 3.3% of the total contiguous area of the HPI. Only 110 square metres will be permanently lost, which accounts for approximately 0.4% of the total contiguous area of the HPI. After following the mitigation hierarchy, approximately 920 square metres of lowland meadow HPI will be temporarily lost (during construction) in order to facilitate proposed strengthening works at Smeaton Arches north of Cattle Market roundabout. This accounts for 3% of the total contiguous area of lowland meadow HPI.

8.9.12 A total of approximately 9,690 square metres of coastal and floodplain grazing marsh HPI will be lost, equating to 8.5% of the total contiguous area of the HPI. Only approximately 4,430 square metres will be permanently lost, which accounts for approximately 4% of the total contiguous area of this HPI. Approximately 5,260 square metres will be temporarily lost, which accounts for approximately 5% of the total contiguous area of this HPI. The reason for this unavoidable loss is due to the location of a compound required where the existing A46 carriageway passes over the railway line, south of Dairy Farm Railway Strip, Newark LWS.

8.9.13 The permanent loss of habitats of ecological value Scheme-wide (including those within LWSs and non-HPI habitats) will comprise of approximately 20% of broadleaved semi-natural woodland (approximately 25,000 square metres), 47% of broadleaved plantation woodland (128,230 square metres), 50% of semi-improved, unimproved, improved, neutral, marshy and poor grassland (265,920 square metres) and 35% of scattered and dense/continuous scrub (18,920 square metres) within the Order Limits. Of the total loss of all woodland types within the Order Limits (approximately 238,960 square metres), a total of approximately 226,340 square metres of non-HPI woodland (broadleaved semi-natural and plantation woodland) not located within a designated site will be lost. Approximately 12,610 square metres of HPI woodland and woodland within a designated site will be lost, which accounts for 5% of the woodland within the Order Limits. The values for loss of woodland in designated sites and loss of HPI woodland provided above cannot be summed, as there is an overlap between woodland in LWS and HPI designated woodland and this would be double counting loss of woodland.

8.9.14 Embedded mitigation will eliminate the impacts of pollution event(s) caused by accidents and hazards associated with the Scheme to terrestrial and aquatic habitat located within the Order Limits, and immediately adjacent (embedded mitigation measures are detailed in Chapter 2 (The Scheme) of this ES.

8.9.15 The gradient of the widened carriageway embankment has been designed to be as steep as is feasible to avoid impact to tree root

protection areas (RPA). Following numerous design iterations to avoid RPA, the Scheme will result in the unavoidable direct partial impact on the RPA of three veteran trees (T038, T136, T139), caused by construction of a maintenance track and earthworks, including drainage pipe installation. This has the potential to cause considerable damage, affecting the integrity of these three veteran trees. One veteran tree (T139) will also require a minor crown lift (<0.5 metres) to provide clearance for the construction plant.

Protected and notable species

Bats

8.9.16 Demolition of building F004 would result in the loss of a confirmed soprano pipistrelle roost. There would also be demolition of further buildings (summarised in Chapter 2 (The Scheme) of this ES) with 'low' potential for roosting bats (no roosts confirmed to date in these structures). No evidence of bats was found during the suite of surveys on building F009, though a hibernation survey was not undertaken (see Section 8.6 (Assessment assumptions and limitations) within this ES Chapter. Therefore, a reasonable worst-case scenario has been applied, presuming a hibernation roost could be present. The proposed works are considered to cause disturbance to a hibernation roost in F009, if present. There is potential for disturbance of confirmed bat roosts in buildings F002, F010, F013, F054 and F057 and trees F123, F210, F213 and F225. A full suite of bat surveys has been completed on trees to be felled for construction of the Scheme, none of which have recorded the presence of a bat roost.

Birds

8.9.17 The Scheme would result in the unavoidable loss of the rookery located north-west of Friendly Farmer roundabout, whilst the rookery at the Winthorpe through-about will be retained.

8.9.18 The Scheme would also result in the unavoidable loss of a kestrel nest due to the felling of a tree located under the new carriageway alignment.

Fish

8.9.19 Temporarily culverting Slough Dyke to facilitate its permanent realignment would potentially result in death or injury of fish. Sheet piling at Windmill Viaduct would potentially result in death or injury of protected fish such as European eel taking refuge in the gaps of the submerged gabion baskets.

8.9.20 Works to integrate the new drainage design into existing headwalls has potential to create siltation at spawning pools at the base of Nether Lock Weir, located adjacent (downstream) to the works. Subsequently, adverse impacts to spawning and survival success of

coarse fish species could reduce the local fish population reliant on this spawning habitat.

8.9.21 The loss of one non-priority pond in Kelham and Averham FCA would potentially result in death or injury of non-protected species of fish. This would result in the loss of habitat that supports common species of aquatic invertebrate (PSYM survey pond P15).

8.9.22 Noise and vibration associated with the installation of sheet piling and artificial light disturbance during night work (bridge beam installation) have potential to disturb fish species temporarily (during installation only) within proximity to Nether Lock Viaduct and Windmill Viaduct, affecting spawning individuals taking refuge in aquatic vegetation and gabion baskets. and changing risk-taking behaviour/reduced avoidance of predators, effecting survival and reproductive success. This impact is of greater consequence to the European eel, a species of principal importance, which is negatively phototactic[49]. Floodplain compensation areas and wetland creation (mitigation) have potential to result in entrapment of fish following receding flood waters after a flooding event.

Multiple species

8.9.23 Vegetation clearance to facilitate construction (including construction of new outfalls, sheet piling at Windmill Viaduct and tying in the new drainage system to existing outfalls) could result in the permanent and temporary loss of aquatic or terrestrial habitats for protected and notable species. This could include habitat that provides shelter, an area for breeding or rearing young, a food resource or commuting corridors for badger, bats, barn owl, reptiles, birds, fish, reptiles, water vole and aquatic and terrestrial invertebrates.

8.9.24 Embedded mitigation would eliminate the impacts of pollution event(s) caused by accidents and hazards associated with the Scheme and construction related runoff, avoiding impacts to water quality and therefore would not adversely affect aquatic invertebrates, water vole, otter, and fish species by decreasing food sources within local water courses, or direct mortality.

8.9.25 Embedded mitigation would reduce general construction disturbance, however there would be some residual impacts which are likely to result in sensitive species avoiding the works at the time of construction activities being undertaken. Species likely to be affected by general temporary construction disturbance are highly mobile (for example birds) and habitat connectivity provides opportunities for movement from the source, which could also impact breeding or rearing young, for example, nests are abandoned. Visual, audible and vibrational disturbance would have the greatest impact at the start of

[49] Vowles, A.S., Kemp, P.S. (2021). Kemp Artificial light at night (ALAN) affects the downstream movement behaviour of the critically endangered European eel, *Anguilla Anguilla*. Environmental Pollution, Volume 274 [online]. Available at: [redacted] (Last accessed December 2023).

works due to the magnitude of change, but due to the duration of the construction period (~ three years), wildlife could move closer to the works as species habituate to disturbance. Any intermittent noise would be temporary, localised and limited to daytime hours whenever possible due to the urban setting (noise impacts to residents).

8.9.26 Night works could directly disturb nocturnal species (such as bats, badger, barn owl, fish and terrestrial invertebrates) and otter foraging and commuting as a result of increased artificial lighting, noise and vibration. This could potentially contribute to the displacement of a number of species from the area, including the abandonment of badger setts, bat and bird roosts and reduce bird breeding opportunities.

Invasive non-native species

Indian balsam

8.9.27 With the implementation of embedded mitigation measures summarised in Chapter 2 (The Scheme) of this ES, it is not anticipated that the Scheme would result in the direct or indirect spread of Indian balsam. It has no biodiversity resource importance and therefore is not considered further in this assessment.

Invertebrate species

8.9.28 With the implementation of embedded mitigation measures summarised in Chapter 2 (The Scheme) of this ES, it is not anticipated that the Scheme would result in further spread of identified INNS, directly or indirectly.

Operation

Designated sites

8.9.29 During operation potential impacts from traffic emissions could lead to increased levels of nitrogen deposition at 12 LWSs, adversely impacting nitrogen sensitive habitats. Increased nitrogen deposition can lead to lower growing plants and bryophytes being outcompeted by faster growing plant species, resulting in a decrease in plant diversity and changes to the overall habitat composition. This in turn can impact animal species which these habitats support.

8.9.30 The air quality assessment models data for a do minimum (DM) and a do something (DS) scenario. DS refers to the Scheme in operation in 2028 (opening year) and DM refers to predicted modelled data in 2028 without the construction of the Scheme. In the DS scenario, 12 LWSs comprise habitats that have a predicted change in ammonia deposition of more than 0.4kg N/ha/yr and a predicted total deposition rate above the lower critical load. Total deposition rates also exceed the upper critical load for nine of these 12 LWSs, in the same

scenario. However, the baseline total deposition rate (in 2022) currently exceeds these upper thresholds for all nine LWSs as well. The predicted total deposition rate in the DS scenario is assessed to be lower than baseline total deposition rate for habitats at six of the 12 LWSs, though still greater than the DM scenario. These are Dairy Farm Railway Strip, Newark LWS, Great North Road Grassland LWS, Kelham Road Grassland LWS, Kelham Road Grassland II LWS, Spring Wood, Kelham LWS and Valley Farm Grassland LWS.

8.9.31 These exceedances affect over ~31% of the total area of both Newark Dismantled Railway LWS and Dairy Farm Railway Strip Newark LWS independently, severing each LWS. However, the existing A46 carriageway already intersects Dairy Farm Railway Strip Newark LWS, Dairy Farm Railway Strip, Newark LWS and the total deposition rate at baseline and DM are over six to three times above the lower and upper critical loads respectively. The total deposition rate for Newark Dismantled Railway LWS at baseline, DM and DS are over four times to double the lower and upper critical loads respectively. A 40m wide deciduous woodland is located between the existing A46 carriageway and this wildlife site, with the potential to buffer the adverse effects of emissions.

8.9.32 Great North Road Grasslands LWS comprises three distinct areas: the northern area is east of A616 Great North Road and north of Kelham Road, the middle area is south of Kelham Road and north of A46 and the southern area is south of the A46 and east of B6326. The total deposition rate at baseline, DM and DS are above the lower and upper critical loads for the whole of the northern and middle areas of this LWS, with no exceedances for the southern area. This accounts for ~71% of Great North Road Grasslands LWS.

8.9.33 The total deposition rate for Coneygre Wood LWS, South Scaffold Lane, Collingham LWS and Spring Wood, Kelham LWS at baseline, DM and DS are over four times to double the lower and upper critical loads respectively, with Flintham Park LWS exceeding the lower threshold by six and the upper threshold by three times. The exceedance for all four of these LWSs are along the edge of each site nearest the A46 carriageway.

8.9.34 The total deposition rate for Kelham Road Grassland LWS and Newark Grassland LWS at baseline and DS are only just over the upper critical load, with DM just under the upper critical load for Kelham Road Grassland LWS. The exceedances in the critical load range for Newark Grassland LWS accounts for 46% of the site.

8.9.35 The total deposition rate at baseline, DM and DS are between the lower and upper critical loads for three LWSs, impacting the edge of the site nearest the A46 carriageway (Kelham Road Grassland II LWS, Newark (Beet Factory) Dismantled Railway LWS and Valley Farm Grassland LWS).

8.9.36 These impacts are summarised in Table 8-8.

Table 8-8: Summary of air quality impacts, with ammonia emissions from traffic considered, on nitrogen sensitive habitats within designated sites within 200m of the ARN

LWS	APIS Habitat	Critical Load Range Minimum (kgN/ha/yr)	Critical Load Range Maximum (kgN/ha/yr)	Baseline Max. Total Dep. Rate	DM Max. Total Dep. Rate	DS Max. Total Dep. Rate	Area in Exceedance of Thresholds (m^2)	Percentage Impacted	Edge / intersect
Coneygre Wood	Broadleaved, mixed and yew woodland	10	20	45.18	43.11	44.15	8106	6.97%	Edge
Dairy Farm Railway Strip, Newark	Broadleaved deciduous woodland	10	20	67.79	59.24	74.35	5247	31.03%	Intersect
Flintham Park	Broadleaved, mixed and yew woodland	10	20	60.05	55.30	56.98	118098	11.72%	Edge
Great North Road Grasslands	Low and medium altitude hay meadows	20	30	37.79	35.05	35.25	21534	71.53%	Edge
Kelham Road Grassland	Low and medium altitude hay meadows	20	30	30.81	28.25	28.70	171	0.84%	Edge
Kelham Road Grassland II	Low and medium altitude hay meadows	20	30	28.63	27.15	27.76	4661.26	15.24%	Edge

LWS	APIS Habitat	Critical Load Range Minimum (kgN/ha/yr)	Critical Load Range Maximum (kgN/ha/yr)	Baseline Max. Total Dep. Rate	DM Max. Total Dep. Rate	DS Max. Total Dep. Rate	Area in Exceedance of Thresholds (m^2)	Percentage Impacted	Edge / intersect
Newark (Beet Factory) Dismantled Railway	Low and medium altitude hay meadows	20	30	24.47	26.45	26.86	2648.78	22.44%	Edge
Newark Dismantled Railway	Broadleaved Deciduous Woodland	10	20	42.34	43.49	44.18	2249.80	31.63%	Intersect
Newark Grassland	Low and medium altitude hay meadows	20	30	32.45	30.13	31.43	10802.54	46.49%	Edge
South Scaffold Lane, Collingham	Hedgerow (APIS: Broadleaved deciduous woodland)	10	20	45.52	45.51	46.34	62.94	0.44%	Edge
Spring Wood, Kelham	Broadleaved, mixed and yew woodland	10	20	47.02	48.61	50.16	1669.15	2.67%	Edge
Valley Farm Grassland	Low and medium altitude hay meadows	20	30	29.52	27.78	28.25	2232.59	5.94%	Edge

Habitats

8.9.37 One veteran tree currently 4.5 metres in height pre-construction, will undergo a crown lift during construction. Following this initial crown lift, it is anticipated that crown clearance management will be minimal during operation, as a low frequency of vehicles will use the maintenance track annually.

Protected and notable species

8.9.38 Any increase in permanent artificial lighting could adversely affect protected species including bats, badger, barn owl, fish and terrestrial invertebrates.

8.9.39 The creation of a new flyover (over the existing A1 carriageway) at height across a potential bat and barn owl commuting route could result in bat and barn owl mortality from collisions with traffic.

8.10 Design, mitigation, compensation and enhancement measures

Design measures

8.10.1 The development of the Scheme design has been an iterative process undertaken by an integrated design team to adhere to the principles of the design and mitigation hierarchy outlined in DMRB LA 104; the first principle being to avoid potential adverse effects if at all possible before seeking to minimise or mitigate any unavoidable impacts through a well-developed mitigation strategy. Embedded mitigation incorporated into the Scheme design development is set out in Chapter 2 (The Scheme) of this ES. Embedded mitigation measures incorporated in the Scheme design include both habitat-focused and species-focused measures. These include minimising habitat loss with a focus on avoiding high value and/or irreplaceable habitat where possible, retention of trees where possible, maintaining and enhancing habitat connectivity, incorporating nature-based attenuation and filtration, utilising existing infrastructure where possible, converting temporary haul roads into permanent access tracks where needed for maintenance, incorporation of directional planting and screening vegetation and sensitive lighting. These features are described below and shown on Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)**.

Mitigation measures - construction

8.10.2 Mitigation measures of relevance during construction are included within the First Iteration EMP **(TR010065/APP/6.5)**. The First Iteration EMP will be developed into a Second Iteration EMP for

implementation during construction of the Scheme. A Landscape and Ecology Management Plan (LEMP), Invasive Non-Native Species Management Plan and Biodiversity Net Gain Management Plan will also be prepared in full as part of the Second Iteration EMP prior to construction commencing. Details on the First and Second Iteration EMPs, including how mitigation is secured within the draft DCO **(TR010065/APP/3.1)**, is provided within Section 4.4 of Chapter 4 (Environmental Assessment Methodology) of this ES. The following measures or principles based on good practice guidance are relevant to ecology:

- ECoW to be employed to provide advice and monitor the works adherence to the EMP and construction mitigation measures.
- A pre-works search by the ECoW prior to vegetation clearance/brash removal to check for notable faunal species such as hedgehog and toad resting places.
- Toolbox talks on protected species and control of INNS to be delivered prior to construction activities.
- Phased grass cutting/vegetation clearance and directional clearance.
- A pollution prevention plan, including emergency spill procedures to mitigate any impacts to riparian and aquatic protected species. Techniques could include the use of oil booms on the River Trent during construction of the new outfall.
- ECoW to check installation of silt curtains to mitigate sediment disturbance and smothering of gravels in watercourses during construction. Monitoring to proceed periodically through construction to ensure the structural integrity of silt curtains is maintained.
- The timing of outfall construction to avoid periods of flooding.
- Outfall construction (integrated into an existing headwall) on the River Trent (adjacent to Nether Lock and Nether Weir) to be undertaken between mid-June and October. This will allow higher winter flows to wash silt through the system before the next coarse fish spawning season (March to mid-June).
- Site drainage (including site compounds and material storage areas) will be designed to connect to existing road/mains drainage network, and not directly discharged to the environment.
- Best practice methodology for the correct storage and disposal of wastewater and pollutants, the establishment of dedicated plant and wheel washing areas at least 10 metres from any watercourse or surface water drain, collection of runoff water in sumps, and the recycle and reuse of water where possible.
- Use of screening, dust suppression measures, vegetating or covering of spoil heaps to minimise dust exposure and dispersal, with focus on areas in the vicinity of LWSs.
- Use of best practice measures to minimise impacts on mammals such as covering excavations over-night, or securing mammals ladders within excavations.

- Restriction of night working along the majority of the working width where possible, to minimise the requirement for artificial lighting to be used, thereby avoiding disturbance effects of artificial lighting on sensitive ecological features such as bats, badger, fish, otter and terrestrial invertebrates.
- Environmental protection best practice guidelines will be followed, such as Construction Industry Research and Information Association (CIRIA) C741 – Environmental Good Practice on Site (4th Edition) (CIRIA, 2015a), CIRIA C532 – Control of Water Pollution from Construction Sites (CIRIA, 2001) and CIRIA C648 – Control of water pollution from linear construction projects (CIRIA, 2006).

Mitigation requirements for designated sites

8.10.3 Fish escape passages in Farndon West wetland area and Farndon East lake will reduce entrapment of lamprey as flood water recedes. Following consultation with the Environment Agency, the specific number, location and design of the fish escape passages will be finalised during detailed design, and the proposals will be tested in the fluvial hydraulic model to assess the potential impact to receptors. Further details are provided below in paragraph 8.10.22.

Mitigation requirements for habitats

8.10.4 Two layers of permeable Cellweb matting, or similar brands, will sufficiently distribute the load of heavy construction plant that cannot be excluded from the RPA of retained veteran trees, mitigating compaction of the soil along this track and resulting in no change to water availability to the veteran tree RPA. The physiological condition of veteran trees will be monitored prior to the commencement of construction and following the installation of temporary protection measures. Further details on the methods for the protection of trees are provided in Appendix 7.4 (Arboricultural Impact Assessment) of this ES Appendices **(TR010065/APP/6.3)**. Annual inspections will be undertaken of veteran trees T038, T136 and T139 during construction to monitor the physiological condition and effectiveness of mitigation detailed in the aforementioned appendix. This matting will also be used in Great North Road Grassland LWS where lowland meadow will be subject to temporary long-term loss (during the construction period) to reduce soil compaction, ensuring suitable ground conditions endure to allow for successful recreation of lowland meadow from green hay cut post-construction. These measures are secured via Table 3-2 REAC within the First Iteration EMP **(TR010065/APP/6.5)**.

Mitigation requirements for species

8.10.5 Species specific mitigation measures to deliver compliance with protected species legislation, to prevent killing and injury, and where relevant, disturbance to protected species - badgers, bats, breeding birds (including barn owl), fish, otters, water vole and reptiles - are detailed below.

Badger

8.10.6 Based on survey data collected to date (inactive sett), it is considered unlikely that a development licence from Natural England will be required for badger sett closure(s). Prior to construction, any identified burrows that are of a size and shape to support use by badgers within 30 metres of the Order Limits, will be monitored for 21 consecutive days using various methods, such as trail cameras, sand, or 'sett sticking' to ascertain whether they are currently being used by badgers (an active sett). If no field signs are recorded during this monitoring period, then a one-way gate will be installed to each entrance, under supervision of a suitably experienced ecologist. Exclusion can be undertaken at any point in the year on disused 'setts' (technically considered a mammal burrow if it is not in use by a badger). Badger will be permanently excluded from those setts to be lost under the footprint of the Scheme (sett F001) and excluded for the duration of construction from those setts that will only be subjected to disturbance (F002). If a large burrow within 30 metres of works is found to be used by badger during pre-construction surveys, or construction (as required under commitment B6 of Table 3-2 REAC within the First Iteration EMP (**TR010065/APP/6.5**)), then a licence would need to be applied for from Natural England '*to interfere with a badger sett for the purpose of development'*. This would permit obstructing sett entrances by means of one-way gates, followed by the destruction of a vacant sett. If the one-way badger exclusion gate was required, it would be installed between 1 July and 30 November. It would stay in-situ for 21 consecutive days following the last sign indicating possible access by badgers into the sett and until immediately before action is taken to close or destroy the sett.

Bats

8.10.7 A bat mitigation licence will be required to allow for derogation from legislation and therefore the lawful destruction of a bat roost (F004). The Method Statement supporting the licence application will detail impacts and appropriate mitigation measures, informed by robust survey data. Please refer to the Consents and Agreements Position Statement **(TR010065/APP/3.3)** for further details regarding consents and agreements (including any licences, permits and other approvals) needed to implement the Scheme.

8.10.8 As a hibernation survey and full inspection of the first floor of building F004 could not be completed (limitations detailed in Section 8.6 of this ES Chapter), a precautionary working method statement will be followed. The building will be soft stripped in the daytime prior to demolition of the building, under direct supervision of a suitably qualified bat licensed ecologist (Level 2 Natural England Licence minimum). Soft stripping will be undertaken in March to April and/or October to November inclusive, where possible, outside of the active bat season (subject to weather conditions at the time) to reduce the risk of injuring or killing a bat. Internal inspections will be undertaken

during the soft-strip via torchlight and/or endoscopic inspection prior to destruction of the building. Should no roosts be identified as being present within the building following the inspection, any suitable roosting features would be made unsuitable. This could be achieved by either soft-stripping materials from the building or in some cases it may be more appropriate to back-fill accessible crevices with wet newspaper, wet hay or expanding foam to eliminate the risk of bats using features identified within the building prior to it being demolished. This method of backfilling will not be undertaken on features that cannot be fully inspected, or where there is a risk to other species being present (e.g. nesting birds).

8.10.9 Prior to soft-stripping building F004, a bat box will be installed close to the building to be demolished, in retained adjacent semi-mature woodland or on posts whilst trees mature, but at least 100 metres from areas of heavy construction (e.g. pile driving). Provision of this bat box will be necessary to allow the bat licensed ecologist to safely move a small number of common bats from building F004 (a confirmed soprano pipistrelle roost), should bats be present during daytime soft-stripping.

8.10.10 Securing a mitigation licence for bats (A13) will result in the provision of appropriate replacement bat roosts where roosts of a specific status are lost, in reference to English Nature's Bat Mitigation Guidelines, Figure 4 Guidelines for proportionate mitigation.[50] With the exception of building F004 detailed above (8.10.7), no further roosts will be lost to the Scheme. The provision of bat boxes will compensate for the loss of trees comprising features with potential for bat roosting (ranging from 'low' to 'high' potential). Replacement roosting opportunities will be located within trees or on structures in the form of bat boxes. A compensation ratio (suitable roosting feature lost: bat box provision) of 1:1 will be provided for 'moderate' and 'high' potential trees lost and 2:1 for 'low' potential trees. Natural England have been consulted on the provision of bat boxes. Suitable locations for bat box installations are shown indicatively on Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)**. Bat boxes provided as mitigation should be located at distances of c.100 metres from areas of heavy construction (e.g. piling), however, this distance could be reduced for areas where lighter construction is scheduled to occur. Based on the indicative bat box locations, a suitably experienced bat ecologist will confirm specific trees in the field for bat boxes to be installed on prior to construction. The ecologist will identify specific trees and box orientations in line with best practice, avoiding such conditions as prevailing winds, exposure to direct full-day sun, and artificial light sources. Mature and semi-

[50] Mitchell-Jones, A. J. (2004) Bat mitigation guidelines [online]. Available at: Bat mitigation guidelines - Jan.PDF (framptons-planning.com) (Last accessed December 2023).

mature trees could support several bat boxes at varying heights, but no lower than 4 metres above ground level.

8.10.11 Alternative access routes for enabling works have been considered for the installation of a security fence adjacent to the toe of the east embankment of the A46 carriageway bridge, over the Nottingham Lincoln railway line. This use of the existing farm track will result in less vegetation removal and bats roosting in building F054 are considered to have habituated to current traffic volumes of farm vehicles and associated activity around the yard. A 4x4 vehicle, and flat-bed pick-up truck and trailer will access the track during the daytime for six to eight weeks. The farmyard will not be used to store materials, receive deliveries, or have vehicles associated with the Scheme left idling.

8.10.12 As per building F054, any bats roosting in buildings F005 and F057 are considered to have habituated to high levels of pre-construction baseline disturbance and will tolerate a slight temporary increase during construction, particularly with the use of suitable piling equipment to minimise noise and vibration (where possible) and slow start ups to piling. In addition to embedded mitigation such as directional lighting (detailed in Chapter 2 (The Scheme) of this ES), the use of task lighting with cowls to prevent illumination of the roost access point or associated access flight lines during any unavoidable night works will mitigate lighting disturbance to the bat roost present in building F057. The above mitigation measures are also applicable to confirmed roosts in buildings F010 and F013 and trees F123, F210, F213 and F225, and the assumed to be present roosts in buildings F002, F005, F009, F034, F062, F063 and F064.

8.10.13 All trees to be felled for the Scheme with potential for a bat roost would be re-inspected for roosting bats prior to felling, as required under commitment B2 of Table 3-2 REAC within the First Iteration EMP **(TR010065/APP/6.5)**. This would comprise aerial climb inspection surveys with endoscopes. Where a feature cannot be fully inspected (e.g. tree unsafe to climb), the tree would be soft-felled where the bat licensed ecologist (Level 2 Natural England Licence or equivalent) can undertake the inspection at ground level. Felling of trees with hibernation potential would be undertaken outside of the hibernation period, or otherwise features would be inspected by a licensed surveyor prior to back-filling accessible crevices on trees reducing the risk of bats hibernating prior to felling.

Birds

8.10.14 Stage 3 barn owl surveys of PNS within 175 metres of the Order Limits will be undertaken pre-construction, as required under commitment B7 of Table 3-2 REAC within the First Iteration EMP **(TR010065/APP/6.5)**. Ideally these would be undertaken in the winter months, when there is lower risk of chicks being present (therefore avoiding disturbance). Where barn owls are absent and not

considered to be nesting or potentially nesting, these checks will allow for the temporary blockage of confirmed nesting sites and PNS for the duration of construction, following provision of alternative nesting sites (i.e. installation of barn owl nesting boxes). If barn owls are present and confirmed to be nesting during Stage 3 barn owl surveys (nest all year), the confirmed nest site will need to be monitored and will only be closed once individuals have naturally fledged (any intervention to encourage dispersal would be a wildlife offence). These surveys will inform the number and exact location of barn owl boxes to be installed a year in advance of closure of nest sites subject to potential disturbance during construction activities[51].

8.10.15 Stage 3 barn owl surveys will be undertaken by an experienced ornithologist who holds a Natural England class 1 barn owl licence. Two barn owl boxes will be erected for each confirmed barn owl nest site temporarily lost during construction, providing one territory for a breeding pair. These will be erected prior to the temporary blockage of nest sites and will be located as close as possible to the closures, beyond 175 metres from the Scheme, and as directed by the supervising ecologist. Prior to completion of Stage 3 barn owl surveys (pre-construction), indicative suitable locations for barn box installation have been informed by the location of PNS, foraging and commuting habitats (existing and post-construction landscape planting) and the carriageway alignment. These indicative locations are shown on Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)**. Pre-construction monitoring requirements are detailed in the First Iteration EMP **(TR010065/APP/6.5)** and the number of barn owl boxes and locations will be confirmed in the Second Iteration EMP.

8.10.16 Barn owl and kestrel boxes will be installed the year prior to construction, close to areas of habitat loss to reduce the effect of nesting bird habitat loss. This will allow bird boxes to ‘bed-in’, increasing the likelihood that barn owls and kestrels will utilise the artificial nest sites as enabling works commence (i.e. vegetation clearance). Provision of two kestrel boxes prior to the closure of the kestrel nest will ensure nesting habitat is available for one territory of a breeding pair during construction and operation. Indicative locations are shown in Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)**. The closure of a nest will be outside of the nesting season, once chicks have fledged and are no longer dependant on their parents. Timing of mitigation is detailed in the First Iteration EMP **(TR010065/APP/6.5)**.

8.10.17 Habitat manipulation of the isolated Type 2 barn owl habitat (sub-optimal) south of the new flyover between Brownhills Roundabout and the A1 carriageway would further reduce the risk of vehicle collision

[51] Shawyer C (2012). Barn Owl Tyto alba Survey Methodology and Techniques for use in Ecological Assessment. Wildlife Conservation Partnership [online]. Available at: Microsoft Word - Barn Owl Survey Methodology Revised 2012.doc (divio-media.org) (Last accessed December 2023).

with barn owl at this potential new TAB. Mitigation would commence during the proposed construction works and continue through operation and would include habitat management such as intensive mowing to render habitat further unsuitable for foraging barn owls.

8.10.18 Where possible, vegetation clearance and topsoil removal will be programmed to avoid the nesting bird season (March to August inclusive) and night-time hours. Where this is not possible a nesting bird survey / pre-works check will be carried out by a suitably experienced ornithologist, no more than 48 hours in advance of proposed clearance works to check for bird nesting activity.

Fish

8.10.19 Electro-fishing would be undertaken as part of fish rescue prior to sheet piling at Windmill Viaduct and works to Slough Dyke to mitigate injury and death of fish. The screening aperture across the abstraction pump inlets during dewatering works at Slough Dyke would be small enough to prevent access of European eel (yellow eel life stage) (no greater than 3mm).

8.10.20 The sheet piling has been realigned to avoid severing the gabion basket on Windmill Viaduct north bank. It would now sit behind the gabion basket, avoiding loss of fish refugia, retaining the existing riverbank profile, whilst providing scour protection. A net would be installed in front of the retained gabion basket and electro-fishing would be undertaken to facilitate a fish rescue prior to sheet piling commencing. An ECoW would be provided to supervise the installation of sheet piling to further reduce risk to fish species such as eel. Where possible, sheet piling works, integrating the drainage design into the existing headwall adjacent to Nether Lock and Nether Weir and dewatering Slough Dyke would avoid the coarse fish spawning period (avoid between March to 15 June). Sheet piling works would be undertaken in the daytime to avoid adverse impacts during more sensitive periods for fish, including migration of lamprey at night. Suitable piling equipment to minimise noise and vibration and slow start up would be used where possible, for all night works adjacent to the River Trent (e.g. bridge beam installation) and any daytime works likely to cause disruption to fish migration, spawning and foraging (e.g. sheet piling). In addition to embedded mitigation (such as directional lighting), the use of task lighting with cowls during unavoidable night works (e.g. bridge beam installation at the viaducts) will minimise disruption to a potential lamprey migration route along the southern branch of the River Trent.

8.10.21 Temporary drainage and silt management techniques are outlined in Appendix 13.4 (Drainage Strategy Report) of the ES Appendices **(TR010065/APP/6.3)**. These methods would be used during construction to reduce the amount of silt discharging into ecologically sensitive areas and could include such techniques as bubble curtains. Water quality monitoring would be undertaken downstream of the

bubble curtain to detect if adverse levels of sediment pass through the curtain. Where indicated, remedial action would be taken to protect the fish spawning site.

8.10.22 The design of the Farndon East and Farndon West FCAs has incorporated fish escape passages to mitigate the risk of fish entrapment as flood water recedes. The fish escape passage design would incorporate the Environment Agency's recommendation of a naturalised shape and measure a minimum of 0.5 metres wide and 0.3 metres deep, where possible. Following consultation with the Environment Agency, the specific number, location and design of fish escape passages will be finalised during detailed design and the proposals will be tested in the fluvial hydraulic model to assess the potential impact to receptors. These details are provided in Table 3-2 REAC of the First Iteration EMP **(TR010065/APP/6.5)**.

Otter

8.10.23 Based on survey data collected to date (no holts recorded, no severance of commuting or foraging routes, no loss of riparian or terrestrial habitat used by otter) and the implementation of embedded mitigation measures (such as the restriction of night working, where possible) as detailed in Chapter 2 (The Scheme) of this ES and secured by the First Iteration EMP **(TR010065/APP/6.5)**, a mitigation licence for otter is not required.

8.10.24 Passage would be maintained along commuting routes (e.g. River Trent) during construction e.g. oil booms would be positioned so that they do not act as a barrier to otter movement. Should otter or evidence of otter be observed within or adjacent to the Order Limits within the zone of influence (ZoI), works must stop and the Scheme ecologist contacted to assess a suitable working methodology for works to proceed without committing a wildlife offence.

Water vole

8.10.25 Surveys have confirmed water vole presence along Old Trent Dyke, outside of the Order Limits, however no confirmed water vole burrows or latrines have been recorded within the Order Limits. As the species is mobile, there are seasonal fluctuations in population size and distribution could alter due to numerous factors. Therefore, pre-construction surveys of areas to be cleared of vegetation along Old Trent Dyke will be undertaken by an ecologist who holds a displacement licence (or is accredited under one), within 24 hours of works commencing. Pre-commencement water vole surveys, as required under commitment B3 of Table 3-2 REAC within the First Iteration EMP **(TR010065/APP/6.5)**, would be undertaken between 15 February and 30 September. Should water vole be present, displacement can only be undertaken between the period 15 February to 15 April inclusive or between 15 September and 31 October

inclusive by an ECoW and in line with the conditions of the relevant class licence (CL31).

8.10.26 Should water vole be identified during pre-commencement surveys, a suitably experienced water vole ecologist will either:

- Displace water voles from the works (areas of habitat directly lost) into connected habitat suitable for water vole, under conditions of a Natural England displacement licence. This will be appropriate for a length of up to 50 consecutive metres along both banks (including a 5 metre buffer) where water voles have been recorded (during pre-commencement checks).
- If more than 50 consecutive metres of suitable vegetation is required to be cleared where water vole have been recorded (during pre-commencement checks), water vole will be removed from the works area by trapping under a mitigation licence from Natural England. The cohort would be released into a donor site within the Order Limits or on an adjoining watercourse, where possible, following habitat enhancement, where necessary, to ensure no net loss for water voles.

Indian balsam

8.10.27 The site will be surveyed by the Contractor to map the extent of INNS within the site prior to enabling works or construction. It is proposed that an INNS Management Plan and Biosecurity Risk Assessment will be submitted to and agreed with Nottinghamshire County Council and Newark & Sherwood District Council prior to the commencement of development to manage and prevent the spread of any INNS, compliance of which will be monitored by the ECoW. This commitment is included in the First Iteration EMP **(TR010065/APP/6.5)**. The following biosecurity measures are recommended and will be detailed within the INNS Method Statement as part of any INNS Management Plan and Biosecurity Risk Assessment:

- All plant within an invasive species working area will be retained within this area, to prevent spread elsewhere in the construction corridor.
- A separate refuelling area will be established for an invasive species working area, to make sure plant stays within the restricted area.
- All pedestrians will be required to clean their footwear as they exit an invasive species working area, via boot baths.
- Any arisings from the boot bath will be deposited onto the invasive species working area and refreshed/refilled when required.
- When construction plant leave an invasive species working area, a full biosecurity wash-down will be established to allow jet washing of all plant to remove any contaminated material.
- No contaminated runoff will be allowed to enter drains or watercourses.

Mitigation measures - operation

Mitigation requirements for habitats

8.10.28 A five-year aftercare period will follow completion of the construction works. During this time, maintenance activities will be undertaken to ensure the successful establishment of planting and provision of new functioning habitats. Maintenance and monitoring tasks will be prescribed in the First Iteration EMP **(TR010065/APP/6.5)** and Second Iteration EMP. This would include the replacement of failed or defective plants. The Second Iteration EMP will include a Landscape and Ecological Management Plan (LEMP). The LEMP will outline management and monitoring requirements for landscape and ecology aspects for the Scheme to ensure the successful establishment of essential mitigation.

8.10.29 Any habitat creation contributing to BNG will be maintained, managed and monitored for 30 years post construction. For further details see Appendix 8.14 (Biodiversity Net Gain Technical Report) of the ES Appendices **(TR010065/APP/6.3)**.

8.10.30 The tree owner or manager has a duty of care under The Occupier's Liability Act 1957 to take reasonable care to avoid acts or omissions that could cause damage to a person or property. As veteran tree T139 is in striking distance of a new target (i.e. maintenance track), this will require ongoing monitoring for perpetuity. The need for management of the retained veteran tree crown (for clearance of maintenance vehicles) would be assessed during annual monitoring surveys of the veteran tree health. Further details are provided in the First Iteration EMP **(TR010065/APP/6.5)**.

Mitigation requirements for species

Badger

8.10.31 Whilst badger exclusion fencing would help to deflect badger away from the widened carriageway towards existing safe underpasses, due to multidisciplinary design constraints, it is not currently deemed feasible to install badger fencing as part of the Scheme. Constraints include the safety requirement to retain a working width of vehicle restraint systems (VRS), avoidance of creating two lines of fencing (badger fencing adjacent to existing security fencing), the need to ensure that fencing does not cause interference with utilities and drainage infrastructure and maintaining personnel safety during installation and maintenance of fencing along steep inclines. Large extents of vegetation clearance (woodland and scrub) would also be required to facilitate the installation and maintenance of the fence line, which could otherwise be avoided, and additional habitat compensation for this loss of habitat would need to be provided which would take time to establish. If badger fencing were to be installed around these constraints it would result in discontinuous lengths of

fencing which could lead to entrapment of badger and increase incidents of persecution due to exposure from reduced shelter. Therefore, it is considered that the benefit of installing badger exclusion fencing (reduced badger mortality) is not proportionate to the cumulative adverse impact of installing it. Subsequently, a worst-case scenario of 'no fencing' has been applied within the assessment of likely significant effects of the current design.

8.10.32 Badgers have a tendency to follow linear features in the landscape and therefore an appropriate planting plan has been incorporated into the scheme, along the A46 carriage way in particular (as detailed in Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)**). The planting plan would discourage badger from crossing the widened carriageway and encourage them towards existing safe underpasses. With this planting plan, the residual effect upon badgers is considered to be reduced.

Compensation measures - construction

Compensation requirements for designated sites

8.10.33 The BNG metric indicates that a 1:1.5 ratio for habitat enhancement (approximately 1,000 square metres) or a 1:10 ratio for habitat creation (approximately 6,800 square metres) is required to compensate for the total loss of lowland mixed deciduous woodland within Dairy Farm Railway Strip, Newark LWS. Opportunities to enhance existing woodland within the Order Limits would not have been connected to or adjacent to Dairy Farm Railway Strip, Newark LWS and so it fell short of adequate compensation for loss of the LWS. An opportunity for woodland creation adjacent to to Dairy Farm Railway Strip, Newark LWS and within the Order Limits was identified. Approximately 9,880 square metres of broadleaved woodland will be created extending northwards from the LWS to Cattle Market Roundabout, parallel to the A46 carriageway. Due to the narrow width of the compensation woodland, this is shown as 'other woodland; broadleaved' rather than lowland mixed deciduous woodland in Appendix 8.14 (Biodiversity Net Gain Technical Report) of the ES Appendices **(TR010065/APP/6.3)**. However, the species mix detailed in Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)** is equivalent to those that will be lost from the LWS and will be subject to similar growing conditions (e.g. seasonally wet, willow-dominant woodland).

8.10.34 The BNG metric indicates that a 1:1.4 ratio for habitat creation is required to compensate for the loss of improved and semi-improved neutral grassland (approximately 22,000 square metres), 1:1.8 for broadleaved plantation woodland (approximately 870 square metres) and a 1:1.3 ratio for one pond within Great North Road Grasslands LWS (approximately 100 square metres). Approximately a total of 20,800 square metres of species-rich neutral grassland will be

created in the fields adjacent to the LWS with approximately 1,300 square metres of the remaining compensation grassland capture Scheme-wide. Great North Road Grasslands LWS is not designated for the woodland habitat present in its boundary and therefore approximately 940 square metres of broadleaved woodland has been incorporated Scheme-wide. Attenuation basins created in the same land parcel as the pond being lost will amount to approximately 540 square metres. Provision of this area was informed by the drainage design to meet the project need for water attenuation, resulting in a net gain above the compensation requirement for the loss of a pond (valued as a habitat). The section 'Compensation requirements for habitats' below details the compensation for the temporary long-term loss (during the construction period) of lowland meadow HPI within this LWS. The compensation area for habitat lowland meadow HPI is located immediately adjacent to the southern section of this LWS to ensure compensation is as close to the source of loss from LWSs. The BNG metric indicates that a 1:2.5 ratio for habitat creation (approximately 300 square metres) is required to compensate for the loss (approximately 110 square metres) of marginal and inundation vegetation in 'good' condition within Great North Road Grasslands LWS. A total of approximately 760 square metres of reed bed of 'good' condition will be created within Great North Road Grasslands LWS around the attenuation basins. Whilst the area was informed by the drainage design to meet the project need for water attenuation, an opportunity to integrate nature-based solutions was identified. This comprised provision of reedbeds in the planting design of these basins to compensate for the loss of marginal and inundation vegetation. This resulted in a net gain above the compensation required for the loss of marginal and inundation vegetation, also benefiting biodiversity.

8.10.35 As the area of Newark (Beet Factory) Dismantled Railway LWS impacted by the Scheme does not meet the LWS citation for its designation, and has been reclassified a lowland mixed deciduous woodland HPI during surveys, the compensation is captured in 'Compensation requirements for habitats' below for this HPI.

8.10.36 The BNG metric indicates that a 1:1.5 ratio for habitat creation is required (approximately 60 metres) to compensate for the culverting of approximately 40 metres of Old Trent Dyke LWS. Two compensatory ditches comprising a total length of approximately 100 metres will connect three ponds in Farndon West FCA. They will retain water year round during typical seasonal fluctuations in water levels and, where possible, shelves, shallow edges or variation in the bank steepness will be created. This will provide a range of conditions to diversify emergent, submerged and floating-leaved plants to establish, achieving an ecological benefit for protected species including bats, birds, invertebrate (aquatic and terrestrial) and reptiles. Physical works to create ditches will not be undertaken within root protection areas of retained trees. Temporary tree protection barriers

are detailed within Appendix 7.4 (Arboricultural Impact Assessment) of the ES Appendices **(TR010065/APP/6.3)**.

8.10.37 Farndon West FCA will be subject to reduced agricultural runoff resulting from land use change, from arable to wetland. This extensive area of reedbed will provide areas of standing water for longer periods throughout the year and improve water quality, which will runoff into Old Trent Dyke and the River Trent. The trees between the River Trent embankments and Farndon West FCA / Farndon East FCA will be retained (covered by TPO) and the initial scrub clearance will provide greater opportunities for a greater diversity of plants to establish from reduced shading. The newly created ditches in Farndon West FCA and the lake in Farndon East FCA will not be subject to the INNS Management Plan and Biosecurity Risk Assessment as it is likely to be subject to inundation, resulting in Indian balsam seeds being deposited from upstream.

8.10.38 The loss of habitats for which a site has been designated or which supports protected species for which the site has been designated, would be planted to make sure a minimum condition of like-for-like replacement is achieved, for an area greater than a 1:1 of habitat loss. Areas connected to the LWS will be prioritised for habitat creation equivalent to those habitats lost from the LWS, to provide continuity of the sites integrity. The location of compensation planting for the loss of habitats for which each LWS has been designated is detailed in Figure 8.4 (Compensation Planting for Loss of Local Wildlife Site Habitats) of the ES Figures **(TR010065/APP/6.2)**. Compensation has been provided as close to the source of loss as possible. Where this cannot be achieved, the equivalent habitat to that being lost from the LWS has been captured Scheme-wide. This detail and the species mixes are provided in Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)**.

Compensation requirements for habitats

8.10.39 The BNG metric ratio 1:8 for habitat creation has been applied to compensate for the unavoidable loss of approximately 1,030 square metres of lowland meadow HPI. Green hay from surrounding retained lowland meadows would be used to create approximately 8,570 square metres of lowland meadow in fields adjacent to Great North Road Grassland LWS. This will increase plant diversity within the existing semi-improved and improved grassland.

8.10.40 The BNG metric ratio 1:7 for habitat creation has been applied to compensate for the unavoidable loss of approximately 9,690square metres of coastal and floodplain grazing marsh HPI (which equates to approximately 67,830 square metres of habitat creation). An area approximately 69,510 square metres of coastal and floodplain grazing marsh will be created in Farndon West Borrow Pits post construction. The additional creation of 1,680 square metres of coastal and floodplain grazing marsh above the compensation ratio has been

proposed to align with the design and boundary of the Farndon West Borrow Pits, avoiding the unnatural division of fields adversely affecting the visual landscape. The opportunity to integrate this habitat creation into the landscape design of the Farndon West Borrow Pits was identified to also have a net gain to biodiversity.

8.10.41 The BNG metric indicates a ratio 1:10 for habitat creation is required to compensate for the loss of lowland mixed deciduous woodland HPI. For the loss of this 300 metres squared of this HPI with Newark (Beet Factory) Dismantled Railway LWS, approximately 3,000 metres squared of habitat creation (planted woodland) would be required. Approximately 1,570 square metres of woodland will be created, comprising of a species composition equivalent to that lost within the Newark (Beet Factory) Dismantled Railway LWS lowland mixed deciduous woodland HPI. This will be located east of the Nottingham Lincoln railway line, parallel to the A46 northbound carriageway south of the River Trent. Approximately a further 1,400 square metres will be created Scheme-wide to compensate for the loss of this HPI from Newark (Beet Factory) Dismantled Railway LWS.

8.10.42 To compensate for the total loss of approximately 11,290 square metres of lowland mixed deciduous woodland HPI, including those located within a LWS, approximately 20,800 square metres of deciduous woodland will be planted Scheme-wide. Where possible, creation of habitats has been prioritised in areas connected and adjacent to areas of the equivalent HPI lost. Where this cannot be achieved within the Order Limits, compensation will be delivered offsite (negotiations are ongoing to secure agreements with landowners). This is the case for lowland mixed deciduous woodland HPI, where approximately a further 13,000 square metres of woodland will be subject to enhancement to a higher quality lowland mixed deciduous woodland, currently anticipated to be provided at Doddington Hall (or another suitable solution). Further details are provided in the First Iteration EMP **(TR010065/APP/6.5)**. This is based on a BNG metric ratio 1:1.5 for habitat enhancement of lowland mixed deciduous woodland HPI. Compensation for the loss of lowland mixed deciduous woodland is made up of a mixture of onsite habitat creation and offsite habitat enhancement. Full details of how this meets the requirement is provided in the Biodiversity Net Gain Technical Report of the ES Appendices **(TR010065/APP/6.3** which includes a Biodiversity Metric expressing the losses and gains in biodiversity units. In summary 15.92 units of the habitat will be lost, 3.96 units will be provided through creation onsite and 12.59 units will be provided through offsite enhancement to give a net gain of 0.63 units.

8.10.43 To compensate for the loss of approximately 226,340 of non-HPI woodland (broadleaved semi-natural and plantation woodland not located within a designated site), approximately 63,750 square metres of ‘other woodland; broadleaved’ will be planted Scheme-wide. As the

aforementioned plantation woodlands have either a medium or low distinctiveness, compensation habitat can be comprised from a habitat type of higher distinctiveness. Further details are in Appendix 8.14 (Biodiversity Net Gain Technical Report) of the ES Appendices **(TR010065/APP/6.3)**. The compensation for the residual loss of non-HPI woodland mentioned below, will achieve a net gain for biodiversity.

8.10.44 To contribute towards compensation for the loss of non-priority habitats, a wetland area will be created 10 metres from the River Trent, which will comprise residual ponds formed in post-borrow pit excavations at Farndon West FCA. A total of approximately 97,450 square metres of reedbeds will be created as part of this wetland area. This will also contribute to achieving the Scheme's BNG objective.

8.10.45 Pond creation will be required as habitat compensation due to the loss of a pond within the Kelham and Averham FCA. This pond will be created within the Kelham and Averham FCA in an area adjacent to the existing pond, as shown indicatively on Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)**.

Compensation requirements for species

8.10.46 The provision of log and brash piles from retained felled trees, in species-rich grassland, around ponds with areas of scrub and the creation of the Farndon West wetland area will compensate for the loss of habitat suitable for reptiles at different life stages.

8.10.47 Creation of species-rich grassland, wet grassland, ditches and scrub on sunny aspects will compensate for the Scheme-wide loss of generalist habitats used suitable for invertebrates at different life stages, including the large garden bumblebee and solitary wasp. Once established, these habitats will also act as stepping stones for dispersal across the wider landscape.

8.10.48 Pre-construction population size class surveys for reptiles, as required under commitment B14 of Table 3-2 REAC within the First Iteration EMP **(TR010065/APP/6.5)**, will inform a suitable location to create hibernacula, providing further opportunities for hibernation to compensate for the loss of shelter, resulting from vegetation clearance. In the absence of survey data, suitable locations for hibernacula shown on Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)** are indicative only.

Compensation measures - operation

Compensation requirements for designated sites

8.10.49 Due to the proximity of LWS immediately adjacent the existing road network, an air quality barrier would not be feasible as it would result in the direct loss of habitat along the edge of the LWS for installation,

whilst maintaining sight lines of road users and the working area of Vehicle Restraint Systems (VRS). Broadleaved trees collect more particulates than conifers, however in winter the particulates enter the drainage system when the leaves are lost from the trees. The planting design comprises native conifer, Scots Pine, as well as broadleaved tree species. As planting along the A46 carriageway corridor establishes, it will act as more of a buffer over time to adjacent grassland, altering dispersion of air pollutants. Planting details are shown in Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)**.

Enhancement measures

8.10.50 Where possible, enhancement of existing hedgerows within the Order Limits will be undertaken by means of, for example, coppicing, hedge laying or planting up gaps with native climate resilient species. However, these enhancement measures have not been taken into account when determining significance of effects because they are over and above what is required to mitigate the adverse effects of the Scheme.

8.11 Assessment of likely significant effects

8.11.1 The assessment of likely significant effects considers effects on biodiversity resources during construction and operation. These effects are determined following the incorporation of the essential mitigation measures outlined in Section 8.10 of this Chapter and Section 13.9 of Chapter 13 (Road Drainage and the Water Environment) and embedded mitigation measures in Section 2.5 of Chapter 2 (The Scheme) of this ES.

8.11.2 The establishment period of vegetation (for mitigation and compensation planting) is taken into account when considering the level of effect and the period for which it will occur. For the purposes of this assessment and based on professional judgement, this is considered to be 1-3 years for grassland, 2-4 years for riparian vegetation, 3-5 years for hedgerows and 15 years for trees.

Construction

Designated sites

8.11.3 Although the Humber Estuary SAC and Ramsar are of international importance, a small proportion of its river lamprey population is likely to inhabit the reaches of the River Trent adjacent to and immediately downstream of the Scheme. Therefore, this receptor is considered to be of county level importance for assessing the likely significant effects.

8.11.4 Although a combination of residual light spill and noise and vibration disturbance during night works at Nether Lock Viaduct and Windmill Viaduct will act as a barrier to lamprey migration, the northern branch of the River Trent will likely act as a bypass to the upper reaches during this period (the main route for lamprey migration). Furthermore, works at Kelham and Averham FCA will be completed prior to commencement of main alignment works. The integrity of the river and sea lamprey population and the Humber Estuary SAC and Ramsar are not considered to be affected during construction as there will be no habitat loss, severance of migration routes or degradation of lamprey spawning substrate. Therefore, following the implementation of the mitigation measures detailed in Section 8.10 (Design, mitigation, compensation and enhancement measures) of this Chapter, a negligible adverse impact is anticipated at a county level, leading to a Slight Adverse effect during construction that is not significant.

8.11.5 The Scheme will result in permanent habitat loss within Dairy Farm Railway Strip, Newark LWS, Great North Road Grasslands LWS, Newark (Beet Factory) Dismantled Railway LWS and Old Trent Dyke LWS as a result of land take required for the Scheme.

8.11.6 Realignment of drainage ditches to accommodate the widening of culverts and creation of the Kelham and Averham FCA and the Farndon East and West FCAs will have a negligible impact to groundwater, surface water and water quality at LWSs adjacent to and hydrologically connected to the Scheme. No increased risk of flooding is anticipated during construction at LWSs and therefore habitats for which they are designated will not be affected. Following the implementation of mitigation measures to minimise dust exposure and dispersal (detailed in Section 8.10 (Design, mitigation, compensation and enhancement measures) of this Chapter) and compensation measures (8.10.38), a minor adverse level of impact is anticipated at the county level due to permanent loss of habitat which does not affect the integrity or key characteristics of the resource at Dairy Farm Railway Strip, Newark LWS, Newark (Beet Factory) Dismantled Railway LWS and Old Trent Dyke LWSs. This would result in a Slight Adverse effect during construction that is not significant.

8.11.7 The total loss of 74% of the Great North Road Grasslands LWS would result in a less viable LWS, reducing its conservation value and impacting the integrity of the site. Following the implementation of compensation measures (detailed in Section 8.10 (Design, mitigation, compensation and enhancement measures) of this Chapter) for loss of habitat, a major adverse impact is anticipated leading to a Moderate Adverse effect during construction that is significant at the county level.

Habitats

8.11.8 The Scheme will result in the unavoidable permanent loss of HPI consisting of coastal and floodplain grazing marsh (total permanent loss of approximately 4,430 square metres, approximately 4% of the total contiguous area of the HPI), lowland meadow (total permanent loss of approximately 110 square metres, 0.4% of the total contiguous area) and lowland mixed deciduous woodland HPI (total permanent loss of approximately 11,040 square metres between three distinct woodlands: 94% of the total contiguous area under the footprint of the A1 flyover, approximately 59% of the total contiguous area south of the lake on British Sugar land and approximately 11% of the woodland on the south-west corner of the British Sugar lake).

8.11.9 The loss of lowland mixed deciduous woodland does not result in the loss of any veteran trees. The permanent loss of two distinct areas of lowland mixed deciduous woodland HPI (approximately 4,930 square metres and 370 square metres) will not impact the integrity of the sites. The almost complete permanent loss of the third woodland (approximately 5,740 square metres) will reduce the conservation value and impact the integrity of the site. Therefore, a major adverse impact is anticipated at county level for lowland mixed deciduous woodland HPI during construction. Following the establishment of compensation planting, once secured, (detailed in Section 8.10 (Design, mitigation, compensation and enhancement measures) of this Chapter), this will lead to a **Slight Adverse** effect during construction that is not significant.

8.11.10 Permanent loss of habitats of ecological value Scheme-wide (including those within LWS and non-HPI) comprise of approximately 20% of broadleaved semi-natural woodland, 47% of plantation woodland, 50% of grassland and 35% of scrub. The ratio of compensation planting (creation, restoration and enhancement) to habitat lost will be driven by BNG calculations, will be provided at a ratio greater than 1:1 (and a ratio of up to 1:10 for some habitat creation within the BNG metric) and will be located as close as possible to areas of the same type of habitat lost. In accordance with BNG Principles and Guidance[52], the loss of irreplaceable or very high distinctiveness habitat (for example lowland meadow) cannot be considered to deliver biodiversity net gain. Compensation of habitats of the same or a higher distinctiveness (such as HPIs) will make sure the Scheme achieves a net gain in habitats of biodiversity value, though this will not be achieved until the compensatory habitat has established. Following the implementation of these mitigation measures (detailed in Section 8.10 (Design, mitigation, compensation and enhancement measures) of this Chapter), a minor adverse level of impact at the county level for the remaining HPI, and a minor

[52] Baker, J., Hoskin, R., Butterworth, T. (2019). Biodiversity net gain. Good practice principles for development. A practical Guide [online]. Available at: Biodiversity net gain. Good practice principles for development. A practical guide (cieem.net) (Last accessed December 2023).

adverse impact at the local level for each non-HPI is considered likely once this has established. This will result in a Slight Adverse effect that is not significant.

8.11.11 The Scheme would require the removal of species-poor hedgerows, the majority of which are located along the verge of the existing A46 or connect to these road-side hedgerows, none of which are classified as 'important' hedgerow under the biodiversity criteria of the Hedgerows Regulations 1997. The permanent and temporary long-term loss of hedgerows (4,710 metres, ~90% of which are intact) is unavoidable to accommodate the Scheme footprint. This will temporarily result in a reduction in hedgerows, whilst a minimum of the same length of newly planted hedgerows establish (3-5 years). Following establishment, a minor adverse level of impact is anticipated at the local level, resulting in a Slight Adverse effect during construction that is not significant.

8.11.12 Whilst Scheme design iterations have resulted in the retention of all veteran trees, there will be an unavoidable permanent adverse impact to three veteran trees due to the direct partial impact to their RPAs and the proximity of one of these veteran trees to the Order Limits, which will require a minor crown lift (<0.5 metres). It is very unlikely that this would result in a slow decline in tree health or accelerate the death of the tree and therefore the integrity of this resource will not be affected. It is anticipated that, with arboricultural supervision to ensure works are undertaken in line with best practice, the level of disturbance stated above can be tolerated by these trees. It is difficult to predict this with certainty and therefore ongoing monitoring is proposed to inform any remedial action. Following the implementation of this mitigation, a minor adverse impact on an irreplaceable resource of national importance is anticipated, resulting in a Slight Adverse effect during construction that is not significant.

Protected and notable species

Badger

8.11.13 The permanent loss of one inactive single-entrance outlier badger sett is unavoidable during construction as it is located within the Order Limits and will be destroyed to facilitate the Scheme. A second inactive single-entrance outlier badger sett is located within the Order Limits. Badgers would be temporarily excluded from this second inactive sett during the construction phase, aiming to avoid the permanent loss of this sett which could be reused by badgers in the future. Pre-construction monitoring surveys, as detailed in Section 8.10 (Design, mitigation, compensation and enhancement measures) of this Chapter and required under commitment B6 of Table 3-2 REAC within the First Iteration EMP (**TR010065/APP/6.5**), will confirm these setts are inactive. Should the setts be found to be active, the closure and destruction of any sett found to be active will be undertaken under licence. There will be permanent loss of suitable

badger habitat as a result of vegetation clearance to facilitate carriageway widening. There would be no severance of commuting routes to both sides of the carriageway and access to the wider landscape would not be restricted during the construction phase. Therefore, alternative habitat suitable for foraging and sett creation would be available for badgers in retained habitat. An increase in direct injury and mortality of badger during construction could arise where individuals attempt to cross the carriageway where vegetation has been removed, however, traffic management would result in vehicles moving slower during construction indirectly decreasing the chance of collision with a badger. Although both setts are inactive, there will be permanent loss to resource and so a minor adverse impact is anticipated at the local level, leading to a Slight Adverse effect during construction that is not significant.

Bats

8.11.14 As full internal inspections could not be undertaken, a reasonable worst-case scenario has been applied that hibernation roosts are present in buildings F002, F005, F009, F010 (confirmed common pipistrelle day roost), F013 (confirmed brown long eared bat day roost), F023, F062, F063 and F064. Building F061 is considered to have negligible hibernation suitability due to the buildings structure likely resulting in temperature fluctuations and the proximity to the existing A46 carriageway and Cattle Market Junction.

8.11.15 Bats in confirmed roosts within building F010 and F013 are considered to have habituated to disturbance from the existing A46 carriageway, including routine maintenance work. It is therefore considered likely that bats, if present, have high levels of tolerance to disturbance within buildings F005, F009, F010, F013, F023, F034, F062, F063 and F064. Whilst proposed works will increase noise, vibration and visual disturbance during construction, these works will not comprise continuous or intermittent heavy disturbance, such as piling, in all locations but building F005. Building F005 located immediately adjacent to Nether Lock Viaduct is subject to very high levels of existing noise disturbance. It is also considered to be subject to fluctuating temperatures due to broken windows combined with an occasional heat source inside the building. Mitigation detailed in Section 8.10 (Design, mitigation, compensation and enhancement measures) of this Chapter, such as slow start ups and piling in the daytime, are considered to sufficiently mitigate additional disturbance resulting from the works. In addition to the distance between buildings F009, F010 and F013 and the works (located 70m south-east of road re-alignment works south of Farndon Roundabout), retained hedgerow and trees parallel to the A46 carriageway and property entrance provide some screening against visual disturbance. Following implementation of mitigation (detailed in Section 8.10 (Design, mitigation, compensation and enhancement measures) of this Chapter), it is considered that any perceptible disturbance from

the proposed works will not affect hibernating bats (either entering the roost at the start of hibernation or being woken from torpor) within any of these buildings.

8.11.16 There will be an unavoidable permanent loss of broadleaved deciduous woodland and hedgerows within the Order Limits. Temporary fragmentation (until establishment of landscape planting) of linear vegetation used by commuting bats along the carriageway embankments, which provides connectivity to the wider landscape, would cause disruption to foraging on a small scale. Commuting and foraging corridors parallel to the existing carriageway will be permanently lost but through planting, habitat connectivity will be re-established post-construction, including Farndon West wetland creation. There is an abundance of connected foraging habitat available during construction, for example dispersal routes along the River Trent and along linear features around field boundaries.

8.11.17 The existing A46 carriageway is considered to be an existing semi-permeable barrier to bats due to the frequent use of HGVs even at night-time. Currently, vegetated embankments are considered to allow safe flight for bats over the railway line parallel to the A46 and under the intersecting A46 carriageway. The wide-span bridge over the river will maintain access for bats commuting and foraging along the river through construction.

8.11.18 During construction, it is anticipated that bat species and suitable habitat would also be exposed to increased disturbance from artificial lighting likely to impact foraging behaviour of some bat species due to redistribution of insects towards external artificial lighting with a high ultraviolet content. Artificial lighting is thought to increase the chances of bats being preyed upon by avian predators, such as owls, and it disrupts the normal 24-hour pattern of light and dark which is likely to affect the natural behaviour of bats. Bright lighting may also reduce social flight activity and cause bats to move away from the lit area. Studies have shown that continuous lighting along roads creates barriers which some species cannot cross. Due to the nature of the works in proximity to confirmed tree roosts F210, F213 and F225 (vegetation clearance of a ditch within 50 metres), disturbance is anticipated to be minimal following implementation of mitigation. The A1 and trees along its embankment are likely to screen confirmed tree roost F123 (located east of the southbound carriageway) from the A1 flyover to a large extent, with mitigation further reducing impacts from disturbance during construction. Impacts during construction are anticipated to be minimal on the common pipistrelle roost in building F010 following implementation of mitigation, due to the proximity to the existing A46 carriageway and Farndon Junction, and therefore habituation to high levels of disturbance pre-construction. Following the implementation of mitigation, the permanent loss of a soprano pipistrelle roost in building F004 will not result in death or injury to bats and only one individual was observed on the final survey across

the whole suite of surveys so the loss of this resource is only considered to be slight adverse. The accumulative impacts to all five roosts are not anticipated to affect the local population of any of these bat species. Outstanding survey data is not considered to materially change the assessment in this Chapter.

8.11.19 In the absence of bat survey data in some areas (for example, in Kelham and Averham FCA), a reasonable worst-case scenario has been applied assuming that bat roosts are present where access has not been granted for surveys and that they are used by species already recorded during surveys to date. With reference to the collected survey data and the proposed works, the construction phase of the Scheme is unlikely to have an impact on the Annex II barbastelle bat species. This assessment is based on the Scheme being located at the top of the bat's range (furthest north), low numbers of passes recorded during transects, no direct impacts to barbastelle roosts (trees to be lost), and no new severance of commuting or foraging routes (dualling Scheme). However, there will be the loss of one roost (building F004) used by a single bat of common species.

8.11.20 Following the implementation of measures to reduce artificial light (embedded mitigation detailed in Chapter 2 (The Scheme) of this ES) and noise disturbance and loss and fragmentation of habitat (detailed in Section 8.10), a minor adverse impact is anticipated at the regional level, leading to a Slight Adverse effect during construction that is not significant.

Birds - barn owl

8.11.21 A total of approximately 150,000 square metres of barn owl habitat will be impacted or lost because of the Scheme. Around 12% of optimal habitat (Type 1) will be permanently lost (19,600 square metres) and 3.6% would be temporarily lost (25,100 square metres). Around 13% of sub-optimal habitat (Type 2) will be permanently lost (97,000 square metres) and 4% would be temporarily lost (176,000 square metres). Vegetation clearance of barn owl foraging sites and construction activities on or near breeding sites and foraging sites could reduce food availability. Heavy construction and vegetation clearance have potential to disrupt foraging activities through visual and noise disturbance. This has potential to temporarily impair the breeding success of at least one barn owl pair considered to be present within the survey area during the three year construction period (considered long-term) on a local scale. One existing barn owl nest box located within 72 metres of the Order Limits will require temporary closure during the works. There is potential for disturbance of seven potential nest sites (PNS) if they were active nest sites, during construction. Five PRS/ARS within 175m of the of proposed works are at potential risk of disturbance. As they have not been internally inspected, they cannot be scoped out from being a PNS

until Stage 3 barn owl nest verification surveys have been completed and should be treated as PNS until that point.

8.11.22 The new alignment around Brownhills Junction and Friendly Farmer Roundabout will intersect five hedgerows or tree lines. The habitat suitability north and south of the new A1 flyover are considered to be either unsuitable or sub-optimal (Type 2) habitat for barn owl foraging. As such the potential for barn owl collision events during construction is considered negligible.

8.11.23 Works that are considered to be high disturbance for barn owl (e.g. piling, or similar) could be undertaken outside of sensitive timings (avoiding the core breeding season), avoiding night works where possible. There is ample foraging habitat in the wider landscape and the erection of barn owl boxes prior to construction (detailed in Section 8.10 (Design, mitigation, compensation and enhancement measures) of this Chapter) would compensate the temporary closure of nest boxes (during construction). There will be permanent loss to the foraging resource of unsuitable or sub-optimal habitat and so a minor adverse level of impact at the county level is anticipated, leading to a Slight Adverse effect during construction that is not significant.

Birds – breeding birds

8.11.24 Under the current design, the rookery north-west of Friendly Farmer Roundabout will be removed to facilitate the works, and the rookery at Winthorpe Roundabout will be partially removed to facilitate visibility splays. Removal of the trees that make-up the rookery located north-west of Friendly Farmer Roundabout and the rookery within Winthorpe Roundabout, would be undertaken, where possible, between September and February, inclusive, outside of the core nesting period. Whilst the rookery at Winthorpe Roundabout will be largely retained, it is anticipated that there will be some permanent loss of nests which form the current rookery and that birds which could use the retained nests may also be temporarily disturbed by construction works, which differ from the current day-to-day activities in the vicinity of the rookery. Any birds displaced by permanent tree loss at either the Friendly Farmer or Winthorpe Roundabouts, or as a result of disturbance caused by construction adjacent to Winthorpe Roundabout, are anticipated to utilise existing woodland across the Scheme, which provides alternative nesting provision. Following completion of construction works in the vicinity of Winthorpe Roundabout, any temporarily displaced birds would have the opportunity to return to the rookery. Once planting detailed in Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)** has established, it will provide alternative habitat to compensate for the loss of the rookery north-west of Friendly Farmer roundabout.

8.11.25 Works undertaken during the bird nesting season are likely to displace breeding birds from suitable habitat located adjacent to the construction areas due to increased noise and artificial lighting (where there are night works proposed). Installation of kestrel boxes prior to construction will mitigate the loss of suitable nesting habitat for this species, as well as the wider landscape offering alternative nesting habitat for common generalist birds (woodland, hedgerows, scrub). Installation will be undertaken a year prior to construction commencing to allow kestrel boxes to 'bed-in' and will be located beyond 100 metres from heavy construction works (e.g. pile driving). This will increase the likelihood that kestrels will utilise the artificial nest sites and therefore mitigate the impact on the local breeding population commencing from enabling works (i.e. vegetation clearance).

8.11.26 Wooded areas along the A46 carriageway embankment currently act as a buffer against light exposure to the wider area. Permanent habitat loss will temporarily (during construction) degrade retained habitat by allowing light splays to extend further at night in areas where trees have been felled and prior to planting establishing (although new operational lighting will be directional to prevent or minimise disturbance). In addition to embedded mitigation (such as directional lighting), the use of task lighting with cowls will minimise disturbance during unavoidable night works (e.g. bridge beam installation at the viaducts). Clearance works will also increase sight lines for bird species and the distance noise will travel, indirectly resulting in temporary (during construction) visual disturbance and audible disturbance of some bird species at a greater distance from the works.

8.11.27 Breeding birds in close proximity to the existing A46 are considered to have habituated to high urban disturbance due to the urban setting of the Scheme. Construction disturbance will be mitigated through use of suitable piling equipment to minimise noise and vibration, slow start-ups (particularly important for unavoidable night works) and provision of ECoW supervision (including nesting bird checks) where vegetation clearance cannot avoid the nesting bird season and for night-time works at any time of year. Therefore, a minor adverse impact at the county level is anticipated, leading to a Slight Adverse effect during construction that is not significant.

Birds – wintering birds

8.11.28 Compensatory planting of hedgerows and treelines will mitigate the permanent loss of commuting routes identified for fieldfare *Turdus pilaris* and redwing *Turdus iliacus* (migratory species) during the construction phases. However, large waterbodies and other optimal habitats in the wider landscape (such as RSPB Langford Lowfields nature reserve located 3.6 kilometres from the Scheme) will continue to provide ample opportunities for large populations of wintering birds and will accommodate any temporary displacement. Although

vegetation clearance works will temporarily (during construction) increase sight lines slightly, there is naturally less screening foliage in winter and therefore the temporary visual disturbance for some bird species at a greater distance from the works is considered negligible. Overall, a minor adverse impact at the county level is anticipated, leading to a Slight Adverse effect during construction that is not significant.

Fish

8.11.29 Fish rescue undertaken at the gabion baskets on Windmill Viaduct north bank will facilitate the extension of the existing sheet piling along a short length of the existing bank, avoiding excessive erosion of the bank and widening of the River Trent, providing necessary scour protection to the viaduct whilst avoiding the killing or injuring of fish taking refuge within gaps in the gabion baskets. This would result in the permanent loss of potential fish refuge habitat. A conservative length of 40 metres of sheet piling has been estimated, extending from the existing carriageway sheet piling westwards. These calculations will be reviewed and updated during detailed design. The ECoW would supervise removal of any riparian and in-channel vegetation during construction of new outfalls and loss of refuge (the gabion baskets) outside of the fish spawning period (defined as March to 15 June for coarse fish), where possible. Temporary drainage and silt management techniques outlined in Appendix 13.4: Drainage Strategy Report of this ES **(TR010065/APP/6.3)** will reduce siltation at fish spawning sites during the construction of new outfalls and realignment of culverts to accommodate their widening. The drainage design and wetland creation at Farndon West will have a negligible beneficial impact on water quality and will improve water retention in a system of connected ponds, providing fish habitat. This wetland has been designed to reduce entrapment of freshwater fish where possible, however this impact will not be totally avoided during seasonal flooding. The deep ponds have been designed so that they will retain water until the next typical seasonal flooding, to keep temperatures stable and prevent deoxygenation (greatest depth to be at least 2 metres). A minor adverse impact at the regional level is anticipated, leading to a Slight Adverse effect that is not significant.

Invertebrates – aquatic

8.11.30 It is considered that common species of aquatic invertebrates will naturally recolonise the newly created pond within the Kelham and Averham FCA (detailed in Section 8.10) to compensate for the permanent loss of PSYM pond P15. A negligible adverse impact is anticipated at the county level, leading to a Slight Adverse effect that is not significant.

Invertebrates – terrestrial

8.11.31 The Scheme will result in permanent loss of terrestrial habitats within Great North Road Grasslands LWS (~27,700 square metres) which supports the life cycle of SPI (large garden bumblebee *Bombus ruderatus*) and notable species (solitary wasp *Lestiphorus bicinctus*, large yellow-face bee *Hylaeus signatus*). Retained hedgerows, tussocky grassland, wetland, scrub in sunny locations and flower-rich ditches and field margins adjacent to the works, continue to provide foraging and nesting sites during construction. A negligible adverse impact at the local level is anticipated, leading to a Slight Adverse effect during construction that is not significant.

Otter

8.11.32 Construction activities could lead to displacement of otter due to increased levels of vibration, noise and artificial light disturbance (which may be unavoidable if night works proceed) during construction. Assuming a realistic worst-case scenario that an otter holt could be present on an inaccessible island in the Kelham and Averham reach of the River Trent, following the implementation of mitigation (including slow start ups and reduction of lighting splay), disturbance from night works at Windmill Viaduct are unlikely to directly affect any individuals using this assumed holt as it is located approximately 1 kilometre away. General disturbance of foraging and commuting otters could occur where nightworks take place; however, with the implementation of mitigation (such as slow start ups) and embedded mitigation (such as reduction of lighting splay, as detailed in Chapter 2 (The Scheme) of this ES), any general disturbance is considered to be reduced. A minor adverse level of impact at the county level is anticipated, leading to a Slight Adverse effect during construction that is not significant.

Reptiles

8.11.33 The construction works would result in the permanent and temporary loss of terrestrial habitat for reptiles, reducing foraging, shelter and basking opportunities short-term (whilst the planting design establishes). For this reason, a minor adverse level of impact at the local level is considered likely adjacent to RS03 and RS06 where low numbers of common species have been recorded. However, habitat connectivity along the railway and the south-east side of the A46 carriageway will provide opportunities for dispersal into the wider landscape, avoiding isolation. Vegetation clearance and topsoil stripping during construction within habitat suitable for reptiles has the potential to result in injury and potentially the death of reptiles. This impact will be mitigated by ECoW supervision of phased vegetation clearance in areas where surveys have identified reptiles are present, towards suitable retained vegetation. The planting design will reinstate habitats lost on the periphery of areas where reptiles have been recorded and once established, improve connectivity along the

A46 to suitable areas along the Scheme. The provision of log and brash piles from retained felled trees, in species rich grassland, around ponds with areas of scrub and creation of the Farndon West wetland area will provide opportunities for grass snake to bask, forage and take shelter and indirectly benefit other wildlife (invertebrates and animals that feed on them, such as amphibians). A minor adverse level of impact at the local level is considered likely during construction due to the permanent loss of suitable habitat, which is not considered to affect the integrity of the reptile population. However, once compensation planting has established, a minor beneficial impact is anticipated at the county level, leading to a Slight Beneficial effect that is not significant.

Water voles

8.11.34 Surveys to date have not confirmed the presence of a water vole population despite suitable habitat being recorded. For the purposes of this assessment and in the absence of complete survey data, a reasonable worst-case has been assumed i.e. that a breeding population of water vole is present somewhere adjacent to the construction areas and will be indirectly affected by increased levels of vibrational, noise and light disturbance (unavoidable night works). This level of disturbance is unlikely to affect the viability of a population, should it be present.

8.11.35 One out of a total of seven watercourses identified as comprising habitat suitable for water voles will be subject to permanent loss of a small extent of habitat due to the extension of existing culverts during construction. This loss is estimated to be less than 50 metres at two distinct locations. Locations include habitat along Old Trent Dyke within Farndon West borrow pits (water vole transect WV14) and in the upper reaches of this watercourse north of the railway. Location details are available in Appendix 8.12 (Water Vole Technical Report) of the ES Appendices **(TR010065/APP/6.3)**. Should surveys confirm water vole presence at these locations, an experienced water vole ecologist would either:

- displace water voles from the works (areas of habitat directly lost) into connected suitable water vole habitat, under conditions of a displacement licence (up to 50 consecutive metres along both banks).
- remove water voles under a conservation licence from Natural England.

8.11.36 If displacement is required to be undertaken, enhancement of bankside habitat will result in a net conservation benefit for water voles (a condition of the licence), extending the length of suitable habitat available. In accordance with the conditions of this licence, the length of displacement will not exceed more than 50 consecutive metres.

8.11.37 Several small pipe culverts are deemed to be semi-permeable barriers for water voles, preventing movement between good and sub-optimal habitat or good and unsuitable habitat, so the lengthening of these culverts will not adversely affect water voles. Where existing pipe culverts are considered too small to safely retrofit mammal ledges and extension of these culverts would result in deterring use by water voles, a negligible impact is anticipated because of the lack of suitable existing habitat at either end of these structures.

8.11.38 A minor adverse impact is anticipated at the county level, leading to a Slight Adverse effect during construction that is not significant.

Operation

Designated sites

8.11.39 No impact pathways have been identified for the Humber Estuary SAC or Ramsar during operation.

8.11.40 None of the habitats within the 12 LWSs located within 200 metres of the ARN are exemplary managed sites and are not highly sensitive (for example, woodland designated for lichens or low nutrients communities, such as chalk grassland). Whilst it is acknowledged that the Scheme will result in an increase in the total nitrogen deposition rate, it is unlikely that the Scheme would affect the integrity of these 12 LWS due to habitats continuing to function at current nitrogen level exceeding critical loads. There is very little intervening planted woodland pre-construction (not a reason for the LWS designation), between Cattle Market Junction and Great North Road Grassland LWS. During operation, the Scheme will alleviate congestion, reducing idling traffic queuing to this roundabout. Once intervening habitats detailed in Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)** have established, they will contribute towards buffering adverse impacts from air quality on the LWS and it is anticipated that air quality will not affect the integrity of this LWS. Therefore, a Slight Adverse impact is anticipated at a county level on these 12 LWS, leading to a Slight Adverse effect that is not significant.

Habitats

8.11.41 The increase in nitrogen deposition during operation is not anticipated to affect the integrity of HPIs or nitrogen sensitive habitats within designated sites and, subsequently, the animal species they support. This is because the habitats identified within 200 metres of the ARN are not highly sensitive (for example, woodland designated for lichens or low nutrients communities, such as chalk grassland) and they are still functional despite current (2022 baseline) exposure to nitrogen in exceedance of critical loads.

Protected and notable species

Badger

8.11.42 The areas of new road and dualling have the potential to increase badger road collisions. Pipe culverts that hold shallow standing water prior to construction (baseline levels) are unlikely to possess conditions suitable for passage by badgers during operation. Safe passages under the A46 carriageway include existing access tracks in seven locations across the Scheme, comprising rough grassland and scrub adjacent to the passages. Due to multidisciplinary design constraints, badger fencing will not be possible (see Section 8.10 of this Chapter for justification). Subsequently, a worst-case scenario of 'no fencing' has been applied within the assessment of likely significant effects. In the absence of fencing, planting has been designed to encourage badgers away from carriageways towards existing safe passages, to reduce badger mortality.

8.11.43 No change in the level of impact is anticipated at the local level during operation in the long-term, leading to a Slight Adverse effect that is not significant.

Birds - Barn owl

8.11.44 Barn owls using the local area are likely to have habituated to the artificial lighting associated with the existing A46. Although confining the lighting splays required at junctions and roundabouts will reduce disturbance, due to the widening of the carriageway, barn owls will need to re-habituate. Installation of barn owl boxes beyond areas of disturbance will provide alternative roosting and nesting opportunities as screening vegetation develops. Barn owls will benefit from the enhancement of existing habitats and the creation of habitats which support small mammals they predate. Due to the increased widening of the road, there is the potential for the road to act as a barrier to dispersal through the loss of foraging corridors. The increase in size of the road and speed may also lead to mortality due to vehicle collisions once the road is operational. To reduce the number of barn owls killed by vehicles, barn owls would be encouraged to fly over the road at a height of at least three metres by planting continuous hedges, trees and shrubs adjacent to the carriageway along both sides of the road where conditions allow, which would act as a natural screening once established. Three traffic accident hotspots for barn owl, one of which is a result of the new A1 flyover, have been identified as a short-term risk whilst habitat either side of the carriageway establishes. The A1 flyover presents a low risk of collision in terms of TAB as it is located between urban areas, including existing busy A1 and A46 carriageways, the immediate landscape comprises of Type 2 (sub-optimal) and Type 3 (poor) habitat and no PNS recorded in the area. No observations of barn owl have been recorded within 300 metres either side of this TAB to date.

8.11.45 A minor adverse impact is anticipated at the county level during operation due to the dualling of the A46 carriageway which increases the risk of collision, although small. This will lead to a Slight Adverse effect during operation that is not significant.

Birds - breeding and wintering

8.11.46 Disturbance associated with traffic on the A1/A46 flyover will adversely affect passerine birds (commonly found in urban areas) further away from the Scheme in the short-term, which will need to habituate to new levels of disturbance, although this is deemed. A negligible adverse impact is anticipated at the county level during operation, leading to a Neutral effect that is not significant.

Otter

8.11.47 The areas of new road and dualling has negligible potential to increase otter road collisions. The absence of otter mortality records (from surveys and desk study data) indicates there are sufficient commuting corridors along the River Trent and tributaries that otter does not venture across the carriageway. The planting plan near Old Trent Dyke (where one otter spraint was recorded), would benefit otter by deflecting them away from the widened A46 carriageway towards existing safe passages. The indicative planting design is detailed in Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)**. No change in the level of impact is anticipated at a county level during operation, leading to a Slight Adverse effect that is not significant.

8.11.48 The effects for the Scheme are summarised in Table 8-9 below.

Table 8-9: Summary of assessment of significance of effect

Receptor		Biodiversity resource importance	Level of impact and description (post embedded mitigation)	Essential mitigation[53]	Residual effects
Internationally designated site	Humber Estuary Ramsar and SAC	County importance (lamprey population)	**Construction Phase:** Temporarily, localised reduction in water quality by increasing silt suspension in the water column of finer particles during construction integrating drainage into an existing headwall on the River Trent. Barrier to migration resulting from light spill during unavoidable night works at Nether Lock Viaduct and Windmill Viaduct. Noise and vibration disturbance from sheet piling at Nether Lock Viaduct and Windmill Viaduct. Negligible adverse **Operation Phase:** N/A	Temporary drainage and silt management techniques are outlined in Appendix 13.4 (Drainage Strategy Report) of the ES Appendices **(TR010065/APP/6.3)**. This includes the use of bubble curtains and floating oil booms. ECoW monitoring of silt curtains to mitigate sediment disturbance and smothering of gravels. In addition to embedded mitigation (e.g. directional lighting), the use of task lighting with cowls will be used. Use suitable piling equipment to minimise noise and vibration and a slow start-up, where possible, for all night works and sheet piling adjacent to the River Trent. Fish escape passages in Farndon West wetland area and Farndon East lake will reduce entrapment. Following consultation with the Environment Agency, the	**Construction Phase:** Slight adverse **Operation Phase:** N/A

[53] All essential mitigation is detailed within the First Iteration EMP (Application Document Reference: TR010065/APP/6.5) and shown on Figure 2.3: Environmental Masterplan (Application Document Reference: TR010065/APP/6.2) where relevant.

Receptor		Biodiversity resource importance	Level of impact and description (post embedded mitigation)	Essential mitigation[53]	Residual effects
				specific number, location and design of the fish escape passages will be finalised during detailed design, and the proposals will be tested in the fluvial hydraulic model to assess the potential impact to receptors.	
Locally designated sites	Kelham Hall Shingle Bank LWS Hill Holt LWS Kelham Road Redoubt Grassland LWS Newark Trent Grassland LWS River Trent – Kelham LWS River Trent, Staythorpe LWS Trent Banks/Wharves, Newark LWS	County Importance	**Construction Phase:** No change **Operation Phase:** No change	N/A	**Construction Phase:** Neutral **Operation Phase:** Neutral
	Great North Road Grasslands LWS	County Importance	**Construction Phase:** Direct (permanent) habitat loss (56%) and temporary long-term loss (17%). Major adverse **Operation Phase:** Increase in nitrogen deposition. Slight adverse	Loss of any habitat of conservation value would be replaced like-for-like (in condition) as a minimum requirement providing a greater area than was lost or enhanced where possible (detailed in Figure 2.3 Environmental Masterplan of the ES Figures **(TR010065/APP/6.2)** along with indicative compensatory planting, as shown in Figure	**Construction Phase:** Moderate adverse **Operation Phase** Slight adverse

Receptor		Biodiversity resource importance	Level of impact and description (post embedded mitigation)	Essential mitigation[53]	Residual effects
				8.4 (Compensation Planting for Loss of Local Wildlife Site Habitats) of the ES Figures **(TR010065/APP/6.2)**, to be finalised with Natural England). Planting design to include a mix of native conifer and broadleaved tree species. As planting along the A46 carriageway corridor establishes, it will act as more of a buffer over time, altering dispersion of air pollutants	
	Old Trent Dyke LWS	County Importance	**Construction Phase:** Direct (permanent) habitat loss at Old Trent Dyke LWS (1%). Minor adverse **Operation Phase:** N/A	Loss of any habitat of conservation value would be replaced like-for-like (in condition) as a minimum requirement providing a greater area than was lost or enhanced where possible (detailed in Figure 2.3 Environmental Masterplan of the ES Figures **(TR010065/APP/6.2)**) along with indicative compensatory planting to be finalised with Natural England).	**Construction Phase:** Slight adverse **Operation Phase** N/A
	Dairy Farm Railway Strip, Newark LWS Newark (Beet Factory) Dismantled Railway LWS	County Importance	**Construction Phase:** Direct (permanent) habitat loss at Dairy Farm Railway Strip (4.9%) and Newark (Beet Factory) Dismantled Railway (0.1%) Minor adverse **Operation Phase:** Increase in nitrogen deposition. Slight adverse	Loss of any habitat of conservation value would be replaced like-for-like (in condition) as a minimum requirement providing a greater area than was lost or enhanced where possible (detailed in Figure 2.3	**Construction Phase:** Slight adverse **Operation Phase** Slight adverse

Receptor		Biodiversity resource importance	Level of impact and description (post embedded mitigation)	Essential mitigation[53]	Residual effects
				Environmental Masterplan of the ES Figures **(TR010065/APP/6.2)**) along with indicative compensatory planting to be finalised with Natural England). Planting design to include a mix of native conifer and broadleaved tree species. As planting along the A46 carriageway corridor establishes, it will act as more of a buffer over time, altering dispersion of air pollutants	
	Coneygre Wood LWS Newark Dismantled Railway LWS Flintham Park LWS Kelham Road Grassland LWS Kelham Road Grassland II LWS Newark Grassland LWS South Scaffold Lane, Collingham LWS Spring Wood, Kelham LWS Valley Farm Grassland LWS	County Importance	**Construction Phase:** N/A **Operation Phase:** Increase in nitrogen deposition. Slight adverse	Planting design to include a mix of native conifer and broadleaved tree species. As planting along the A46 carriageway corridor establishes, it will act as more of a buffer over time, altering dispersion of air pollutants	**Construction Phase:** N/A **Operation Phase** Slight adverse
Habitats of principal importance	Lowland meadow	County Importance	**Construction Phase:** Permanent loss of 0.4% and temporary long-term loss 3% of lowland meadow (BNG metric considers any loss unacceptable).	Bespoke compensation package to be finalised with Natural England for loss of lowland meadows. Green hay from retained lowland meadow	**Construction Phase:** Slight adverse **Operation Phase:** N/A

Receptor		Biodiversity resource importance	Level of impact and description (post embedded mitigation)	Essential mitigation[53]	Residual effects
			Major adverse **Operation Phase:** N/A	will be used to establish approximately 8,400 square metres of lowland meadow close by. Habitat replanting will achieve a net gain for all habitats of principal importance in the long-term, once established. Native and locally sourced species will be used in landscape design.	
	Lowland mixed deciduous woodland	County Importance	**Construction Phase:** Total permanent partial loss of 62% of lowland mixed deciduous woodland (partial loss of two woodlands: 59% and 11% and almost complete loss of a third woodland (94%). A further 4% of this third woodland would be subject to long-term temporary loss. Major adverse **Operation Phase:** N/A	Loss of any habitat of conservation value will be replaced like-for-like (in condition) as a minimum requirement providing a greater area than was lost. Habitat replanting will achieve a biodiversity net gain for this habitat of principal importance in the long-term, once established. Native and locally sourced species will be used in landscape design.	**Construction Phase:** Slight adverse (following the establishment of compensation planting[54]) **Operation Phase:** N/A
	Coastal and floodplain grazing marsh	County Importance	**Construction Phase:** Permanent loss (4%) and temporary long-term loss (5%) of coastal and floodplain grazing marsh. Minor adverse **Operation Phase:** N/A	Loss of any habitat of conservation value will be replaced like-for-like (in condition) as a minimum requirement providing a greater area than was lost. Habitat replanting will achieve	**Construction Phase:** Slight adverse **Operation Phase:** N/A

[54] Negotiations with landowners are ongoing to secure the compensation planting for lowland mixed deciduous woodland HPI.

Receptor		Biodiversity resource importance	Level of impact and description (post embedded mitigation)	Essential mitigation[53]	Residual effects
				a net biodiversity gain for all habitats of principal importance in the long-term, once established. Native and locally sourced species will be used in landscape design.	
	Wood pasture	County Importance	**Construction Phase:** N/A **Operation Phase:** N/A	N/A	**Construction Phase:** N/A **Operation Phase:** N/A
Non HPI habitat	Woodland Scrub Grassland Species-poor and defunct hedgerows	Local Importance	**Construction Phase:** Permanent loss of small areas of non-HPI (woodland, scrub, grassland and hedgerows). Minor adverse **Operation Phase:** N/A	Loss of any habitat of conservation value would be replaced like-for-like (in condition) as a minimum requirement. Habitat replanting will achieve a net biodiversity gain for all habitats in the long-term, once established. Native and locally sourced species will be used in landscape design.	**Construction Phase:** Slight adverse **Operation Phase:** N/A
Trees	Veteran and notable trees	National Importance	**Construction Phase:** The RPA of three veteran trees (T039, T136 and T139) will be directly impacted by the construction of a maintenance track and earthworks, possibly resulting in a slow decline in tree health and accelerating death of tree. One veteran tree (T139) to be subject to a crown lift to 4.5m to provide aerial clearance to vehicles using the maintenance track. Major adverse **Operation Phase:**	Tree protection measures for all retained trees, including temporary barriers, Cellweb matting, or similar brand. Supervision by the Scheme arboriculturist following the installation of protection measures, during construction, and on completion of construction operations. Annual inspection to monitor the physiological condition of veteran trees T039, T136 and	**Construction Phase:** Slight adverse **Operation Phase:** N/A

Receptor		Biodiversity resource importance	Level of impact and description (post embedded mitigation)	Essential mitigation[53]	Residual effects
			N/A	T139 and monitor the effectiveness of the permanent ground protection. This will inform whether remedial and compensatory action is required, for example 'veteranise' other retained trees.	
Protected and Notable Species	Badger	Local Importance	**Construction Phase:** Permanent loss of one inactive one-entrance outlier sett. Vegetation clearance resulting in the disturbance of badger in the wider landscape (less visual screening) and temporary loss of foraging habitat. Potential for an increase in badger mortality from vehicle collisions during construction where screening habitat has been removed. Major adverse **Operation Phase:** Potential for an increase in badger mortality from vehicle collisions.	21 day monitoring of badger setts prior to closure and destruction of sett. Closure of inactive sett, vegetation clearance and earthworks to be supervised by a suitably experienced ecologist. Landscape planting (as shown in Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)**) will mitigate for loss of foraging habitat. Strategic planting to direct badger to safe passage whilst planting establishes, where possible.	**Construction Phase:** Slight adverse **Operation Phase:** Slight adverse
	Bats	Regional Importance	**Construction Phase:** Permanent and temporary loss and temporary fragmentation of foraging and commuting habitat whilst landscape planting establishes. Increase in lighting disturbance. Demolition of building F004 with a confirmed bat roost. Disturbance of confirmed bat roosts (buildings F002, F010, F013, F054, F057 and trees F123, F210, F213, F225) and the	ESMP licence for bats required for demolition of building F004 and disturbance to confirmed bat roosts. Internal inspection by licensed surveyor prior to back-filling accessible crevices on trees and buildings and prior to soft-stripping materials from one building (F004) to be demolished.	**Construction Phase:** Slight adverse **Operation Phase:** N/A

Receptor		Biodiversity resource importance	Level of impact and description (post embedded mitigation)	Essential mitigation[53]	Residual effects
			assumed to be present roosts (buildings F002, F005, F009, F034, F062, F063 and F064). Major adverse **Operation Phase:** N/A	Felling of trees with hibernation potential undertaken outside of hibernation period or sensitive working methods implemented within this season (as per mitigation above). Landscape planting and creation of the Farndon West wetland area and Farndon East lake will mitigate for loss of foraging and commuting routes. Installation of bat boxes in retained woodland and trees. Indicative locations are shown in Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)**.	
	Birds - barn owl	County Importance	**Construction Phase:** Temporary closure of three barn owl nest boxes during construction and disturbance of six potential nest sites. Loss of foraging habitat. Risk of injury and mortality for vehicle collision due to loss of screening vegetation. Major adverse **Operation Phase:** Small increase in collision risk compared to baseline. Minor adverse	Provision of barn owl nest boxes, with indicative locations shown in Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)**. Avoid construction works with suitable buffer around active nest sites. Creation of wetland area and planting of rough grassland for foraging, within 500m of the nest boxes or existing nest sites. Landscape planting will mitigate for loss of foraging and commuting routes.	**Construction Phase:** Slight adverse **Operation Phase:** Slight adverse

Receptor		Biodiversity resource importance	Level of impact and description (post embedded mitigation)	Essential mitigation[53]	Residual effects
				More opportunities for roosting following installation of barn owl boxes.	
	Birds - breeding and wintering	County importance	**Construction Phase:** Permanent loss of nesting (including one rookery in full and another, partially), foraging and commuting habitat and temporary visual disturbance. Major adverse **Operation Phase:** Disturbance impact short-term only resulting from A1 flyover will expose birds at a greater distance, which will need to habituate. Minor adverse	Vegetation clearance undertaken outside of breeding bird season or sensitive working methods implemented within this season. ECoW supervision during vegetation clearance undertaken during the core nesting bird period (March – August, inclusive) or for night-time works at any time of year. Landscape planting incorporating breeding bird habitats and installation of kestrel boxes in woodland and retained trees and creation of wetland.	**Construction Phase:** Slight adverse **Operation Phase:** Neutral
	Fish	Regional importance	**Construction Phase:** Potential siltation of a coarse fish spawning site at Nether Lock Weir from integrating the drainage into an existing headwall on the River Trent. Culverting and realignment of Slough Dyke could result in injury or mortality of fish. Temporary, short-term, localised noise and vibration disturbance where sheet piling works undertaken and light disturbance from night works, during works at both viaducts. Minor adverse **Operation Phase:** Potential for fish entrapment in the pools at	Electro-fishing as part of fish rescue prior to sheet piling and works to Slough Dyke. ECoW supervision for riparian and in-channel vegetation removal and installation of sheet piling. Timings of in-channel works, including integrating into existing infrastructure to avoid spawning season where possible. Works within the River Trent are to be undertaken between mid-June and October inclusive where	**Construction Phase:** Slight adverse **Operation Phase:** Neutral

Receptor		Biodiversity resource importance	Level of impact and description (post embedded mitigation)	Essential mitigation[53]	Residual effects
			the newly created Farndon east wetland area as flood waters recede. Minor adverse	possible, to avoid coarse fish spawning season (March to mid-June) and migration of river and sea lamprey (November to May). Use suitable piling equipment to minimise noise and vibration and a slow start-up, where possible, for all night works and sheet piling adjacent to the River Trent. Temporary drainage and silt management techniques are outlined in Appendix 13.4: Drainage Strategy Report of this ES **(TR010065/APP/6.3)**. This includes the use of bubble curtains. Landscape planting and creation of Farndon West wetland area and Farndon East lake, both with fish escape passages, will mitigate for loss of foraging and spawning habitat and reduce entrapment. Following consultation with the Environment Agency, the specific number, location and design of the fish escape passages will be finalised during detailed design, and the proposals will be tested in the fluvial hydraulic model to assess the potential impact to receptors	

Receptor		Biodiversity resource importance	Level of impact and description (post embedded mitigation)	Essential mitigation[53]	Residual effects
	Great crested newts (GCN)	County Importance	**Construction Phase:** N/A **Operation Phase:** N/A	N/A	**Construction Phase:** N/A **Operation Phase:** N/A
	Invertebrates – aquatic and terrestrial	County importance	**Construction Phase:** Permanent loss of one pond in the FCA. Permanent loss of terrestrial habitats within Great North Road Grasslands LWS. Minor adverse **Operation Phase:** N/A	Creation of a compensatory pond in the Kelham and Averham FCA (as shown on Figure 2.3 Environmental Masterplan of this ES **(TR010065/APP/6.2)**). Landscape planting will mitigate for loss of foraging and egg laying habitats within LWS (as shown on Figure 2.3 Environmental Masterplan of the ES Figures **(TR010065/APP/6.2)**).	**Construction Phase:** Slight adverse **Operation Phase:** N/A
	Otter	County Importance	**Construction Phase:** Potential for general disturbance of otter due to increased levels of vibrational, noise and artificial light disturbance. Minor adverse **Operation Phase:** Potential of road traffic collisions. Minor adverse	Creation of Farndon West wetland and Farndon East lake. Nightworks to be avoided in proximity to the River Trent, where possible. Directional planting, once established, will also benefit otter, guiding them towards existing safe passages under the A46.	**Construction Phase:** Slight Adverse **Operation Phase** Slight Adverse
	Reptiles	County Importance	**Construction Phase:** Loss of habitat and temporary fragmentation of foraging and commuting routes. Minor adverse **Operation Phase:** N/A	Habitat creation including grassland would provide replacement habitat of value for reptiles (foraging, egg laying, commuting and refuge). In addition, the provision of log	**Construction Phase:** Slight beneficial **Operation Phase:** N/A

Receptor		Biodiversity resource importance	Level of impact and description (post embedded mitigation)	Essential mitigation[53]	Residual effects
				and brash piles from retained felled trees, in species rich grassland, around ponds with areas of scrub and creation of the Farndon West wetland area will compensate for the loss of habitat suitable for reptiles at different life stages (within the Order Limits), as shown on Figure 2.3 (Environmental Masterplan) of the ES Figures **(TR010065/APP/6.2)**. ECoW supervision of terrestrial and riparian vegetation following completion of hand searches.	
	Water voles	County Importance	**Construction Phase:** Permanent loss of habitats with foraging, burrowing and commuting value for water voles, which constitute isolated sections adjoining sub-optimal and unsuitable habitat. Minor adverse **Operation Phase:** N/A	Landscape planting and enhancement of sub-optimal adjoining habitat will mitigate for loss of foraging and commuting routes. ECoW supervision of riparian and terrestrial bankside vegetation clearance along watercourses (under licence if required following pre-construction surveys).	**Construction Phase:** Slight adverse **Operation Phase:** N/A

8.12 Monitoring

8.12.1 The Scheme is anticipated to result in a residual significant effect during construction. No residual significant effects are anticipated during operation. Monitoring during both construction and operation will aim to record changes in the ecological baseline, determine whether the mitigation/compensation measures are successful, and inform whether remedial actions are required. The Scheme monitoring requirements are detailed within the First Iteration EMP **(TR010065/APP/6.5)**. In accordance with Requirement 3 of the draft DCO **(TR010065/APP/3.1)** a Second Iteration EMP will secure the monitoring requirements and procedures, as summarised below, to reduce or eliminate impacts on the environment prior to construction commencing.

Monitoring requirements for habitats

8.12.2 To ensure the success of habitats planted as compensation, these planting areas will be maintained for a period of five years from completion of the Scheme. Audits will be carried out by a suitably qualified Landscape Architect to review the establishment and continued growth of new planting.

8.12.3 Any habitat creation contributing to BNG will be maintained, managed and monitored for 30 years post construction. The annual monitoring of veteran trees impacted by the Scheme will also be required post construction to align with BNG.

8.12.4 A LEMP will be produced as part of the Second Iteration EMP which will outline management requirements for landscape and ecology aspects for the Scheme. The LEMP will also specify monitoring requirements for landscape and ecology during the aftercare period to assess whether habitat created/restored/reinstated has responded favourably to the implemented mitigation, and to inform ongoing habitat management. The LEMP will be updated for the Third Iteration EMP which outlines long-term maintenance requirements.

Monitoring requirements for protected species

8.12.5 Consistent methods will be used pre- and post-development to aid comparison of population trends. The level of monitoring required will be proportional to the population assessment and the impact of development. Post-construction monitoring and maintenance of protected species populations are detailed within the First Iteration EMP (**TR010065/APP/6.5**) and in accordance with Requirement 3 of the draft DCO (**TR010065/APP/3.1**) a Second Iteration EMP will secure the monitoring requirements and procedures. Post-construction monitoring and maintenance associated with protected

species populations is summarised below under each respective receptor heading.

Bats

8.12.6 All bat boxes provided across the scheme will be subject to annual monitoring from year 2 and year 3 of construction and for five years during operation. Monitoring will include maintenance (cleaning, repair and replacement).

Birds

8.12.7 Annual monitoring of barn owl boxes and kestrel boxes will be undertaken during construction and for three years post construction[51] in September/October to coincide with box maintenance (including replacement) and clean out. Suitably experienced ecologists who hold a survey licence for development projects (CL29) or a Schedule 1 licence to disturb barn owls will undertake monitoring of barn owl nest boxes. Maintenance (cleaning / repair / replacement) will be undertaken as required during this time. Post this period, continued monitoring could be undertaken by voluntary groups, should the site be entered into a national monitoring scheme (for example, British Trust Ornithology (BTO) Nest Record).

Reptiles

8.12.8 Monitoring will be undertaken in year 1, 3 and year 5 during operation. Monitoring will comprise of only an assessment of habitat created for reptiles in year 1 and presence / likely absence surveys for reptiles as well as habitat assessment in years 3 and 5. Results will indicate whether new habitats have established successfully, whether reptiles have recolonised and will inform whether any remedial work is required. Post this period, continued monitoring could be undertaken by voluntary groups, should the site be entered into a national monitoring scheme e.g. National Reptile Survey (part of the National Amphibian and Reptile Monitoring Programme).

Water voles

8.12.9 Annual field sign surveys of areas both sides of culverts (where it is safe to do so) will be undertaken during late summer/ autumn for five years post construction. Further monitoring using remote cameras could be used, where possible, over a period of four weeks during early spring and a further four weeks during late summer/autumn.[55] A suitably experienced water vole ecologist will undertake this monitoring.

[55] Dean M, Strachen R, Gow D, Andrews R (2016). The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series). Eds Mathews F and Chanin P. The Mammal Society, London. (Last accessed December 2023).

8.13 Conclusions

8.13.1 The habitat strategy is based on the principles of no net loss and has also achieved a net gain in habitats of biodiversity value (though not a Scheme-wide biodiversity net gain), which are of benefit to a wide range of protected species. In the case of lowland meadow, a compensation strategy has been designed to address unavoidable losses to this very high distinctiveness habitat, as detailed in Appendix 8.14 (Biodiversity Net Gain Technical Report) of the ES Appendices **(TR010065//APP/6.3)** and the First Iteration EMP **(TR010065/APP/6.5)**.

8.13.2 It is anticipated that the Scheme is likely to have a Slight Adverse effect on Humber Estuary SAC and Ramsar during construction.

8.13.3 A Moderate Adverse effect is anticipated on Great North Road Grasslands LWS during construction and a Slight Adverse effect is anticipated during operation.

8.13.4 A Slight Adverse effect is anticipated on Dairy Farm Railway Strip, Newark LWS, Newark (Beet Factory) Dismantled LWS and Old Trent Dyke LWS during construction. A Slight Adverse effect on Dairy Farm Railway Strip, Newark LWS and Newark (Beet Factory) Dismantled LWS is anticipated during operation.

8.13.5 A Slight Adverse effect on Coneygre Wood LWS, Newark Dismantled Railway LWS, Flintham Park LWS, Kelham Road Grassland LWS, Kelham Road Grassland II LWS, Newark Grassland LWS, South Scaffold Lane, Collingham LWS, Spring Wood, Kelham LWS and Valley Farm Grassland LWS is anticipated during operation only.

8.13.6 No effects are anticipated on the remaining LWS during construction and operation. These include Kelham Hall Shingle Bank LWS, Kelham Road Redoubt Grassland LWS, Newark Trent Grassland LWS, Hill Holt LWS, River Trent – Kelham LWS, River Trent, Staythorpe LWS and Trent Banks/Wharves, Newark LWS.

8.13.7 A Slight Adverse effect is anticipated on HPI and non HPI during construction.

8.13.8 A Slight Adverse effect is anticipated on three veteran trees during construction.

8.13.9 The Scheme is anticipated to have a Slight Adverse effect during construction on badger, bats, breeding and wintering birds, fish, reverting to Neutral once operational.

8.13.10 The Scheme is anticipated to have a Slight Adverse effect on barn owls during construction and operation.

8.13.11 The Scheme is anticipated to have a Slight Adverse effect during construction on invertebrates (aquatic and terrestrial) and water vole.

8.13.12 The Scheme is anticipated to have a Slight Beneficial effect on reptiles during construction.

8.13.13 The Scheme is anticipated to have a Neutral effect on otter during construction and operation.

8.13.14 The operation of the Scheme is likely to result in a reduction of the quality and functionality of adjacent habitat due to increased levels of disturbance and potential changes to air quality. The increase in nitrogen deposition during operation is not anticipated to affect the integrity of HPIs, LWSs that are designated for their botanical interest or, subsequently, the animal species they support. Local protected species populations may also be adversely affected by the operation of the Scheme, due to increased traffic levels and therefore levels of disturbance. The introduction of the new A1 flyover may also increase the risk of killing and injuring aerial species such as bats and birds through collisions with traffic. The increased traffic levels may also increase the risk of killing or injuring terrestrial mammals due to collisions with vehicles.

8.14 References

[1] National Highways (2020) DMRB LA 108 – Biodiversity, Revision 1 [online]. Available at: LA 108 - Biodiversity (standardsforhighways.co.uk) (Last accessed December 2023).

[2] National Highways (2020) DMRB LD 118 Biodiversity design, Revision 0 [online]. Available at: LD 118 - Biodiversity design (standardsforhighways.co.uk) (Last accessed December 2023).

[3] CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine Version 1.2 [online]. Available at: ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.2-April-22-Compressed.pdf (cieem.net) (Last accessed December 2023).

[4] The Conservation of Habitats and Species Regulations 2017 (SI 2017/1012) [online]. Available at: https://www.legislation.gov.uk/uksi/2017/1012/2022-10-01 (Last accessed December 2023).

[5] The Planning Inspectorate (2022) Advice Note Ten: Habitats Regulations Assessment relevant to nationally significant infrastructure projects Version 9 [online]. Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-ten/ (Last accessed December 2023).

[6] The Environmental Targets (Woodland and Trees Outside Woodland) (England) Regulations 2023 (SI 2023/90) [online]. Available at: https://www.legislation.gov.uk/uksi/2023/90/made (Last accessed December 2023).

[7] Department for Transport (2014) National Networks National Policy Statement [online] available at: National Policy Statement for National Networks (publishing.service.gov.uk).

[8] Department for Levelling Up, Housing & Communities (December 2023). National Planning Policy Framework [online] available at: National Planning Policy Framework (publishing.service.gov.uk) (last accessed March 2024).

[9] 'A Green Future: Our 25 Year Plan to Improve the Environment' https://www.gov.uk/government/publications/25-year-environment-plan (last accessed December 2023).

[10] HM Government (2023) Environment Improvement Plan 2023; First revision of the 25 Year Environment Plan.[online] available at: Environmental Improvement Plan (publishing.service.gov.uk) (www.gov.uk) (last accessed December 2023).

[11] Nottinghamshire Biodiversity Action Group (2008) Local Biodiversity Action Plan [online]. Available at: [redacted] (Last accessed December 2023).

[12] Green Estates Development Strategy & Plan 2013-2023 Appendix 1 [online]. Available at: https://www.nottinghamshire.gov.uk/media/125962/green-estates-strategy-2013-2023.pdf (Last accessed December 2023).

[13] Department for Transport (2020) Road Investment Strategy 2: 2020–2025 [online]. Available at: Road Investment Strategy 2: 2020-2025 (publishing.service.gov.uk) (Last accessed December 2023).

[14] Highways England (2015) Our plan to protect and increase biodiversity [online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/441300/N150146_-_Highways_England_Biodiversity_Plan3lo.pdf (Last accessed December 2023).

[15] National Highways (2020) DMRB LA 115 – Habitats Regulations assessment [online]. Available at: e2fdab58-d293-4af7-b737-b55e08e045ae (standardsforhighways.co.uk) (Last accessed December 2023).

[16] Department for Transport (2022) TAG UNIT A3 Environmental Impact Appraisal [online]. Available at: TAG UNIT A3 Environmental Impact Appraisal (publishing.service.gov.uk) (Last accessed December 2023).

[17] Chartered Institute of Ecology and Environmental Management (CIEEM) (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland Version 1.2 [online]. Available at: ECIA-Guidelines-April 2022.pdf (cieem.net) (Last accessed December 2023).

[18] National Highways (2022) A46 Newark Bypass EIA Scoping Report [online] available at: TR010065-000002-A46N - Scoping Report.pdf (planninginspectorate.gov.uk) (last accessed December 2023).

[19] Nottinghamshire County Council (2016) Minerals Local Plan Background Paper Biodiversity. [online]. Available at: https://www.nottinghamshire.gov.uk/media/111889/bp-biodiversity.pdf (Last accessed December 2023).

[20] Collins, J. (ed.) (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines, 3rd Edition. Bat Conservation Trust: London.

[21] Caporn, S. et al (2016). Assessing the effects of small increments of atmospheric nitrogen deposition (above the critical load) on semi-natural habitats of conservation importance. Natural England Commissioned Reports, Number 210 [online]. Available at: naturalengland.org.uk/publication/5354697970941952 (Last accessed December 2023).

[22] National Highways (2020) DMRB LA 113 – Road drainage and the water environment [online]. Available at: d6388f5f-2694-4986-ac46-b17b62c21727 (standardsforhighways.co.uk) (Last accessed December 2023).

[23] Natural England and Forestry Commission (2022). Ancient woodland, ancient trees and veteran trees: advice for making planning decisions [online]. Available at: Ancient woodland, ancient trees and veteran trees: advice for making planning decisions - GOV.UK (www.gov.uk) (Last accessed December 2023).

[24] Natural England and Department for Environment, Food & Rural Affairs (2014) Protected species and development: advice for local planning authorities [online]. Available at: https://www.gov.uk/guidance/protected-species-how-to-review-planning-applications (Last accessed December 2023).

[25] English Nature (2001). Great Crested Newt Mitigation Guidelines. English Nature, Peterborough.

[26] National Highways (1999) DMRB Nature conservation advice in relation to otters. Volume 10 Section 1 Part 9 HA 81/99.

[27] Shawyer C (2012). Barn Owl Tyto alba Survey Methodology and Techniques for use in Ecological Assessment. Wildlife Conservation Partnership.

[28] National Highways (2019) DMRB LA 105- Air Quality Revision 0 [online]. Available at 10191621-07df-44a3-892e-c1d5c7a28d90 (standardsforhighways.co.uk) (Last accessed December 2023).

[29] Defra (2018) MAGIC Interactive Map [online]. Available at: http://magic.defra.gov.uk/ (Last accessed December 2023).

[30] Natural England (2018) Natural England website [online]. Available at: https://www.gov.uk/government/organisations/natural-england (Last accessed December 2023).

[31] NCC (2018) JNCC website [online]. Available at: http://jncc.defra.gov.uk/ (Last accessed December 2023).

[32] Cardiff University (undated) Map of otter casualties [online]. Available at: [redacted] (Last accessed December 2023).

[33] Air Pollution Information System (APIS) (2023) [online]. Available at: [redacted]. (Last accessed December 2023).

[34] Joint Nature Conservation Committee (JNCC)(n.d). Humber Estuary [online]. Available at: https://sac.jncc.gov.uk/site/UK0030170 (Last accessed December 2023).

[35] Nottinghamshire Local Sites Panel (2018) Guidelines for the selection of Local Wildlife Sites in Nottinghamshire Part 2A – Local Wildlife Sites selection criteria: species [online] Available at: PART 2 – BIOLOGICAL SINC SELECTION CRITERIA (nottinghamcity.gov.uk)pdf (Last accessed December 2023).

[36] Joint Nature Conservation Committee (JNCC) (2010) Handbook for Phase 1 Habitat Survey - a technique for environmental audit [online] Available at: Handbook for Phase 1 Habitat Survey (jncc.gov.uk) (Last accessed December 2023).

[37] Joint Nature Conservation Committee (JNCC) (2008). UK Biodiversity Action Plan Priority Habitat Descriptions: Lowland Meadows. Available: Eutrophic standing waters (UK BAP Priority Habitat description) (jncc.gov.uk).

[38] Atkins, Technical Note: A46 Newark Northern Bypass, Preliminary Walkover Survey (2019).

[39] Bat Conservation Trust: Bat surveys for Professional Ecologists, Good practice Guidelines 3rd edition (2016).

[40] Atkins. (2019). HE551478-ATK-EBD-XX_A46-RP-LE-000008. A46 Newark Northern Bypass Preliminary Walkover Survey Technical Note.

[41] Bird Survey & Assessment Steering Group. (2022). Bird Survey Guidelines for assessing ecological impacts, v.1.0.0. Available URL: [redacted] (Last Accessed 15 December 2023).

[42] Bibby, C.J., Burgess, N.D., Hill, D.A., Mustoe, S. and Lambton, S. (1992, 2000). Bird Census Techniques. *Academic Press, London, UK.*

[43] Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Noble D. and Win, I. (2021). The status of our bird populations: The Fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. *Brit. Birds* 114, 723–747.

[44] M. Edwards (2012). Bees, Wasps & Ants Rcording Society (BWARS) website [online]. Available at: [redacted] (Last accessed December 2023).

[45] S. J. Falk (2001). Bees, Wasps & Ants Rcording Society (BWARS) website [online]. Available at: [redacted] (Last accessed December 2023).

[46] Dean, M (2021). Water Vole Field Signs and Habitat Assessment: A Practical Guide to Water Vole Surveys. Pelagic Publishing.

[47] Nottinghamshire County Council (2011). Crayfish in Nottinghamshire: Help us to protect our native white-clawed crayfish [online]. Available at: [redacted]. (Last accessed December 2023).

[48] WFD-UKTAG listed INNS, categorised as High/Medium/Low/Unknown Impact (WFD-UKTAG, 2021).

[49] Vowles, A.S., Kemp, P.S. (2021). Kemp Artificial light at night (ALAN) affects the downstream movement behaviour of the critically endangered European eel, *Anguilla Anguilla*. Environmental Pollution, Volume 274 [online]. Available at: [redacted] (Last accessed December 2023).

[50] Mitchell-Jones, A. J. (2004) Bat mitigation guidelines [online]. Available at: Bat mitigation guidelines - Jan.PDF (framptons-planning.com) (Last accessed December 2023).

[51] Shawyer C (2012). Barn Owl *Tyto alba* Survey Methodology and Techniques for use in Ecological Assessment. Wildlife Conservation Partnership [online]. Available at: [redacted] (Last accessed December 2023).

[52] Baker, J., Hoskin, R., Butterworth, T. (2019). Biodiversity net gain. Good practice principles for development. A practical Guide [online]. Available at: [redacted] (Last accessed December 2023).

[53] [Clarification note]

[54] Dean M, Strachen R, Gow D, Andrews R (2016). The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series). Eds Mathews F and Chanin P. The Mammal Society, London. (Last accessed December 2023).